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THE TELEPHONE.

ON March 10th, 1876, ALEXANDER GRAHAM BELL spoke into an instrument which he had fixed in the attic of his house. This instrument was connected by 100 ft. of a wire to a similar instrument in the basement. He said "Mr. Watson, come here, I want you." The result was that Mr. WATSON came bounding up the stairs shouting gleefully "I heard you, I heard you." Thus the telephone, which, as the POSTMASTER-GENERAL rightly said, deserves to be ranked as among the greatest contributions of science to industry, was born.

It was obviously the bounden duty of the Institution of Electrical Engineers to celebrate an event of such outstanding importance, but for various reasons it was not possible to do so until last week. This formal celebration was a great success. The short speeches at the luncheon, Sir OLIVER LODGE'S lecture and the exhibition of ancient and modern telephones at the conversazione in the evening all combined to play their part and did it well. Fortuitously also the year is a fortunate one for the celebration. Before its end it is probable that the first public automatic exchange will be installed in London. A conference is even now being held in Paris with the object of improving telephonic communication in Europe. A new submarine cable with twelve speech channels between this country and Holland will make a regular service with Germany possible and the facilities between the British Isles and France and Belgium are also to be similarly extended. Further, ordinary two-way transatlantic telephony is in sight. Last, and most important of all, in its bearings not only on scientific but on national progress, people are acquiring the telephone habit.

Telephony, it cannot be denied, is an interesting subject. Perhaps more than any other branch of electrical work it has called for great ingenuity, and this ingenuity has been translated into considerable success. But this good quality, which has been necessary enough for dealing with a number of difficult matters, has been directed mainly to solving the problem of putting two persons who wish to communicate with each other into communication as quickly as possible. And it has thus tended, perhaps inevitably, to obscure the wonderful phenomena by which the thought in the mind of the speaker is conveyed instantaneously to the brain of the listener many miles away.

It was therefore well that the lecture on Thursday last dealt with this fundamental question and the Institution were fortunate to obtain a speaker of the calibre of Sir OLIVER LODGE to put the intrinsicalities of the telephone before them. As Sir OLIVER said, GRAHAM BELL'S invention was one of almost absurd simplicity. He arrived at it not electrically but from a study of phonetics, though his genius in recognising that electrical transmission was the best to use must be noted. It has been stated that had GRAHAM BELL been a scientist he would have known that telephony was impossible, but its possibility having been demonstrated by a non-scientist, it was one great scientist, KELVIN, himself no mean inventor, who recognised at once the uses that could be made of it, and another, HEAVISIDE, who solved those line problems which have made long distance communication a living fact. Seeing the part that telephony plays in our work and pleasure, it was appropriate that Sir OLIVER'S lecture should be broadcast. For the most non-technical listener should know about its progress and could not fail to be impressed with the wonder of it all.

Though, as we have said, the keynote of the celebrations was the inherent simplicity of the telephone, it is well that it should not be forgotten that, though this is true enough as far as the instruments are concerned, it is far otherwise with the exchange and line equipment. This is amply demonstrated by the interesting exhibition which has been arranged at the Science Museum, South Kensington. This exhibition, which was on view during the Institution Conversazione, will remain open for six weeks, and we hope that many electrical engineers will pay a visit to it. It includes examples of early telephone instruments and adequately covers the progress of the past fifty years up to the latest automatic telephone exchange system, a working model of which is on view. Even more recent is the seven-valve set which the British Broadcasting Co. are showing.

Besides the telephone equipment there are many line problems to be considered. These have been pretty fully dealt with in recent years, notably by Mr. FRANK GILL in his presidential address to the Institution of Electrical Engineers in 1922, by Dr. J. A. FLEMING in his Kelvin lecture in 1923 and Mr. W. CRUIKSHANK in his report which appears in the current volume of the Institution "Journal." They are summarised again in the interesting technical review of telephonic progress from the pen of Mr. H. H. HARRISON which appears on another page of this issue. For while it may be said that the exchange problem is

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solved, there is still much to do in increasing the effective speaking range which Graham Bell put at 20 miles, and which now reaches 3 400 miles, an increase of 170 times in 40 years.

How this has been done is, as Mr. HARRISON justly says, a fascinating story, the main outlines of which are familiar to our readers. HEAVISIDE was the pioneer, though his idea that the solution lay in increasing the inductance of the line was for long regarded as ludicrous. Nothing was therefore done, apart from an invention by SILVANUS THOMPSON (which though not correct in itself might have led to a correct solution), until PUPIN took up the question rather over a quarter of a century ago and introduced what is now well known as loading. Further progress was made by the introduction of the valve, which has not only mitigated the difficulties of loading by partially removing the necessity for it, but has enabled more and more lines to be placed underground. It is these results which open up the possibility of a trans-European network of telephone links when once the political difficulties have been overcome.

Even now, however, a limit is set to the distances over which telephonic communication can be established, if it is necessary to abandon the use of land lines. The practicability of being able to establish a commercial telephone system between this country and America therefore depends on the employment of wireless methods. This has ceased to be a vision and, as we have already said, has become an actual fact. Even this is not the end. Further discoveries will assuredly be made. For, as Sir OLIVER said, "Progress in science is based on the ultimate intelligibility of everything, and so far wisdom has been justified of her children."

Current Topics.

An Invitation to Bouverie House.

THE ELECTRICIAN is now established in its new offices at Bouverie House, 154, Fleet Street, London. This move, it is interesting to note, brings us back to the street we left in 1863, and we have therefore completed a cycle with the low periodicity of 0·19 per annum. When we were in Fleet Street before we were at No. 86, on the site now occupied by the Press Association, but with very different accommodation. The amplitude of the cycle has also been low, for the offices of THE ELECTRICIAN have never been more than a few yards from what is often called the "Street of Ink," but which nowadays would be more appropriately described as the "Street of Press Palaces." Bouverie House is the latest of these palaces, and, believing that our readers will be interested in seeing the premises from which THE ELECTRICIAN is published each week, we give them a cordial invitation to come and have tea with us between 4 and 6 p.m. on Thursday, July 8th. Formal cards have already been sent out for this function, but in case any of our readers should not have received one, we shall be glad to rectify the omission. We can show them a modern office building admirably designed for the purpose for which it is to be used, and an electrical installation second to none of its kind in the country. There will also be an opportunity of seeing not only the work done by a number of technical and trade contemporaries with whom THE ELECTRICIAN is associated, but by a book-publishing concern which, in an extraordinarily short time, has established a world-wide reputation for excellent literary products dealing with almost every sphere of human activity. Please, therefore, come on Thursday, July 8th, and let us show you where we work.

The Contractors' Conference.

FROM the moment we heard that the Electrical Contractors' Association had decided to hold an annual conference we were confident of its success. But neither we, nor anyone outside the Association's Sussex branch, which so capably conducted the arrangements, expected the magnificent reception prepared for the large crowd of visitors at Brighton last week. From start to finish everything went with a swing, and with never a dull moment. Apart from the very real enjoyment afforded by such a gathering, the conference provided a means for an airing of views on a diversity of questions of real interest to contractors and, for that matter, to all sections of the industry. The recent rapprochement between the E.C.A. and the I.M.E.A. found general approval, and manifestations of the new co-operative spirit between these two interdependent sections were forthcoming from both sides. An extensive illustrated report of the conference proceedings will be found elsewhere in this issue.

A Descriptive Name for Contractors.

ALTHOUGH everyone in the industry knows what an electrical contractor is, the significance of this appellation is not so clear to members of the public who have occasion to utilise his services. Slightly more intelligible, but more unwieldy, is the title "registered electrical installation contractor." Strictly speaking, as Mr. DUNLOP has pointed out on occasion, many members of the B.E.A.M.A. are also literally electrical contractors. In the U.S.A. the word "electragist" has been adopted, and here there is a desire for a similar but more euphonious term to take the place of the existing "label." This desire was voiced at the E.C.A. Conference by Mr. H. T. YOUNG, and Mr. F. W. PURSE confessed that unsuccessful efforts had been made by the registration authority to find a suitable word. He thought, however, that further suggestions might be forthcoming, and if an appropriate word were found it would be adopted. To assist the search THE ELECTRICIAN will be pleased to receive suggestions—which will be forwarded to the National Register of Electrical Installation Contractors—and to award a prize of £5 5s. for the title that is officially adopted, provided that it is thus received and forwarded by us. Readers may send in as many suggestions as they like, but each attempt should bear the inventor's name and address.

Contractors and Co-operation.

IN the important Paper on "Co-operation between the Supply and Electrical Contracting Sections of the Electrical Industry" which he read at the Conference of the Electrical Contractors' Association last week, Mr. WALTER FINLAY said that as the electricity supply and contracting sections were in immediate touch with the public, their cordial co-operation was of supreme importance. The difficulty was to know what were the proper limits of the spheres of their respective activities, but he believed that the two branches were interdependent and should not therefore encroach on each other's fields, neither for their own good nor for that of the public. He was, as is only natural, opposed to the supply undertakings doing wiring work themselves, but on the new grounds that it would restrict choice and tend to favour the products of certain manufacturers, and even to a tendency to give away installations. He believed therefore in co-operation, especially as money was necessary to secure the good installation it was desirable to have, and also because in the end the contractor might be expected to do the work more cheaply. To this, no doubt, certain supply engineers will reply with equal justification that they have to do the work because the contractors in their area cannot or will not do it satisfactorily. The solution of both these difficulties, as Mr. FINLAY rightly sees, lies in a policy of "give and take." For if it can be arranged so that without checking progress the contractor gets a quick profit from the installation, and the supply undertaking a slower but none the less sure profit from the current sold, a great deal will have been achieved. Perhaps Mr. FINLAY's final point was the most important. Co-operation is especially essential on propaganda. Here both sides can help each other, and E.D.A. help both, with excellent results.

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Wiring Rules.

Two of the Papers read at the conference of the Electrical Contractors' Association at Brighton last week dealt with the Institution Wiring Rules, one directly and one by inference. Mr. LLEWELYN B. ATKINSON argued that electricity required rules because it is only known by its effects after they have happened. The latest I.E.E. rules, he added, had been much misunderstood. There was no technical objection to them and no addition in cost, that was worth serious discussion, arose from using them. While this is perhaps putting the matter too high, there is no doubt that when the I.E.E. rules are employed a thoroughly good installation is obtained, and that is worth paying something for. Mr. PURSE for his part put up a good case for the registration of contractors, and was able to show that the National Register has already done a good deal for its members. One of the most important of its activities is the investigation of complaints of inferior work, and it is obvious that if this is to be done successfully there must be some standard. This once again brings in the Institution Rules, though Mr. PURSE was in favour neither of the National Register adopting them, nor preparing a set of their own. With the latter view there will be general agreement. A feeling was, however, expressed in the course of the discussion that rules, if a necessary evil, are also a necessity, and a suggestion was made by Mr. W. R. RAWLINGS that there should be different rules for different classes of premises. Such a compromise, however, would hardly be advisable. It would add to the number of rules, while difficulties would arise as to which set of rules should be applied to certain premises. Though there are objections to making the adoption of the rules a condition of membership of the Electrical Contractors' Association, this seems to be the correct way out of the difficulty, and we were glad to hear from Mr. YOUNG that it is a policy that is likely to be adopted.

Electric Mining Locomotives.

THREE or four years ago Mr. CHARLES MARKHAM conceived the humane idea of rescuing the pit pony from strenuous service in the mine and installing in its place a machine capable of doing greater service with increased efficiency. If this can be done the results will obviously be beneficial from other than the humanitarian point of view. Wages, as we all know to our cost, are a difficult matter in the mining industry and it is extremely likely that were more machinery used the economic position of this British key industry would be greatly improved. In offering a £1 000 prize for the best electric storage battery locomotive Mr. MARKHAM was therefore doing the country a real service. It will be remembered that a very exacting specification was compiled for the use of competitors and that this was analysed by Mr. JOHN T. PRINGLE in THE ELECTRICIAN of December 14th, 1923. Trials of the competing locomotives were subsequently held with the result that the prize was awarded to Joseph Booth and Brothers, Ltd. A report of the tests, which were held at Broadsworth Colliery, near Doncaster, has been issued by the Stationery Office and this is dealt with also by Mr. PRINGLE on another page of this week's issue. Mr. PRINGLE'S first criticism is of the test track. He considers that it should have been of a type more nearly approaching that found in collieries and that had this been the case the winning locomotive would not have shown so high a degree of efficiency. This is a severe criticism and if it can be maintained does much to vitiate the value of the tests.

Some Criticisms.

THE field tests were preceded by battery discharge tests, and though the battery employed was found to have a substantial reserve after the duty cycle test had been completed it must be remembered that it was new and that it would not therefore be wise to reduce its weight. Another criticism is that not enough information is given regarding the tubs used in the drawbar tests. A satisfactory feature, however, is that though the winning locomotive was certainly the best of the five entered, a survey of the defects in the other machines shows that they could be easily remedied, and if this were done they would give a much better exhibition. It therefore seems that the test has disclosed that there are in this country five types of locomotive available which will carry out the test satisfactorily, and the important question therefore remains whether they would do equally well in normal service. Mr. PRINGLE'S careful examination of the various machines entered is in this respect encouraging. Some improvement seems to be called for in the electrical equipment. In the winning machine the flame proof enclosure was faulty. In general there was in fact a lack of ingenuity in the design of these parts, and it is still unsafe to work a direct-current machine particularly in a gaseous atmosphere. More attention to the plugs and sockets is also necessary. On the whole, nevertheless, the test locomotives show an advance over what has up to now been done in this country and are considerably better than those of foreign manufacture. This is good hearing. On the other hand, it is not likely that they will obtain a great market in this country where the mines are old, the roads unsuitable and the atmosphere gaseous. But the competition may stir up designers to produce a cheap and safe pulling locomotive and if it does it will have been well worth while. We regret that the report of these tests, which resulted from his enterprise and generosity, should have been so closely followed by the death of Mr. CHARLES MARKHAM himself at the age of 61. He was, as is well known, chairman of the Staveley Coal and Iron Co. and other large collieries, and the lines on which he managed these concerns were an example to others, especially at the present time. He was very much an individualist and preferred to remain outside the Coal Owners' Association. In spite of this, his relations with his employees was excellent and he took a great interest in the technical improvement of mining operations. The competition on which we have just commented is an outstanding example of this and if the results of it are what they should be will form by no means a small tribute to his memory.

Tramways Problems.

IF tramway undertakings cannot make money at the present time they at least find it possible to hold very successful conventions. The twenty-ninth annual meeting of the Tramways and Light Railways Association, which took place at Torquay last week, is no exception to this rule. On the business side the principal questions dealt with were motor omnibus competition and the design of rolling stock, two subjects which are perhaps not so remote from one another as might appear at first sight. The first is having a serious effect on the balance sheet. For instance, a Lanarkshire company which has always previously been prosperous has lost £7 000 in one year through unrestricted competition from motor omnibuses. The Association have therefore determined to approach the Ministry of Transport with a view to obtaining further legislation on this matter. This, it is true, may do a good deal especially in the removal of relative injustices, but it may be wondered whether it will do enough. The public is a factor that must be considered and the public seems to be increasingly regarding the omnibus as the more pleasant and more efficient vehicle in which to ride. Something may, however, be done in another way. The report of the Joint Committee of the Tramways and Light Railways Association which was presented at the meeting on the question of rolling stock, stated that there was room for considerable improvement in tramcar construction and that while they had stood still the motor omnibus had progressed. It is satisfactory, therefore, to learn that the matter is to receive special consideration by a Standing Committee. We believe that the tram has a great future before it if the problems, difficult as they are, which now exist are tackled in the right way.

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THE TELEPHONE, 1876—1926.

Samuel Pepys—The Work of Graham Bell and Edison—Development of the Exchange—The Coming of the Automatic System—Practical Visionaries.

By H. H. HARRISON, M.I.E.E., M.I.R.S.E.

WRITING in 1848, Edward Highton in his book "The Electric Telegraph" commences:—"What an age of wonders is this!" Writing more than threequarters of a century later, with what emphasis can the statement be repeated? The transmission of the spoken word over a distance has engaged attention from the earliest times. We need not dwell on the scientific trickery of the priesthood in the heathen ages, but it is interesting to note that the speaking trumpet emerged in the reign of Charles the Second. Thus, in his dairy for April 2nd, 1668, Mr. Pepys says:—"Here to my great content I did try the use of the Otacousticon, which was only a great glass bottle broke at the bottom, putting the neck to my eare, and there I did plainly hear the dancing of the oares of the boats in the Thames to Arundel gallery window, which, without it I could not in the least do, and may I believe, be improved to a great height, which I am mighty glad of." Curiously enough, although the famous diarist makes several references to Sir Samuel Morland, he says nothing of the speaking trumpet which Morland invented—a device which must have been highly interesting to a scientific dilletante such as Pepys was.

Bell's Early Researches.

According to Kingsbury in his authoritative and fascinating book "The Telephone and Telephone Exchanges," the word "Telephone" was first applied in 1845 to a compressed air syren invented by Captain John Taylor, R.N., for fog signalling. From this date onwards the word would seem to have been loosely applied to speaking trumpets, speaking tubes, ear trumpets or any acoustic devices intended to facilitate the transmission and reception of sounds using the air as a medium.

Alexander Graham Bell came of a family the members of which were highly interested in the mechanism of speech and the synthesis of sounds. His early experimental work in connection with what we should now term audio frequency multiple telegraphy, led him step by step to the articulating telephone. He found that a polarised vibrating reed suspended in front of an electro-magnet was capable of generating "undulatory" currents and would set a similar reed in vibration if the current generated by the transmitting reed was passed to the electro-magnetic portion of the second or receiving reed. By employing a plurality of reeds, the transmission of several telegraph messages over one circuit became possible, or the transmission of a complex musical sound, a problem in which Bell was far more interested.

Without dwelling on Bell's experimental work and his speculations at this stage, which would require a considerable space for adequate treatment, it is easy to see that with his deep knowledge of the work of Helmholtz and others, the passage from musical sound transmission to speech transmission was but a step. Bell saw the limitations of his multiple reeds for transmitting highly complex sounds such as human speech. In modern language, the "frequency band" was too narrow. He abandoned the idea of a reed type of "articulating" telephone and the membrane type substantially as constructed to-day followed closely on its heels. Shortly after July 1st, 1875, the first experiments with the electro-magnetic speaking telephone were carried out, and these demonstrated the practicability of the invention. The solution of the problem was, in fact, more complete than the inventor himself at that time realised.

The telephone then became the scientific wonder of its time, and claimants to prior invention sprung up. The news of its advent spread rapidly throughout the scientific world, and was scoffed at by many leading scientists, but those who came to scoff remained to pray. It was an accomplished fact.

The Transmitter.

In the original Bell apparatus, the telephone was alternately employed as transmitter and receiver. This was rendered possible by the fact that the apparatus was reversible. Sound waves striking the membrane set it in vibration, and this varied the flux distribution in the cores of the polarised magnet. The receiving coil embraced these cores and the whole arrangement constituted a feeble electro-magnetic generator. The currents so produced flowed along the line circuit and traversed the receiver coils at the far end. The process here was reversed, the diaphragm vibrating in response to the varying currents and transforming electrical into acoustic energy. The apparatus would transform acoustic into electrical energy or *vice versa*, and was thus completely reversible. The amounts of energy set in motion were extraordinarily small, and this set a limit to the resistance of the intervening connecting wires and, consequently, the distance apart at which the telephones could be placed.

The telephone, as it now existed, was in extensive use for private line purposes, and its range and all-round utility were considerably enhanced by the next step due to T. A. Edison. He produced in 1878 the carbon transmitter in which the resistance of the speaking circuit was varied in accordance with the complex varying acoustic energy impressed on the speaking diaphragm. This was a much more effective method of producing Bell's "undulatory" current, as larger amounts of electrical energy could be modulated in this way, and the range of transmission was thereby extended.

Edison's further important contribution was the interposition of the induction coil between the transmitter and the line. By means of this arrangement the microphone was placed in a comparatively low resistance primary circuit, so that variations of transmitter resistance were considerable and not swamped as they otherwise would have been when the battery, transmitter, line, and distant receiver were all in series. The induction coil was a small open core transformer of the step-up variety, so that the electrical energy was transmitted at a higher pressure than that of generation, and the C^2R losses thus reduced. Edison's transmitter has undergone innumerable modifications, but the induction coil is still standard. The Bell telephone with the additions of Edison was now ready for the next step.

Methods of Calling Up.

The Bell interests at first suggested vocal calls, stating that these would be heard within two or three feet of the instrument. Later, battery signalling with call bells and buzzers were applied, and later still, Watson—Bell's assistant—patented the application of the magneto electric machine as a signal transmitter, the telephone receiver itself being used as an "alarm." Watson finally invented the polarized ringer practically in the form of the ringer in use to-day. The automatic switch by which the bell is removed from the circuit and the talking apparatus connected up followed, and the telephone was then a complete organism.

As the public grew in knowledge of the usefulness of the telephone, the demand for exchange systems sprung up. The number of fire alarm systems and the numerous telegraph exchanges furnished an example of the usefulness of intercommunication between groups of individuals, and as the telephone required no special training to use it as did the telegraph, the exchange was the next natural step in the evolution of the telephone as a public utility. It would take too long to deal adequately with this, in many respects the most interesting period in the development of telephony.

Simple crossbar switches, with drop shutter calling and clearing indicators and flexible cords with metallic plugs at each end formed the central office equipment. The subscriber used his magneto for calling the exchange and for clearing—"ringing off"—when the conversation was finished. Later, the crossbar switch was replaced by a vertical panel on which were mounted flat contact springs or "jacks" spaced closely together and arranged in horizontal rows so that a particular subscriber's jack could be quickly identified. The cords were provided with switches or "keys" by which the operator, observing a call, could connect herself to the calling subscriber and take his requirements, the free end of the cord terminated by a plug was then plugged into the required subscriber's line and the operator rang him up, finally switching herself out of circuit and leaving the two subscribers in connection with each other. A typical switchboard of the period (1878) is on exhibition at South Kensington Science Museum. By 1879 such a switchboard was erected in Coleman Street, London.

The next step in development was the means by which exchanges of several hundred lines capacity could be formed. Each operator in such an exchange would have one to two hundred subscribers to attend to, and in the event of receiving

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a call for a subscriber situated in another section of the exchange, would complete the call with the aid of a second operator and a connecting link or " transfer " circuit between her position and that of the second operator at the position where the required subscriber was located.

The transfer system had obvious defects, especially as the capacity of exchange systems increased. These objections were removed by the adoption of the principle of giving each operator access to every line incoming to the exchange.

Thus each line would first appear at one operating position of the exchange—the answering position, the calling indicator being placed here also. The line would then be multiplied to all positions of the switchboard and thus become accessible to any operator. As a connection is now effected by one operator and as she may be able to see whether the required line is engaged at any other position, a " busy " or engaged signal was provided. Various systems were devised, but the general principle is this : When a line is taken into use a potential is put on the framework of the jack. When an operator desires to effect a connection with any line, she places the tip of the plug on the jack and obtains a click, due to a current flowing from the jack frame through her telephone, provided, of course, that the line is busy. The absence of this click is a permit to her to complete the connection.

As Mr. Kingsbury very truly remarks, this step in development must be regarded as next in importance to the telephone itself. Without the multiple principle, telephone exchanges of any size would have been excessively complicated, and the operating would have been very slow. The germ of the multiple principle was laid down by L. B. Firman in 1882.

The Central Battery System.

Up to now the current for talking was furnished by primary batteries placed at each subscriber's station. In addition, the work of ringing the exchange to call attention, ringing the distant subscriber and ringing for disconnecting purposes when the conversation was over, was thrown on the subscriber. This system has given good results and is still in use ; in fact, it is only a few days ago that " Bank " exchange in the heart of the City of London was withdrawn from service, but it has its drawbacks when a large metropolitan network is considered. Battery maintenance is a serious matter and the signalling arrangements leave something to be desired. In the central battery system one large capacity battery is located at the exchange and serves to feed all the lines connected to the exchange, both for talking and signalling purposes.

The battery is permanently connected to all the lines, but at the subscribers' sub-stations the calling bell is across the lines through a 2 mfd. condenser. Ringing current is alternating and is sent out from the exchange when required. The subscribers' apparatus is thus always in a position to be rung, while the condensers prevent current from the central battery circulating over the system.

When a subscriber removes his telephone from its hook, the bell and condenser are withdrawn from the circuit and replaced by his talking apparatus. The line will now allow current to pass, and a relay individual to that line, and situated at the exchange, operates and lights a small signal lamp. Calling has now been reduced to the simple action of lifting the telephone preparatory to talking. By means of keys the operator can come in on the calling line via a pair of cords and plugs which she takes into use for effecting the connection to be made. By means of the cord circuit the operator is able to test the required subscriber, apply ringing current to his line and switch the two through to one another.

Automatic Clearing.

Owing to the central battery, clearing becomes automatic also ; two " supervisory " relays being included in the cord circuit. These are held in the operated position while both subscribers are talking, but de-energise when both hang up their telephones. They control two supervisory lamps, and the condition of these advise the operator of the state of the call.

The common battery system has been in successful operation since about 1893. The automatic method of calling and clearing and the supervision of a call were features which gave it considerable advantages from an operating standpoint, and its employment spread rapidly all over the telephone-using world.

Within recent years small improvements directed to lightening the operator's load have been brought out. On some of these " feature " boards, as they are termed, the operator has only to plug into a calling line to be automatically connected. Ringing is automatically initiated and terminated. The calling subscriber where connected to a subscriber in another office can instantly recall the originating or A operator by the simple process of hanging his receiver up and again taking it down. He does not have to wait for clearance until the distant subscriber hangs up and the clearing signal has been given. Thus a pronounced defect in the manual system is overcome. All these modifications are tacit confessions of weakness in the manual system from the point of view of service to the public.

From about 1880, several minds had turned to the subject of mechancial switching as an alternative to the existing manual method. Early workers in the field include such names as Connolly and McTighe, Dane Sinclair, Ericsson and others, but in the main their ideas centred around small subsidiary exchanges serving a group of a few subscribers only.

It is generally conceded that the first step towards the automatic main exchange problem was that made by Strowger in 1891 when U.S. patent 447 918 was issued, disclosing his co-ordinate or double motion switch, in which contact-making wipers or brushes were lifted opposite circularly disposed rows of contacts and rotated until the desired set of contacts was reached. In this way, with ten rows of ten contacts each, any one of a hundred contacts could be selected in a maximum of twenty, or an average of ten steps.

The development of this system in the face of incredible difficulties is a veritable romance which would take many pages to relate. The system as first proposed by Strowger required five line wires, and a system of push buttons had to be correctly manipulated by the calling subscriber in order that the central office switches were positioned. The reduction of the five wires to three, and afterwards to two, as in standard manual practice, resulted from intensive study and research on the part of Keith, T. G. Martin, Lee Campbell, E. A. Mellinger and others. Mechanical improvements were steadily introduced by the brothers Ericsson and others, and in particular may be mentioned the calling dial brought out in 1898, which, in principle, has been followed by every maker of automatic telephone equipment since.

The Financial Aspect.

While the technical difficulties were being successfully overcome, the financial aspect was gloomy and unpromising. Only the courage and vision of Joseph Harris, backed with the enthusiasm and convictions of the men mentioned above, enabled the manufacture and exploitation of the system to be pursued. The large Telephone Administration would have nothing to do with it, and the only field for exploitation was among the growing number of independent telephone companies in existence, who had arisen when the Bell patent monopoly expired. Opposition even took the form of acquiring independent companies who had installed automatic equipment, pulling this out, and replacing it by manual apparatus.

As late as 1910 a prominent official of the Bell Company stated that the automatic system was not adapted to American telephone service requirements. In spite of this, according to the current annual report of the Bell system, 1 496 000 lines of automatic equipment have been installed, and other systems in that country have 500 000 lines automatically operated. In the same report it is stated that the results of machine switching are satisfactory from the standpoint both of operation and of service to the users.

There is a remarkable parallel between the early struggles of Bell and his associates and the devoted band of workers in the automatic telephone field. Both were considered as visionaries and vested interests offered strenuous resistance to their ideas. They *were* visionaries, but what vision !

In 1877 the Bell interests limited the distance for speech transmission to 20 miles. By contrast in 1892 they had obtained through service between New York and Chicago, and in January, 1915, a regular service between New York and San Francisco (3 400 miles) was opened. The transmission range had been multiplied 170 times in 40 years.

There is no more fascinating story than that dealing with the gradual increase of speaking range in telephony. Space will only allow of a brief outline of the remarkable development which has taken place.

As the exchange system grew, inter-city communication resulted, and the part that the line conductors played in the chain of apparatus employed began to be of importance.

The process of transmission was not understood. Vaschy

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TELEPHONE EXHIBITION.

Informative Historical Display at South Kensington—Modern Automatic Working—Latest Patterns of Line Plant and Apparatus.

IN connection with the celebration of the Jubilee of the Telephone, an interesting exhibition has been arranged at the Science Museum, South Kensington. This was inspected by the members of the Institution of Electrical Engineers at their Annual Conversazione on Thursday, June 24th, and will remain open for six weeks so that the public may have an opportunity of seeing it.

The exhibition has been arranged in two sections, one illustrating the development of the apparatus, and the other line plant. Among the authorities and manufacturers who have kindly supplied or lent material are the following: The General Post Office, the Institution of Electrical Engineers, the Standard Telephones and Cables Co., Siemens and Brothers and Co., the Automatic Telephone Manufacturing Co., the Peel Conner Telephone Works, and the British L.M. Ericsson Telephone Manufacturing Co.

Fig. 1.—Visitors to the Telephone Exhibition testing the Navy telephone connected by one of the latest automatic exchanges, shown in background. This photograph gives a general view of the automatic apparatus.

The items are assembled practically in order of the dates of their invention so that the evolution of present-day types may be followed. Following the same system it may be remarked that the first case contains samples of the earliest forms of receivers on the lines of that invented by Bell, and also an example of the earlier Reiss telephone which transmitted sounds only. This is followed by a case of carbon transmitters, which were introduced later—by Hughes in England and Edison in America. A striking contrast is afforded by the presence of a modern wireless broadcasting transmitter, standing alongside the primitive and original types.

The first step towards the introduction of a telephone system for public use was attained by the invention of the magneto bell by Mr. Watson, a co-partner with Bell, and the utilisation of the existing magneto generator for producing currents to operate the bell and attract attention to the instrument. This device was quite suitable on a direct line connecting two telephones, but it soon became evident that in an exchange system a multiplicity of ringing bells would become an unpracticable proposition. The necessity for a silent yet efficient calling system led to the invention of the magneto drop indicator for the exchange ends of the lines and the assembly of the lines on jacks for inter-connecting mounted on a panel adjacent to the indicators, the whole arrangement with plugs and cords being designated a switchboard.

The evolution of the modern switchboard is shown in the exhibition by the display of various types, beginning with the magneto and terminating with a modern common battery board, fitted with lamp signalling. Beyond the manual switchboards come the automatic switching units, which the Post Office exhibited in the Government Pavilion at Wembley to demonstrate the method of dealing with London and other large multi office areas, and which are now permanently installed in the Science Museum as working models. Four exchanges, North, South, East and West are installed and also an exchange called a tandem exchange. The four main exchanges provide for direct calling between subscribers without the intervention of an operator, in certain cases the calling is done on direct junctions connecting the exchanges concerned, and in other cases the junction pass through the tandem exchange. Facilities are provided for operating from automatic to manual and vice-versa. The system of which the fundamental basis is an ingenious selecting, storing, translating and signalling device called a "Director" is extremely flexible and allows for the provision of a continuous service throughout the area during the process of conversion from manual to automatic with a minimum of interference. A self-contained automatic exchange called "Central" is installed to illustrate the operation of a single exchange area with outlets to other areas through a manual board. The complete battery and ringing equipment with changing machine and power board are in operation daily, except Sundays during certain hours, and demonstrations are given at stated periods.

On the line plant side, samples of paper core telephone cables of various periods and sizes are shown. The modern method of loading cables, either by continuously winding iron or stalloy wire round the copper conductors, or by the insertion of coils inserted in the lines at recurrent intervals is demonstrated on the stands. The use of thermionic valves for wireless work is well known to the public, but their application to the transmission of speech along wires is not so appreciated. The placing of telephone circuits underground, while securing stability and a certain amount of freedom from external disturbance, has a deleterious effect upon speech transmission inasmuch as the electrostatic capacity of a pair of wires is much greater when placed close together in a cable underground than when fitted fairly widely apart on poles. Loading the cables in the manner indicated above remedies this to a certain extent, but on longer lines repeaters are fitted. These repeaters consist mainly of amplifying valves with devices to stimulate the characteristics of the lines and to suppress echoes. Two repeaters, one for a 2-wire circuit and one for a 4-wire are shown in operation. The amount of space taken up by underground telephone routes is effectively illustrated

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THIS MODEL OF BELL'S FIRST
TELEPHONE IS A DUPLICATE OF THE INSTRU-
MENT THROUGH WHICH SPEECH SOUNDS WERE
FIRST TRANSMITTED ELECTRICALLY 1875.
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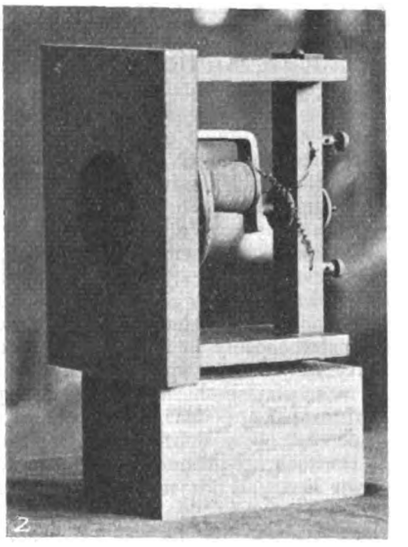
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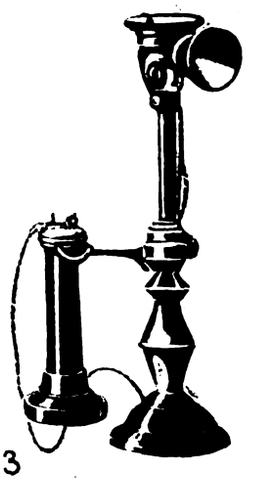
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TELEPHONE PROGRESS PICTURED.

A GOOD idea of the tremendous progress that has been made in the field of telephony since 1875 is obtainable from this collection of pictures illustrating chronologically the development of telephone apparatus.

The illustrations show (1) *A view of a model of Graham Bell's first telephone, introduced in* 1875.

(2) *The original Bell telephone transmitter with which Mr. Bell first sent a message from one room to another at Boston, U.S.A., in* 1876.

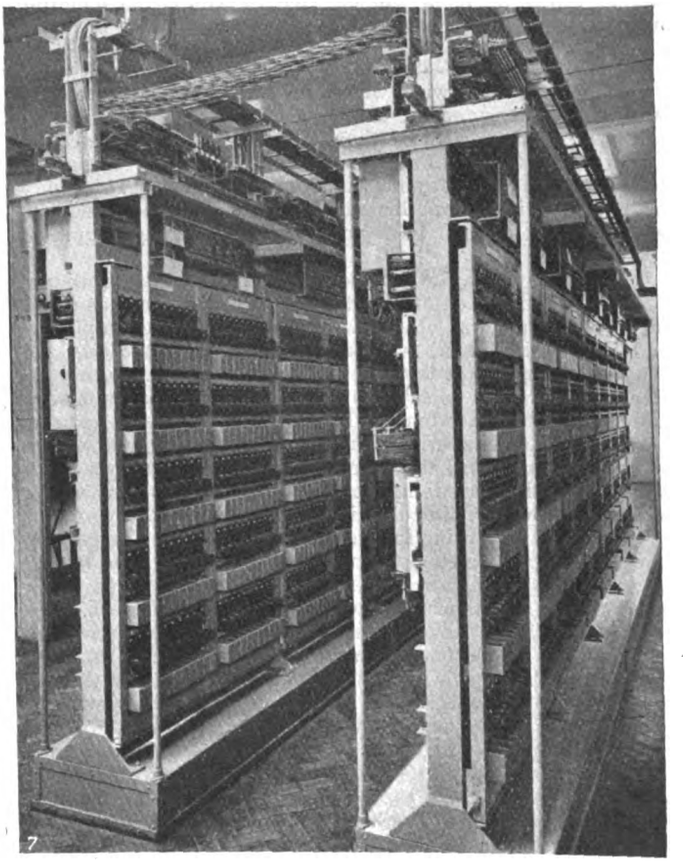
(3) *One of the instruments through which telephone conversations were conducted in* 1886.

(4) *The year* 1898 *marked an important change in telephone receiving instrument design, as this illustration shows.*

(5) *A modern Western Electric telephone receiver fitted with two ear-pieces.*

(6) *An ordinary pattern Western Electric telephone receiver of the type in use to-day.*

(7) *A view inside a modern automatic telephone exchange.*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SIR OLIVER LODGE ON TELEPHONY.

Lecture to Technical and Broadcast Audiences on "The Greatest Invention of the Nineteenth Century"—A Sceptical Reception—The Work of Kelvin, Heaviside and Fleury.

IN connection with the celebrations of the jubilee of the telephone Sir Oliver Lodge delivered a most informative and instructive lecture at the Institution of Electrical Engineers, on Thursday, June 24th, to a crowded audience. The first part of the lecture was broadcast generally and also to schools, the latter portion of the audience being cut off during the concluding half of Sir Oliver's remarks.

The lecturer said that the telephone was invented by a man who was not a professed electrician, who was not really learned in physical science, but who was interested mainly in introducing precision and clear intelligibility into human speech. Graham Bell's articulation was of the most precise character. He had been concerned with the training of the deaf and dumb; he had married, Sir Oliver understood, a deaf and dumb wife, and had devoted himself to the accurate production of human speech, whether by his own lips and larynx or through its reproduction by instrumental means. He was credited with the statement that it was fortunate that he was not a scientifically trained physicist, for if he had been he would probably have known that a simple articulating machine was an impossibility.

The Essential Instruments.

The instruments with which he had essentially to deal were the human voice at the one end and the human ear at the other, and he realised that if one of these was defective the other must be still more precise and accurate. Thus the telephone had arisen from a study of articulation. This study he had inherited from his father, Alexander Melville Bell, whose whole life had been employed in teaching people to speak.

The way in which Graham Bell had found that the reproduction of human speech at a distance by electrical means could be accomplished was of surpassing and surprising simplicity, and if he (Sir Oliver) were asked suddenly what was the simplest and greatest invention of the nineteenth century he should be disposed to say the telephone, for it had not only had a wide effect in extending human intercourse, but had put into the hands of experimenters an instrument of great value. It had revolutionised the detection of minute currents in all manner of sciences; it had made measurements easy which without it would be difficult; in many cases it had superseded the eye as an observing instrument; and now in the present century, supplemented by further discoveries, it bade fair to make wireless telephony possible all over the earth, with international results which could only dimly be foreseen.

The remarkable novelty in the method of long distance transmission by electrical means was not so much that the ether was able to pick up and transmit the pulses by the aid of the ingenious mechanism provided; the ether was so docile that it would nearly always do all that was wanted of it, except display and enforce its own existence. The wonder was that a simple iron plate was able magnetically to be affected so that it could reproduce and follow accurately, not only the intonations of the human voice, but the sound from every instrument in an orchestra, in a perfect and detailed manner. This was essentially the surprising discovery of Graham Bell. Crude sounds had been transmitted electrically before by Philip Reis and others. Wheatstone had transmitted the sounds of a musical instrument through a wooden rod to a distant soundboard. But Bell had found how to make the vibrations of an iron plate at one end generate fluctuating electric currents which should cause an iron plate at the far end to vibrate in a precisely similar manner.

Kelvin and the B.A.

Graham Bell's first instruments, which were shown by Lord Kelvin at a meeting of the British Association, were of the simplest character. No energy was put into the circuit except that supplied by the voice. The battery was, however, soon introduced, and it was thus possible to magnify the voice and transmit to a distance any reasonable amount of fluctuating energy. But the essential apparatus has remained quite simple, the numerous complications having to do with the distribution and the selection of the person talked to, and with the mechanical or automatic calling up at the central station. The telephone was received in this country with a certain amount of scepticism, but the reasonable attitude of the enlightened was well illustrated by the opening paragraph of James Clerk Maxwell's Rede Lecture before the University of Cambridge in 1878, though their disappointment at its humble appearance was only partially relieved on finding that it was really able to talk.

It might be said, continued Sir Oliver, that the articulating telephone was born on March 10th, 1876, when Bell was Professor of Vocal Physiology at Boston University. During his experiments with tuning forks and Morse signals one of the transmitter springs got out of order and made a faint sound in the receiver. He had hoped till then to get the deaf to interpret musical sounds by a code, but this accident gave him another clue, and as a result he was able to communicate telephonically with his assistant.

In present-day long-distance telephony, wired and wireless telephony constantly tended to approximate to one another, and Sir Oliver drew attention to the contributions of many experts on the subject, including Heaviside's remarks on electric waves in communications to THE ELECTRICIAN for August 17th, 1888, p. 479, and October 19th, p. 772, which were reprinted in Vol. II. of "Electrical Papers," p. 486 onwards.

Discussing the advantage of permanent magnetism in the telephone, it must not be supposed, Sir Oliver continued, that, although the telephone was simple, that simplicity was attained straight away or that the theory of it was unworthy of attention. The instrument consisted essentially of a magnet, a coil and an iron plate. The coil naturally had an iron core so as to be an electromagnet; but in combining these three things—an electromagnet, a permanent magnet and an iron plate—many varieties of arrangement were possible, only one of which was really efficient. The inventor's problem was, therefore, like those bridge or chess problems where a certain key move, or a certain discard, was necessary to the solution, and where all others failed.

The Most Interesting Problem.

The most interesting part of the problem was the need for a permanent magnet. It seemed at first as if an electromagnet ought to do all that was wanted in the receiver, and probably the permanent magnet was introduced in order to enable it to act as a transmitter. In the transmitter, use was made of Faraday's well-known discovery, now nearly a century old. This discovery, regarded theoretically, was the essential connection between the three things. In the transmitter, magnetism and motion were combined, and the result was an electric current; in the receiver the magnetism of that electric current produced motion. One was a kind of dynamo and the other was a kind of motor.

The transmitter produced alternating currents which synchronised in every detail with the mechanical vibrations of sound. In the receiver those currents produced corresponding infinitesimal vibrations in an iron plate in front of an electromagnet. The vibrations were of nearly infinitesimal, or rather molecular, magnitude, but their detection was within the capacity of the ear. The telephone made use of the sensitiveness of the ear and gave it that with which it was competent to deal. An electromagnet close to a suitably clamped iron plate would seem to be the right detector. Why, then, should a permanent magnet be used at all? It was found essential to employ a permanent magnet to back up the electromagnet. The soft iron core close to the iron plate at one end had to have a permanent magnet at its other end, so that the iron plate should be in a permanent magnetic field. The soft iron core transmitted the lines of force of the permanent magnet and thus constantly attracted the iron plate. All that the received currents had to do was not to cause that attraction, but modify it—i.e., to strengthen or weaken the force of attraction according as the currents were positive or negative. The theory of this was simple enough, but was not at first obvious, and there was some discussion as to why a permanent magnet was necessary. Discussing the reason algebraically, Sir Oliver said that the force of attraction depended on the square of the magnetic field. If that field varied between $+ h$ and $- h$, and if the square of that small quantity had to be depended on, hardly any result would be obtained. If, however, it was reinforced by a fixed quantity H, so that the value oscillated between $(H + h)$ and $(H - h)$ and

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the difference of those squares were taken, a very different result would be reached. The difference between $(a+b)^2$ and $(a-b)^2$ was $4ab$; and although b might be very small, $4ab$ might be as big as one pleased by making a big. Thus the permanent field H came in as a factor, and what the telephone observed was not the fluctuation in h but the fluctuation in Hh, which might be of a totally different order of magnitude, depending on the size of H, which was the permanent field supplied in the instrument by the permanent magnet.

In the first instruments the coil was wound over a considerable length of iron core, but it was soon found that the right plan was to use a very short length, to concentrate the coil at the top of the permanent magnet, and to utilise only the fluctuations in a strong permanent field, making the permanent magnet contribute to the sensitiveness by supplying a constant factor to the periodic or fluctuating disturbances which had to be observed.

Magnetic Requirements.

This mode of regarding the influence of a permanent magnet in the receiving telephone was, however, incomplete, for it would suggest that the stronger the magnet the better, and that if greater sensitiveness were required it could be obtained by the use of a strong electromagnet instead of a steel one. But that would defeat its own end. The soft iron inside the coil must not be saturated with magnetism, because then its magnetism would not fluctuate. The permeability of iron was rather a delicate matter. The act of magnetisation was the turning round and facing in one direction of a large number of pre-existing magnets or magnetised molecules, and there were three stages in this operation in most kinds of iron:—

First, when the applied force was too small to disturb them in any large number;

Second, when they began to topple over or turn round, in an almost unstable condition under their mutual forces; and

Third, when the majority of them had already faced round, so that a further force had little or no effect.

That third stage was saturation, and in the telephone must be avoided. The application of a permanent magnet brought the iron into the intermediate or sensitive stage, when its permeability was very high. If the applied magnet were too weak the iron remained in the first stage, with low permeability. If the applied magnet were too strong it reached the final stage, which was also of low permeability. The intermediate stage was the one to aim at when sensitiveness was required. Hence, there was a best strength of permanent magnet, which presumably was hit upon by the experience of instrument makers.

Similar considerations to those applying to the receiver would apply also to the transmitter if Bell's original magnetic transmitter were used, but it had been entirely superseded by the microphone, which depended on the fluctuations of resistance in the contacts of carbon granules in circuit with the battery. All that need be said about it was that it was undesirable to send the battery current itself into the line and through the receiving instrument. It was better to employ a transformer, for that transmitted no steady current at all, but only the currents induced by the variation in the primary current. The line thus received nothing but alternating currents, which were able to do all that was wanted without exerting any polarising or steady perturbing effect on the receiver; the strength of the induced currents being proportional, not to the strength of the primary current, but to its rates of variation.

Transmission Problems.

Discussing transmission he said that any perfectly insulated transmitting line possessed three definite characteristics, which were independent of each other, none of which could be entirely obliterated, but any one of which might be reduced to a comparatively small amount. These three were resistance, inductance and capacity. The deleterious effect of resistance and capacity in combination was distortion. Kelvin had done much in the direction of producing receiving instruments of surpassing delicacy, which minimised, but did not avoid, distortion. Even a small amount of distortion was destructive to telephonic transmission. Speech through a long cable was impossible. The combination of resistance and capacity might enable it to be affected through a cable fifty miles long, but not more. For the distance to which an alternating current of frequency n could be received without too much attenuation was inversely proportional to $\sqrt{nCR}$. The higher frequencies, on which the characteristics of speech depended, were therefore rapidly blotted out. The fundamental note might be received, but the harmonics would be wiped out, and nothing would be got but a featureless and unintelligible drone.

This distortion was due to the inclusion of n, the frequency, along with the CR. If any one of the three factors could be kept small, then the transmission might be clear and definite. n could not be kept small, for the high harmonics were necessary for telephony. R could not be made small, except by the use of an unwieldy amount of copper or by the impracticable device of excessive cooling. There was some control over C, however. Instead of surrounding the copper wire with gutta-percha and a metallic sheath, such as was needed in submarine cables, it might be surrounded by air, supporting it by paper, and these air-spaced cables were in actual use for telephonic purposes. Even if the wires were supported on poles a good distance above the ground, capacity effects were only minimised, and could not be wholly avoided.

The problem of the avoidance of distortion was attacked by Oliver Heaviside, who took into consideration the factor of inductance and leakage in combination, and showed for the first time how to produce a distortionless cable. Kelvin had neglected this factor, but had taken into full account the combined effect of resistance and capacity. Heaviside's theory, however, was not well received by practical electricians, and it was some time before it was practically employed, but Pupin was finally able to persuade American financiers to risk the construction of loaded cables. It was true that inductance increased the impedance, but that by itself turned out not to be deleterious. What was wanted in order to avoid distortion was to get all frequencies to travel at the same rate, so as to preserve the features. A massive disturbance with plenty of inertia behind it could overcome the elastic effect of capacity, and enable the signals to arrive in much the same condition as that in which they started. Heaviside had shown that when the factor of inductance was introduced, the law of transmission was entirely modified, that there was some approach to a true wave propagation with a definite velocity, and that the head or front of the signal would reach its destination with the velocity of light. There might then be more attenuation, but attentuation alone was not the evil; it was the discriminative attenuation that was bad. Mere attenuation would not prevent telephony if only distortion could be avoided. If all frequencies could travel at the same rate it did not so much matter what that rate was. The addition of inductance made some approach to this condition, and accordingly many loaded cables were now in use, some of them with extra inductance coils arranged at regular intervals, but some with the copper conductor surrounded by iron, especially with a nickel alloy, "Permalloy," which had a high permeability even for very small magnetic forces, so that the iron was worked on the steep part of the curve even when fully magnetised, thus greatly adding to the inertia of the current and enabling it to reach its destination unimpaired.

Overcoming Distortion.

Sir Oliver remarked that he was not aware that a really distortionless cable, constructed in accordance with Heaviside's theory, had ever been made, nor did he know if it were practicable. Heaviside had shown that the right condition was to apportion the four characteristics—resistance, inductance, capacity and leakage—in such a way that the ratio $R : L$ was equal to the ratio $C : K$, K being the leakage. In that case the velocity of transmission would be:— $\sqrt{\frac{1}{LC}}$ a speed quite independent of the frequency, so that all the harmonics would arrive together and every feature would be preserved. The attenuation would undoubtedly be great, but, as there was no distortion, considerable power might be applied; or, on the other hand, since the signals would be received in unimpaired condition, however weak, they could be magnified to any desired extent.

Whether such a cable would ever be constructed he did not know, but it seemed probable that modern discoveries had rendered it unnecessary. Fleming's invention of the valve detector had put into our hands an automatic relay of surpassing docility, and long-line transmission could be attained by a succession of short lengths of cable or land line connected together by valve relays. Speech transmission had been effected in America some thousands of miles.

(*Concluded on p. 14*)

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BATTERY LOCOMOTIVES FOR MINES.

A Review of the "Markham" Competition Tests—Criticisms of Test Conditions and the Competing Locomotives—A Bright Outlook.

By JOHN T. PRINGLE.

WITH the meaning of the word "efficiency" in the minds of all persons interested directly or indirectly in coal or metalliferous mining, the Report of the Mines Department on Battery Locomotives Tests at Broadsworth Colliery, near Doncaster, which is dated April 21st, 1926, and has recently been issued by the Stationery Office, cannot fail to be of interest. It shows in condensed form the truly humane attempt of Mr. Charles Markham* to rescue the pit pony from strenuous service in the mine, and to instal in its place a machine capable of doing greater service with increased efficiency. How far this attempt has been successful we shall endeavour to measure by a careful survey of the report. At this stage we can pass over the exacting specification compiled for competitors, as this was dealt with very fully in THE ELECTRICIAN of December 14th, 1923, and proceed to consider the field trials.

An Unusual Track.

A plan of the track was supplied to each competitor and this is reproduced at the back of the report. A track is shown, which, considering gradients, number of curves, curve radius and condition with general layout is seldom found in any modern colliery, and I am inclined to conclude that the winning locomotive could not possibly have achieved the same degree of efficiency if tested on a track of an intermediate design between those existing in mines and the one set down for the trials. Such a track would, I believe, be a closer approach to the actual conditions of the majority of modern collieries.

The field tests were preceded by battery discharge tests in order to prove the declared capacity of the batteries. By what method these tests were carried out is not described, and as this matter is important a full description of the tests should be given, a battery discharge test should be taken as part of the locomotive, and should not be, as they sometimes are, taken running a separate piece of apparatus.

It has been proved again that the deciding factors in battery locomotive design are weight and battery capacity, and in this trial no competitor had been able to produce a machine within the weight given for the duty stated, the winning locomotive being 3·15 tons, or 0·65 tons heavier than the stipulated weight. In this particular case the battery was found to have a substantial reserve after the duty cycle test had been performed, and its weight could possibly be reduced, but again in tests of this kind the batteries are in new condition, and if reduced in weight and supplied for a locomotive for actual mine service they would soon be inadequate for the work to be performed.

The tests applied under Schedule A were subjected to actual measurement and calculation whilst those in Schedule B were judged by inspection. With the former it would have been more conclusive if the duty cycle test had been carried out on a mine track exactly similar in condition to a track near the face in any modern colliery. The energy consumption of the locomotive on the test track and on the one above described should have been averaged to obtain the final result. With Schedule B the facility of handling in shunting and marshalling, the facility for battery charging and the ease of replacement of the locomotive after derailment should have been timed as well as observed.

Drawbar Pull Records.

The autographic record of the drawbar pull drew special attention to the great effort required to overcome the rolling friction of the colliery tubs, and here I consider the report is incomplete and should have given a detailed account of the sizes of wheels and axles and type of bearing used, with the centres of axles, as much depends upon these items when considering rolling friction in mine wagons. A reader of the report cannot suggest a remedy for an abnormal condition without knowing the apparatus causing that condition.

The winning locomotive was certainly the best of the five entered, when judged from test figures and along the lines of the competition, but a careful survey of some of the defects in the other machines will clearly show that these can be easily remedied and if again put to the test would be strenuous competitors with the winning machine. The great feature of the Booth locomotive was the floating outer frame, the ball bearings on the gears and the roller bearings on the main axles, which, along with the well designed motor, reduced the demand upon the battery by more than could have been expected at this stage in the development of battery locomotive design. The judges appear to conclude that a reduction in the weight of the battery could be made on this account, but with this I do not agree, as a big battery margin is the most efficient thing in battery locomotive design. After a locomotive has run for some time it is found that the extra battery capacity given when new is readily absorbed in the additional friction in the machine and in inseparable battery defects. We must not forget that in these tests we are dealing with new machines straight from the test bed, and a reduction in battery capacity would bring down the efficiency more than in a proportional ratio, probably to a point more comparable with competitive machines.

The winning machine appeared to have a good battery receptacle, easily and quickly changed by three men. The battery box had spring valves for relieving the gaseous pressure with protected nickel gauze openings, these do not appear to be of efficient and safe design. I have always thought that the gases could be safely extracted from a closed container by a rotary pump driven by the locomotive. The resistance container has 12 holes, each 1½ in. diam., covered with sheet gauze which showed defects in design, and on test endorsed my statement on control gear in these columns in 1923. The controller has certainly improved, as this report shows, but the controller resistance cannot be said to be absolutely explosion proof. The two speeds of the locomotive appear to be good, but the point arises as to whether it is, or is not more efficient to obtain your variation in speed by electrical or mechanical methods.

The brakes, spring drawbar hooks, and buffers are of excellent design, and the latter are by no means an unnecessary refinement. The maximum speed of 5½ miles per hr. with a 5-ton load on a gradient 1 in 24·8 is not excessive, and shows the locomotive to be light in power.

The disadvantages of outside coupling rods stated by the judges could easily be eliminated by the introduction of an internal geared axle, and this could be effected cheaply.

Acceleration and Speed Figures.

The two axle 10·5 B.H.P. single motor locomotive (Vehicle A) although 0·2 tons lighter than the winning machine (Vehicle E) gave a 70 lb. better drawbar pull at start on an up-grade of 1 in 24; a 10 lb. better steady pull on the same grade; almost the same speed at the end of the gradient, and a 100 lb. better drawbar pull on the level.

The acceleration on an up grade 1 in 24 was 0·06 ft. per sec. per sec. better than Vehicle E, but the acceleration on the level was 0·47 ft. per sec. per sec. less, also its speed on the level 0·84 miles per hr. less. The gross weight of the train in Vehicle A's test was just 0·2 tons gross below Vehicle E's. Vehicle A's average speed while current was on was 0·89 miles per hour in excess of E's, but when the current was off the average speed was 1·24 miles per hour below E's.

The average speed over a cycle of 30 trips was about 0·5 miles per hr. in excess of E's, but the current consumption was 4·1 kWh in excess of E's. The watt-hours per ton mile was 92·6 in excess of E's. The brakes, flameproof enclosures and the rerailing and marshalling were defective on this machine; otherwise it appears to be of high standard and easy of improvement.

The 7·5 B.H.P. Vehicle B designed on the regenerative principle gave a lower speed and acceleration, but a considerably better drawbar pull than Vehicle E. It was 9/10ths of a ton lighter, gave about the same speed with the current on, but less speed than Vehicle E with the current off, this no doubt due to the regeneration. It ran a lower speed per cycle of 30 trips and during the test for battery output had to drop out after the fourth trip through overheating of the contactor connections. The flame-proof enclosure of the controller resistance and motor were again defective. The two motor 4·75 B.H.P. separately driven axle locomotive (Vehicle C) with four running speeds and chain gearing between motors and axle was 1/10th of a ton heavier than Vehicle E, gave a better drawbar pull on the level and at the start, a better speed and acceleration on the level, but a reduced speed and acceleration on an up gradient of 1 in 24. The average speed with current

* Mr. Markham died on June 20th, 1926.—ED. E.

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on was 0·4 miles per hour above that of E's and with current off 2·03 miles per hour better than E's; this shows the excellent mechanical design of Vehicle E. The average speed over 30 trips was about the same as E's. The electricity consumption was 2·14 kWh in excess of E's for the cycle of 30 trips.

The watt-hours per gross ton mile was 42·5 more than Vehicle E, and the flame-proof enclosure was defective in the battery. I should here like to draw attention to the desirability of eliminating chain drives in battery locomotives for mines. The 8 B.H.P. four-motor Vehicle D is the heaviest machine in the competition, being 2·39 tons heavier than Vehicle E. It gave a 70 lb. better drawbar pull at start, a little lower pull than E on the 1 in 24 up grade, but 100 lb. greater pull on the level; the acceleration on the up grade 1 in 24 was 0·03 ft. per sec. per sec. below E's and 0·05 ft. per sec. per sec. below E's on the level. The average speed with current on was 3·35 miles per hr. against E's 3·4 miles per hr., and with current off 4·45 miles per hour against 6·13 miles per hour for Vehicle E. For a cycle of 30 trips the average speed of D was 3·67 miles per hour against E's 5·7 miles per hour, and the current consumption in kW hours for the 30 trips was 9·4 for Vehicle D and only 5·7 kWh for Vehicle E, thus again proving E's mechanical efficiency as reflected through the electrical equipment, which was also well designed. The flame-proof enclosure of the battery container was again faulty.

For the winning machine (vehicle E), with a single 8 B.H.P. motor and locomotive, weight 3·15 tons, the drawbar pulls were practically the lowest recorded, the acceleration and speeds were the second highest in the competition, whilst the current consumption per cycle was the lowest, and this the most important factor in battery locomotives; the sanding and flame-proof enclosures of the electrical gear being the only faulty points in a splendid little machine.

Dealing now with Mr. G. Watson's dynamometer tests, these have proved to be very thorough and interesting, the results reflecting great credit on the operator, whose services to the judges must have been immeasurable. The data obtained is most useful, and the increasing drawbar pull on the curves would, if tabulated for varying sizes of wheels and wheel centres, be helpful.

The table shows that for the duty specified a starting torque or effort of 1 000 lb. is required; this is what I said it should be in my note to this paper in 1923, but the horse power I estimated then was about 40 per cent. more than has been found necessary in the tests. This excess was due to my calculation covering a more difficult and in my opinion a more practical mine track than that set down for the competition.

The average rolling resistance was 284 lb., or 57 lb. per ton, and Mr. Watson suggests that this was probably due to the absorption of water by the load. Would it not be partly due to windage as well? Here the report is weak in statement, as the description of the tubs and wheels should be given, and something needs seriously overhauling if the rolling resistance is as high as shown in the tests.

The electrical equipment is dealt with in Appendix C. The cover plates for the circuit breaker should have machine flanges, and for the resistance compartment forced ventilation should be provided by the locomotive itself. The unoccupied volume of one cubic foot in the accumulator compartment is probably on the small side, and with regard to flame-proof enclosures of the vital parts of the locomotives, the tests and results obtained by Prof. Statham are an endorsement of previous tests by Prof. Wheeler and Prof. Thornton and well known to electrical engineers; these prove that there is a lack of ingenuity in the design of these parts, and it is still unsafe to work more particularly (as Prof. Thornton has proved) a d.c. machine in a gaseous atmosphere. I have always thought that a totally enclosed machine can be made with forced ventilation by cooled air under pressure. All stud holes should be bottomed and spot welding done away with. A redesigned bolt head or nut that cannot be removed without a special spanner is all that is required.

The recommendation of using armoured cables in conduit is controversial and can be left with the makers. For this class of work can you have better armouring than the conduit? For the plug and socket connections these are now of good design on many mining machines, and could be obtained of similar kind for battery locomotives.

In conclusion, I am inclined to the belief that the locomotives put to the test in this competition are an advance on those previously made in this country; they are as good and may be considerably better than those of foreign manufacture taking gross weight, drawbar pull and current consumption into consideration, but they do not appear to be likely to attract buyers in the larger proportion of the mines in this country where the mines are old, the roads unsuitable and the atmosphere gassy. In the former the cost of installation would be too large, and in the latter somewhat unsafe. The great field for these locomotives would be in metalliferous mines, or new mines in new districts, all without any large degree of gas. In existing mines, battery locomotives are used to advantage in return roadways for riding men from the shaft to the working face. I have had experience of a 9-ton Jeffrey locomotive conveying 150 men at once for 2¼ miles underground; this locomotive is doing daily service with splendid test results. If this can be done with a large machine, surely this competition will stir up designers to produce the cheap, safe and useful putting locomotive that is so much desired by colliery owners.

World Power Conference.

Details of British Papers for the Bâle Sectional Meeting.

As already announced in THE ELECTRICIAN, a sectional meeting of the World Power Conference will be held at Bâle, Switzerland, from August 31st to September 8th, 1926. To enable Great Britain to participate in this important gathering on lines commensurate with her position as organiser of the first plenary World Power Conference a British National Committee representative of the Government Departments, Engineering Institutions, Industrial and Technical Organisation and of the Dominions has been formed. Mr. D. N. Dunlop and Mr. C. Rodgers have been appointed chairman and secretary respectively of this Committee, and an Executive Committee composed of fourteen members has also been appointed.

The following papers have been presented on behalf of the Committee: "On the Uses of vd/γ as a parameter in the practice of hydraulics," by Mr. E. Parry; "Electric Ploughing," by Mr. R. Borlase Matthews; and "Economic Aspects of Electric Traction, with special reference to those advantages which cannot be expressed numerically," by Col. E. O'Brien. All correspondence relating to this matter from those wishing to participate in this country should be addressed to The Secretary, World Power Conference, 36, Kingsway, London, W.C.2.

REVIEW.

Electrical Engineering for Mining Students. By G. M. HARVEY. (London: Isaac Pitman and Sons.) Pp. 156. 5s. net.

This little book is intended for technical school students in their first and second years, and forms an introduction to a larger work on Colliery Electrical Engineering.

The author is to be congratulated on the very clear way in which he has dealt with his subject. He has the gift of getting into personal touch with his reader, and this gift of stating simply the elements of what are often very complicated subjects is one to be coveted. He gives the student, in addition to fundamentals, many peeps into questions of design and practice.

It is very easy to be critical of any such work on the score of omissions, and yet we venture to remark that had he treated the question of cables, switchgear, and flame-proof problems in the same simple and clear way, he would have been unable to give the same impression with regard to the suitability of d.c. methods in colliery working, which we regret to find.

We also suggest that the chapter on the pure synchronous motor is rather out of place and should really deal with the more modern auto-synchronous-synchronous motor which is now being so freely applied.

A brief reference to electrical winders might also be of advantage. We mention this because with these additions this book would be of great help to the large body of practical colliery electricians who have not had the opportunity of a technical college training, and would thus reach a much wider field than that of the student only.

W. M. SELVEY.

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NATIONAL PHYSICAL LABORATORY.

Some Interesting Exhibits—An Electrical Method of Testing Food—The Application of X-rays to Engineering Work—Recent Photometric Apparatus.

THE annual visitation last week by the General Board to see the work that is being performed at the National Physical Laboratory was, as usual, made the occasion for inviting a number of scientific and technical visitors, who were received in the Aerodynamical Building by Sir Ernest Rutherford, O.M., P.R.S., and the Director, Sir Joseph E. Petavel, F.R.S. We give below a short account of various interesting exhibits that were on view.

The Prevention of Rust.

In the engineering department the most important experiments dealt with were those which have been started to discover a means of preventing rust. These include the use of lanoline (the waste grease obtained in wool scouring) instead of petroleum grease. Boxes of test pieces have been sent on a three months' sea voyage, and stored in exposed positions, with considerable success, hardly any rust making its appearance. At the high temperatures now used in steam engines and gas turbines it was found that the metals used to "creep" continuously at comparatively low stresses. Investigations of high importance are therefore being carried out to find a metal which undergoes no "creep," or continuous distortion at such temperatures as 1 500 deg. Fahr.

A considerable amount of work for the Food Investigation Board is now being carried out at the laboratory, and among the exhibits was an apparatus that is being developed for measuring the heat evolution in fruit by a process which may be compared to that of respiration in animals. Essentially it consists of a differential electrical calorimeter in which the heat generated by the apples is balanced by an electrical supply of heat in a similar container with dummy apples made of spheres containing glass wool and adjusted to the same thermal capacity as the apples.

A great deal is also being done in X-ray work. Over 200 000 V can be applied to the X-ray tube in the apparatus which is used for the purpose of examining thicknesses of steel up to 2 or 3 in. On this apparatus are tested the protective materials which are submitted to the laboratory for investigation in accordance with the recommendation of the British X-ray and Radium Committee, which is charged with the safeguarding of those who have to operate X-ray installations in hospitals and elsewhere. Work has also been done in determining the best manner in which to set diamonds which are used as pivots in various scientific instruments. The direction of the cleavage planes of the diamond with reference to the bearing surface has been found to be of great importance.

A 5 000 V D.C. Generator.

In the Electrotechnics Department is an interesting 5 000 V direct-current generator. The rapid development of railway electrification has presented several new problems arising from the use of high pressure direct current, and this generator has been built for the purpose of investigating them. It has been used already for the testing of specially impregnated timber used for protecting railway track workers from accidental contact with live rails. A precision wattmeter equipment designed for voltages up to 25 000 V was in process of verification for a Government laboratory of one of the Dominions.

One of the more important researches in hand in this department is a study of various methods of measuring the dielectric losses in power cables, some of the most important instruments used having been specially designed and constructed at the laboratory. Interesting results are being obtained in this work, which is being carried out for the British Electrical and Allied Industries Research Association, for which other researches on the behaviour of insulating materials under different conditions are in hand. There has been a considerable demand for work on the behaviour of fuses under short circuit conditions, and there have been a number of investigations of a technical character carried out for Government departments.

Another interesting research is candle-power measurements of electric lamps by means of photo-electric cells. In this arrangement two photo-electric cells are connected in series in a Wheatstone bridge arrangement. One of these is placed at the end of a photometric bench and exposed to the illumination of a lamp which can be moved up and down the bench, whilst the other is placed at the bottom of a cube and exposed to the illumination of a lamp inside the cube. A yellow filter is placed immediately in front of the bench photo-electric cell in order to make its sensitivity curve approximate to that of the eye. The photo-electric currents through the two cells are balanced—using a Compton electrometer—by moving the lamp on the bench. If a standard lamp is used on the bench and the bench reading noted, then, by replacing the standard by a lamp on test, the bench reading to obtain a balance in this case gives a measure of its candle-power. In the arrangement shown a 75 W lamp run at 1·5 W per candle was placed 2 metres from the cell at the end of the bench. In this case a change in candle-power of 0·01 per cent. can be easily detected, and when due account of errors is taken the accuracy of measurement is estimated at 0·1 per cent., which is a distinct improvement on the accuracy of 1 per cent. obtained from a single set of visual measurements.

An interesting exhibit in the Photometric Division was a couple of dozen wireless valves which are being tested for efficiency at different periods during a continuous run of 1 000 hours. This is the first test of this kind which has been made at the laboratory, and is being carried out for one of the largest makers of valves in this country.

Artificial Daylight.

In the Photometry Division was shown the new hollow sphere, which is 10 ft. in diameter and whitened internally. It is to be used for measuring the efficiency of fittings used for interior lighting, street lighting and similar purposes. It is believed to be the largest sphere in the world used for this purpose. In a room in North Lodge (one of the houses in the laboratory grounds which has now been taken over for research work) there was shown an interesting experiment on the imitation of daylight by artificial light. A window has been entirely covered with translucent paper and on the outside of it is a whitened box which contains the now familiar blue bulb lamp. The effect inside the room is exactly similar to that given by ordinary daylight passing through a window glazed with ground or opal glass, and the effect is singularly restful and pleasing to work in. The observers working in this room during the short days of winter were very deceived, and expressed surprise on coming out into the early evening, from what appeared to them to be daylight, into darkness.

Of interest to broadcast listeners was the somewhat elaborate equipment, shown in the Wireless Division, for testing valve amplifiers and receivers. Another set of apparatus was shown in use for the testing of low-frequency transformers for amplification and distortion. A very sensitive two-valve frame coil set was shown, which has recently been used for receiving signals from a small ship transmitter about 7 000 miles away. Small valve sets were shown operating on a wavelength of under 2 m., and a wireless direction finder was in use on the transmission from an American station on a wavelength of nearly 20 000 m. In the chief transmitting hut was shown the installation from which are transmitted at regular intervals waves of accurately known wavelength, to enable listeners from a distance to calibrate their wave metres or receivers. Other transmitters were shown for carrying out of experiments, in which use is made of a number of aerials erected in the adjoining meadow, together with a large earth screen 600 ft. long by 150 ft. wide.

In the Metallurgy Department a number of investigations on metals in all their aspects are being carried out. X-rays are again being used to determine the way the atoms are arranged in crystals, by means of the X-ray apparatus for examination of crystal structure, which has been presented by Sir Robert Hadfield. One of the latest features is the successful examination under the microscope of mercury and its amalgams with tin and silver, such as are used for dental fillings. These are wholly or partly liquid at room temperatures and have to be kept frozen by means of carbonic acid "snow" or by liquid air before they can be cut, polished and examined. Then there are the light alloys that are required for aircraft, in which aluminium and magnesium play the principal parts. To these we may shortly have to add the very light and strong metal beryllium, which has recently been successfully produced by the National Physical Laboratory in reasonable quantities. It is a very light, white metal, which retains its polish for many months; it is nearly as hard as iron, and although it is somewhat rare, large supplies are likely to be found if serious search is made.

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CORRESPONDENCE.

ELECTRIC WELDING.

[To the Editor.]

Sir,—I regret that I should have to trespass on your valuable space in order to reply to the letter from Mr. L. J. Steele, which appeared in The Electrician of June 25th. Mr. Steele agrees that the principal application for the Cyc-Arc process is the welding of studs on to ship bulkheads, and then continues by enumerating branches of the engineering industry in which it is considered the process will be applied in the future.

I would point out, what appears to have entirely escaped Mr. Steele's notice, that in the various processes dealt with only *actual* applications were considered. No mention was made of the possibilities of the several processes. Your readers would no doubt be interested to hear that they may, in the future, be able to hang the fish slice on a hook welded to the wall, but the article was not intended to cover probabilities.—I am, etc.,

P. L. Roberts.

Manchester.

NOTES ON WIRELESS MATTERS.

[To the Editor.]

Sir,—Mr. W. H. Date, in his letter printed in your issue of June 25th, appears to support "the curious but very common custom" of stating the resistance of the anode-filament circuit of a three-electrode valve as the anode *impedance*. Whilst thoroughly agreeing that it is reasonable, and in fact imperative, to distinguish between the two quantities V_a/I_a and $\delta V_a/\delta I_a$, I think it is incorrect and therefore highly undesirable to perpetuate the use of the term *impedance* to express the quantity $\delta V_a/\delta I_a$, however much this term has been used in the past in this connection.

The value of an impedance is necessarily related to a specific frequency, and unless this frequency is stated or understood, the magnitude of the impedance has no real significance. The quantity commonly called the *anode impedance* of a valve is quite independent of frequency and is solely dependent on the characteristics of the valve itself and the static operating conditions. How, then, can this quantity be regarded as an impedance?

Since this quantity is the ratio of a change of (or difference in) anode voltage to a change of (or difference in) anode current, the term "anode differential resistance" has been suggested, but this is cumbersome and for this reason would not appeal to the compilers of valve manufacturers' catalogues.

Although the quantity in question can be determined from the static characteristic curve, it is not in effect a static property of the valve. It is an *operating* characteristic depending on a *change* in current, this current being an alternating current. The term *anode a.c. resistance* has therefore been proposed, and this term has the advantage of conveying the correct meaning and also of distinguishing between the miscalled *impedance* and the actual *anode resistance*.

The following two definitions are to be found in the British Standard Glossary of Terms used in Electrical Engineering, recently published by the British Engineering Standards Association:—

Anode Resistance.—Of a thermionic valve. The ratio of the anode voltage to the corresponding anode current as determined from the static characteristic curve showing the relation between the anode current and anode voltage, the grid voltage and electron emission remaining constant.

Anode A.C. Resistance (Anode Impedance, deprecated).—Of a thermionic valve. The ratio of a small change of anode voltage to the corresponding change of anode current as determined from the static characteristic curve showing the relation between the anode current and anode voltage, the grid voltage and electron emission remaining constant. Symbol R_a.

I am, etc.,

John F. Stanley.

London, N.6.
June 25th.

A descriptive leaflet on "Ventex" time switches, for limiting the time of lighting shops after business hours, and a list of prices of "Ventex" cut-outs, distribution boards, and fuseboards are being sent out by the "Ventex" Electrical Co., 220, Cooksey Road, Small Heath, Birmingham.

THE FARADAY MEDAL.

Interesting Ceremony at the Institution of Electrical Engineers.

An interesting ceremony took place at the Institution of Electrical Engineers last week, when Col. R. E. Crompton was presented with the Faraday medal before a crowded audience.

Having briefly recalled the circumstances under which the Faraday medal is awarded the President (Mr. R. A. Chattock) called upon Mr. Woodhouse.

Mr. W. B. Woodhouse said that every now and then in the field of endeavour we found a new worker who not only threw light on dark places, but by his example and energy worked to assist progress and stimulated other workers by his great and striking personality. When a genius dealt with new problems, accompanied by the persistent and continuous energy necessary to bring these problems into the field of practical use, then we indeed had an exceptional type of man and in the case of Col. Crompton we had that very striking type. There was no need to review the work that Col. Crompton had done, for it was already known to all electrical engineers. It must not be forgotten, however, that Col. Crompton was distinguished in many other fields as well. Apart from his special work, in fact, the great work he had done in connection with standardisation and in bringing nations together must be recognised. Mr. Woodhouse remarked that he could not conclude without some reference to the man himself. His amazing energy, his hatred of humbug, his complete uprightness in all matters he dealt with, were something which were very greatly to be admired. Behind that, there was the most delightful and kindly personality. It was an honour to have Col. Crompton as a member of the profession and a member of the Institution.

A Happy Life.

Mr. Roger T. Smith said that in the forty-five years he had known Col. Crompton he seemed to have become younger. Nobody could either become younger or remain young unless he was happy in his life and Col. Crompton had more than once told him how his lot in life was a very happy one. Perhaps Faraday would be content to know that his Institution Medal should go to a man who had succeeded in being happy all through his life, although he was an engineer. Of all Col. Crompton's multitudinous interests in the industry, perhaps the one he would most wish to be connected with this medal was his interest in the International Electro-Technical Commission. Again, therefore, he thought that Faraday who, nearly 100 years ago, with his experiments laid the foundation of our electrical industry, would be very pleased to think that his Medal was going to a man who had helped so successfully to increase the goodwill among one industrial section of so many countries.

The President then handed the Faraday Medal to Col. Crompton amid loud applause.

Col. Crompton said it was very difficult for him to reply in suitable terms to what had been said about him. After all, he had only been one of a band of workers, and if he had any merit at all it was that, like the captain of a cricket eleven, he had chosen good men and had always praised the good men when they did a good thing. In speaking of good men, he must speak of one of the best of all—a good woman, his wife. When, in the days they were pushing the idea of electricity supply, they were looked upon as amiable lunatics, it was very difficult to get the right people to listen. His wife, with that splendid instinct of women, had found out who were the people likely to be interested and who were the people likely to help, and she brought them together and succeeded in bringing other people to see them, so that they collected a band of people who supported them with money and sympathy and, what was more, who had a belief in their future. It was to that band of people, largely engineered by his wife, that the advance of the electricity supply industry, at all events in London, was due. Something had been said about the International work and he agreed that this had been an extreme pleasure to him. It must be the right thing to get at the best thought in all countries, as well as our own, and not be so conceited as to think that we in England were the only people in the world. Even so, England was still looked upon as a clear thinking country where ideas were worked out logically, practically and usefully, and he could correctly say that we were preserving the position of being the centre of the world.

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The Telephone, 1876—1926.

(*Concluded from page 5.*)

the French scientist had a glimmer of the truth, but the writings of Heaviside in the columns of THE ELECTRICIAN showed the way to overcome the vicious effects of distributed capacity. For a long time Heaviside's gospel fell on deaf ears. The increase of the inductance of the conductors above that inherent to them seemed absurd to those who, while aware of the effects of capacity and resistance in attenuating speech currents, thought of inductance as "electro-magnetic retardation," and assumed that its presence would "retard" differently the components of the complex current and add to the distortion already prevailing.

Prof. Silvanus Thompson patented in 1891 the use of either distributed leakage or shunt inductance as a means for overcoming distortion. Unfortunately, Thompson did not persist with his idea, even from a theoretical standpoint, or he might have stumbled on the correct solution of the problem. We now know that his methods would have been not successful as, although they would have cured the distortion trouble, the attentuation due to the presence of the numerous shunt elements artificially introduced, would have been impracticably great.

Heaviside's mathematics were *caviare* to the majority of workers of the day; his methods, though effecting powerful solutions to the problem, were not conventional. To-day the merits of his operational calculus are recognised, and it is not only extensively used, but is being improved upon by American writers. One could wish the same remark applied to this country where, except for the work of Malcolm, nothing has been done.

It is to Prof. M. I. Pupin, 1898–1899, that the practical application of Heaviside's ideas is due. The problem was how to apply the inductance coils.

The Work of Pupin.

He took the analogy furnished by a vibrating string loaded at intervals by pellets. When a certain number of pellets occur within a wavelength of the disturbance propagated along the string, the latter behaves in the same way as if the load were "smoothly" applied instead of "lumped." From this Pupin was lead to investigate the degree of equivalence existing between a loaded telephone line and another line having distributed constants equal to the inherent plus the added load of the first line. From this investigation practical rules were evolved, and the loaded line came into existence. The effect of loading on range can be seen from the following figures:

300 LB. AERIAL WIRE LOADED AND UNLOADED.

Inductance added. Henrys per mile.	Limiting length in miles.
None	372
0·037	734
0·017	642

Paper air-spaced cable had long superseded the gutta-percha and india-rubber covered wires where it was necessary to go underground, and, due to the introduction of the amplifying valve, the tendency of telephone administrations is to put their inter-city networks underground.

The introduction of the valve repeater has had a profoundly modifying effect, both on the dimensions of the cable and the degree of loading applied.

Loading reduces the velocity of propagation along the conductors, and where several repeater stations exist along a trunk route, disagreeable "echo" effects are set up. These are reduced if the propagation speed is increased, and the tendency is to diminish the loading and reduce attenuation by inserting additional repeaters. Within the next few years we may expect to see a trans-European network of telephone links as a result of the labours of the International Commission now considering this matter.

The interlinking of radio and land line circuits has become a commonplace since the introduction of the broadcasting of speech and music from a central point—London—to various provincial relay stations over the public telephone lines.

With the completion of the new radio station at Rugby, transatlantic telephony which has been experimentally effected on one or two occasions may, in the near future, become a regular feature, and we could then talk between London and San Francisco. This is no visionary idea, it is already possible.

The introduction of broadcasting has stimulated the design of loud speaking telephone receivers and also the investigation of the acoustics of large buildings. It is possible for a speaker to address a huge audience and be heard by everyone, due to the judicious distribution of loud-speaking telephones and the use of a suitable microphone. The requirements for the successful transmission of speech and music are reacting on the design of both line plant and apparatus, and more accurate, purer reproduction is being attained as a result. Those who have read Bellamy's "Looking Backward" will remember that music was distributed from a central point to the private houses of the city. At the time that Bellamy described this, radio-telegraphy was not in existence, and as Bellamy had not even the scientific knowledge of a Jules Verne his book was remarkably prophetic.

Sir Oliver Lodge on Telephony.

(*Concluded from page 9.*)

Wireless transmission, said Sir Oliver, was another way of avoiding distortion. Ether had properties far more perfect than any form of matter, and none of the difficulties of metallic conduction applied. It was entirely devoid of resistance—by which he did not mean that it was a perfect conductor; it was not a conductor at all. It did not act by conduction, neither had it any leakage. It acted simply and solely by inductance and capacity. It transmitted true waves, all at the same definite speed, so that it transmitted without a trace of distortion. Signals transmitted to the ether could be detected at any distance—weakened by the spreading out, but otherwise unimpaired. And by suitable magnifying devices the conserved peculiarities could be magnified and could reproduce speech and music in any part of the earth. This showed how little mere attenuation mattered, so long as distortion was avoided. If the features were there, even though they might be infinitesimal, they could be magnified, if necessary a million-fold, until they became perceptible.

Though the Heaviside layer tended to preserve the waves in the earth's neighbourhood, nevertheless, some of them must go into the depths of space, and though they would be violently attenuated by the time they reached the planet Mars, he saw no reason why one of our skilled amateur observers, if he could take his instruments with him to that planet, should not be able to detect and interpret them.

Telephone Exhibition.

(*Concluded from page 6.*)

by a model of a section of Victoria Street, which shows all the public service mains, gas, water, electric light and telephones, and includes the manhole at the end of Dean Farrar Street through which passes 18 400 wires. Specimen joints on cables carrying as many as 2 000 wires in a 3-in. pipe are shown in various stages of construction. Interesting samples of submarine telephone cables, in lengths and in section, are shown.

Freedom from inductive disturbance and consequent overhearing or cross-talk from one pair of wires forming a telephone circuit to another adjacent pair is largely a matter due to careful construction and laying-up of the pairs inside the load sheath, but in spite of this a most careful selection has to be made during the laying process of the pairs to be jointed so that any inequalities of resistance, capacity inductance and insulation may be balanced out throughout the lengths. An imposing array of the apparatus used for this purpose is included in the exhibition.

The Summer number of "Punch," which has just been issued, is as usual a welcome publication. It will do much to counteract any deficiencies in the holiday weather. The outstanding feature is a clever series of caricatures by Sir Bernard Partridge, entitled "The Westminster Follies Cabinet Troupe," in which delicate fun is poked at politicians and the political situation. Equally funny are Mr. George Morrow's drawings on "Holiday Makers in History," and the black and white section gives our contemporary's regular black-and-white artists a chance to show what they can do. Altogether a good shillingsworth.

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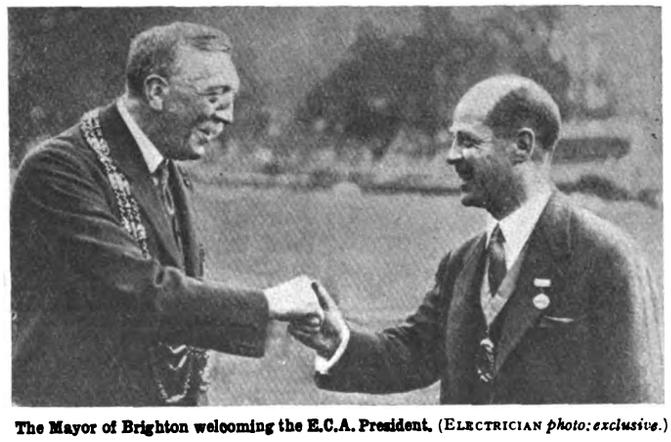
THE E.C.A. CONFERENCE AT BRIGHTON.

A Conspicuous Success—Attendance nearly 400—Papers and Discussions on Topics of Vital Interest—Brilliant Social Programme.

SUPERLATIVES are avoided as far as possible in this journal, but it would be impossible to do justice to the brilliantly successful first annual conference of the Electrical Contractors' Association and its allied organisations, the N.E.C.T.A., Ltd., and the N.F.E.A., held at the Royal Pavilion, Brighton, on Wednesday, Thursday and Friday in last week, without using a number of them. Even the most optimistic anticipations were entirely eclipsed by the actuality. The attendance was not far short of four hundred, and many of the contractors were accompanied by their ladies. Well-known representatives of the manufacturing and supply sides of the industry were also present.

Even our long pent-up store of superlatives proves inadequate to do justice to the extremely capable manner in which the conference was organised by Mr. Galliers, Mr. Miles and the other members of the Sussex Branch of the E.C.A. Everything was carefully planned beforehand, but the working of the arrangements was never visible, every item on the programme happening strictly to time, but without any sense of working to a time table. On the opening day there was no "ice" to break, and throughout, the gathering, but for its size, might have been a happy family party.

Although the business part of the programme was on a rather ample scale, the sessions were never unduly long, and the prime interest of the subjects discussed made the conference very well worth while from the business point of view alone. Besides the presidential address, the president's annual report, and the incoming president's concluding address there was a stimulating paper on "Co-operation between the Supply and Contracting Sections of the Industry" by Mr. Walter Finlay—in the discussion on which the supply side was represented by Messrs. J. Christie and A. C. Cramb—one on "Apprenticeship" by Mr. Walter Riggs; a discussion initiated by Mr. Llewelyn B. Atkinson on "The Need for a Standard Set of Rules to be Applied Nationally," and a paper on "Registration of Electrical Contractors" by Mr. F. W. Purse. Considering the provocative nature of the papers, the views expressed in the discussions were surprisingly in accord with those of the authors, whose task in replying was thereby rendered easy. As an aid to crisp speaking the appliance comprising a red and a green lamp—so ably manipulated by the President—was invaluable. Speakers were warned beforehand that the switching on of the green lamp signalised "slow up," while the lighting of the red lamp meant "shut up." Both lamps were used, somewhat unfairly, by the President, to stem the tide of congratulatory remarks addressed to him by many of the speakers.



The Mayor of Brighton welcoming the E.C.A. President. (ELECTRICIAN *photo: exclusive.*)

The weather was kind on the whole, though a series of sharp showers on the Thursday delayed the taking of the official photo for some hours. It is really surprising that the elements were so kind, for as many of the local residents pointed out, it always—or nearly always—rains during Brighton Races, and this fixture, as we noted last week, coincided with the opening day of the E.C.A. Conference. As if this was not enough to invite a downpour, one delegate arrived in a straw hat, and was promptly "named" as the bringer of the small amount of rain that did fall.

On the social side there was a succession of enjoyable entertainments. On the opening day there was a reception and conversazione followed by dancing in the Music Room and King's Apartments. Comparative, and even complete strangers were soon put completely at ease by the urbane stewards provided by the Sussex Branch, and the dancing was brought to an end at midnight. All were agreed that a conference with such an enjoyable *hors d'œuvre* was a sure winner. The following evening there was a smoking concert at which entertainers of exceptional ability appeared. On the closing day there was a garden party in the grounds of the Royal Pavilion, where there was a musical performance by the Royal Artillery Band, and finally a ball—by invitation of the Mayor of Brighton—at which the guests numbered approximately 600. Dancing was carried on in the magnificent ball room and also in the music room, and supper was taken in the Dome.

As a token of esteem, the Council of the Association presented Mr. T. E. Alger with a gold cigarette case. To Mr. H. J. Galliers they gave a fitted travelling case, and Mrs. Galliers, who, with the other Sussex ladies, contributed materially to the success of the social functions, was the recipient of a beautiful travelling clock.

All those who so enjoyed the first conference are now eagerly looking forward to the second one, which will probably be held at Scarborough next year. But only the Sussex stalwarts know what a herculean task confronts its organisers!

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PRESIDENTIAL ADDRESS.

The E.C.A. as the Oldest Electrical Trade Organisation—A Constructive Policy—Compulsory Registration of Contractors—Progress by Negotiation.

IN his opening address at the E.C.A. Conference on June 24th, Mr. T. E. Alger gave an interesting account of the history, aims and achievements of the Association during the past twenty-five years, and pointed out that the E.C.A. represented the oldest trade organisation within the British electrical industry.

As a consequence of early E.C.A. activities in the direction of consolidating the trade and in promoting fair and reasonable trading agreements (said Mr. Alger), other sections of the industry had followed the E.C.A. lead and had organised themselves upon similar lines. However, the first efforts in this direction, made by electrical contractors twenty-five years ago, would always remain to the credit of the installation side of the industry.

The President then related how contractors' organisations came to be formed, and pointed out that even in the early days the contractors' aims and objects were definitely constructive in character and aimed at the general development and improvement of the whole trade. Many of these aims were in need of further careful consideration and action even at the present time, and if progress in some directions had been somewhat slow the fault did not lie with those who had attempted to lead installation opinion.

Throughout the Association's history no opportunity had been lost to open up helpful negotiations with other sections of the industry; and if the need for such inter-sectional conference appeared to be as great in some directions to-day as it was twenty-five years ago, the blame certainly could not, in common fairness, be placed at the door of the electrical installation contractor.

An impression of Mr. T. E. Alger, president of the E.C.A. Allied Associations.

[*Specially drawn for* THE ELECTRICIAN *by "Spider."*]

Mr. Alger then gave a detailed account of the development from the old National Association, formed in 1902, to the present trinity of organisations, consisting of the Electrical Contractors' Association (Incorporated), the N.E.C.T.A., Ltd., and the National Federated Electrical Association, and generally known as the E.C.A. Allied Associations.

Dealing with the National Register of Electrical Installation Contractors, Mr. Alger emphasised that, since its inception the Register had been accorded the full and unstinted support of the E.C.A. "We recognise," he said, "that the National Register is destined to play a singularly important part in raising the professional status of installation engineers. We look forward to the time when registration shall have become compulsory, and when work carried out by registered contractors shall be executed to a definite and recognised code of rules. In those two directions really substantial progress has yet to be made; but contractors are willing to recognise that the Register must learn to walk before it can run. The best way to provide the organisation with real running strength is for every eligible contractor forthwith to associate himself with the movement. Only in this manner will contractors achieve the substantial aims entertained on their behalf by the N.R.E.I.C."

It should be remembered, Mr. Alger proceeded, that the N.R.E.I.C. was designed essentially to consolidate the professional status of the installation engineer. To secure his commercial security every reputable contractor should also be a member of the E.C.A. Associations. Both movements, functioning in entirely different ways, should have the unstinted support of all contractors.

The E.C.A. had been untiring in its efforts to ensure and stabilise the future of the trade by paying special attention to the proper training and material encouragement of apprentices.

Regarding contractors' relations with supply authorities the Association had published very useful "memoranda" for the guidance of contractors in fostering the best possible relations with supply authorities. All sections of the industry were in the same boat and the time was more than ripe for all sections to get together and co-operate in the closest harmony and understanding for the common good.

The central aim of the E.C.A. had always been to secure progress by negotiation. Although in the past negotiations were often carried out in an atmosphere of mutual distrust, relations were now improving and each succeeding meeting between the E.C.A. and kindred organisations marked a growth in amity and friendly concord. Like all pioneers, the E.C.A. had suffered their checks and rebuffs; but he would take this opportunity to testify to the ever-growing spirit of co-operative amity that was developing throughout the length and breadth of the electrical brotherhood. Formerly no conspicuous attempt was made to appreciate the difficulties of the "other fellow" nor to understand his reasoned view-point. His attitude was prejudged as "unreasonable," and the thing to do was to administer the knock-out, if possible, in the first round, or, at any rate, with the minimum number of futile preliminaries.

But that attitude was very largely, if not entirely, a thing of the past. "Die-hards" and "Last ditchers" were out of fashion. Real progress was now being made in the only sensible direction open—namely, in the direction of securing the greatest possible general good of the trade as a whole. No other ideal was worth consideration. Certainly no other ideal was worth maintaining by force of arms. The need of the hour was reconstruction.

In conclusion, Mr. Alger said it was his firm belief that the country was on the eve of a period of prosperity, and he hoped that this, their first Conference, would prove to be a good omen for the future prosperity of the electrical industry in general, and for electrical contractors in particular.

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THE ANNUAL MEETING.

A Year of Exceptional Activity—Compromise on Municipal Retail Trading—Association's Improved Status—Trading Committee's Work.

THE annual general meeting followed the Presidential Address. Mr. Alger, in presenting the annual report for 1925-26 said the year had been full of activities of an exceptional nature. These might be summarised as follows: Appointment of Mr. R. W. Kennedy as whole-time editor of the "Electrical Contractor"; death of the general secretary; appointment of Mr. L. C. Penwill as secretary; a change in the Chairman of Finance; opposition to six Parliamentary Bills; compromise of one Parliamentary Bill; compromise with I.M.E.A. on municipal retail trading; a general strike; and, finally, the Association's first conference.

During the year the Association had vigorously dealt with the municipal trading question and had finally arranged a compromise with the I.M.E.A., which was not only in keeping with the spirit of the times, but which would be to the lasting benefit of the whole electrical trade and industry in the country. A clause had been agreed for inclusion in all Parliamentary Bills seeking trading powers. This agreed clause would also be put forward by the I.M.E.A. as an amendment to the Electricity Bill in substitution of the amendment at present standing in the name of the I.M.E.A., which was the old L.C.C. Clause. This clause, and the goodwill of the I.M.E.A., as expressed by Mr. Purse, Mr. Cramb and others at a recent meeting, should prove of valuable assistance to E.C.A. members.

The most important feature of the whole compromise, Mr. Alger continued, was to be found in the Committee which must be set up to deal with all points in dispute between local authorities and members of the electrical trade. This standing Committee would include municipal engineers and electrical contractors, together with representatives of all kindred electrical associations.

There had been a steady increase in membership but they should not be satisfied until all established contractors were numbered among their members. The Association's status was increasing rapidly, and that conference was one of the many signs of their ever-increasing strength and trade spirit. The year had been a period of extraordinary expenditure, much of which would not recur. Very substantial progress had been made in their relationships with other trading associations. The Trading Committee had conducted friendly negotiations with other trade associations.

At the close of a strenuous year (Mr. Alger concluded), he was happy to hand over the responsibilities of presidency to Mr. H. J. Miles.

Moving the adoption of the report, Mr. W. R. Rawlings paid special tribute to the devoted services of Mr. Alger, who week in and week out had stayed in London to keep the Association's work going. In seconding the motion, which was carried with acclamation, Mr. F. H. Starling also referred in eulogistic terms to Mr. Alger's valuable services.

Mr. H. Marryat, as acting chairman of Finance, presented the accounts, which, he pointed out, were the work of Mr. W. H. Walton, who was now in South Africa. The adoption of the accounts was proposed by Mr. J. Orringe, seconded by Mr. W. A. Baxter, and carried after Mr. H. F. Simon had entered a plea for an increased annual subscription to the E.D.A. This suggestion is to be considered by the Council.

Mr. W. A. Shaw, in proposing the re-election of the members of the N.F.E.A., said the E.C.A. membership was now 797 full members and 78 second members. They needed more development committees; every branch should have one. Seconded by Mr. H. J. Galliers, the resolution was carried unanimously, as was a vote of thanks to the chairman, proposed by Mr. H. Willoughby Ellis and seconded by Mr. W. Riggs.

SUPPLIER AND CONTRACTOR.

Both Sections Inter-dependent—Contractors' Pioneer Work—Regular Conferences Advocated—Ousting the "Kerbstoner."

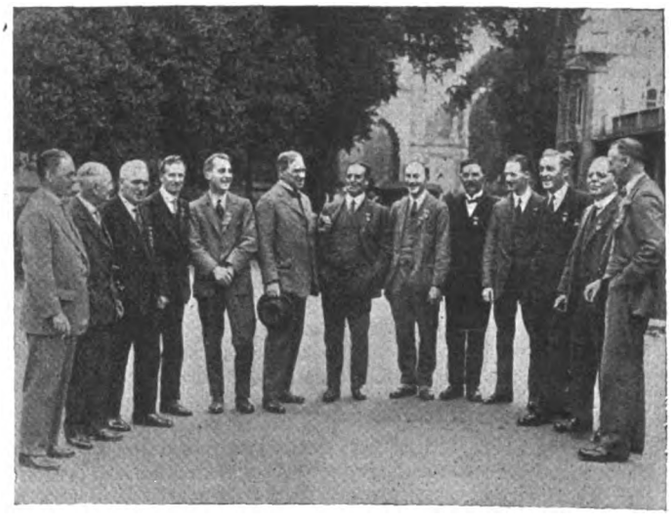
"CO-OPERATION between the Supply and Electrical Contracting Sections of the Electrical Industry" was the title of the paper read by Mr. Walter Finlay (secretary and solicitor to the E.C.A. of Scotland). The author pointed out that both sections were in direct touch with the public, and that hearty co-operation between the two was essential to success. In the past they had developed side by side in relative independence, and even now neither section appeared to be quite sure what were the proper limits of their respective activities. His own view was that they were inter-dependent, and not competitive, and that neither should seek to invade the proper sphere of the other.

Examining the process whereby the present position had been reached, Mr. Finlay remarked that long before "supply authorities" were ever thought of, the electrical engineer or "contractor" was in existence, and was installing electrical plants in private houses, works and ships before there was any public supply. Electricity had made considerable progress before supply authorities were established, and the thousands of consumers who started using electricity in the early days, and the millions of consumers on the mains to-day, had all been obtained by the initiative of electrical contractors.

In the early days some of the so-called contractors had a very rudimentary knowledge of electricity, but this was not the case to-day. Year by year the electrical contractor was becoming more and more a highly trained technical specialist.

Every time a contractor secured an order he obtained temporary employment for himself, but he brought to the supply authority a perpetual demand for electrical energy.

The need for extending the uses of electricity was agreed by all, and it was up to the suppliers and contractors to work shoulder to shoulder to increase demand. There were two alternatives. Either the supply authority could undertake the work itself and attempt to do everything that the private contractor had been doing in the past, or each section could recognise its dependence on the other and attend assiduously to its own job, whilst co-operating with the other for the mutual benefit of both. The first alternative would lead to an intolerable position, amounting in fact to a secret subsidy payable from the supply revenue for improving private individuals' premises, resulting from the tendency to give away installations in order to secure an increased consumption. This method would be good neither for the industry nor for the consumer in the long run. The second alternative was the right one, constituting a sound basis for a solid forward movement.



Members of the E.C.A. Sussex Branch with Mr. J. Christie. Mr. H. L. Smith (chairman of the Branch), is on the left, and Mr. L. C. Penwill (general secretary), Mr. H. J. Miles (the new president), and Mr. H. J. Galliers (hon. Conference secretary), are on the extreme right. (ELECTRICIAN *photo: exclusive.*)

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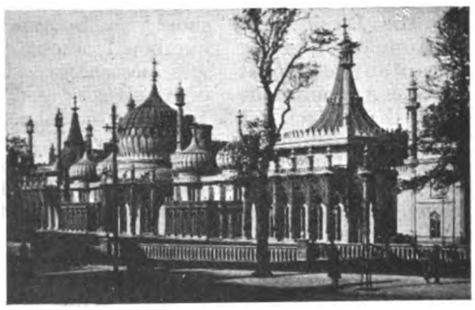
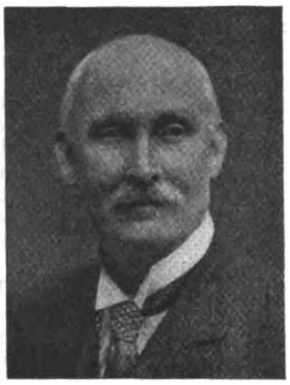
AUTHORS OF PAPERS





ONLY one of the papers read at the E.C.A. Conference was by an electrical contractor, this being the one on "Apprenticeship," by Mr. Walter Riggs, whose portrait is seen to the left. Mr. Walter Finlay, however (above, left), is almost a contractor—but not quite, as he was careful to point out—being secretary of the E.C.A. of Scotland. Mr. Ll. B. Atkinson (above, right) initiated a discussion on "The Need for a Standard Set of Wiring Rules," and Mr. F. W. Purse (below, right) presented a paper on "The Registration of Electrical Contractors." Above, in the centre, is a view of a part of the Royal Pavilion, where the Conference was held.

To be successful, a supply undertaking required consumers to be put on to the mains naturally by a contractor. On the other hand, the contractor required a supply authority which would not only be efficient, but would supply energy at cheap rates, and would have charges adaptable to varying needs.

Supply authorities might ask: "Why should we endeavour to get customers for the contractor and pass them on to him?" The answer was that the contractor had got and passed on many customers to them without a murmur, because he realised that supply was the undertakings' proper sphere. From these customers the contractor only obtained a temporary profit and possibly minor custom for maintenance. But each installation meant continuous and probably increased custom to the supply authority for all time to come.

Recently, Mr. Finlay continued, one supply engineer suggested that he was acting very fairly in maintaining an "installation department" with a large standing staff. He thought he was acting generously in passing on his surplus orders to contractors at nett cost plus 20 per cent. to cover all oncost charges and contractors' profit. In addition, this engineer retained an additional 15 per cent. over all to cover profit to the authority merely for passing on the order. This was commercially unfair. It was making use of the contractor as a "standby supply" and it was claiming from the contractor a minimum rate for a standby service which would never be given by the supply authority were the business positions reversed and the demand was for current and not installation work.

If we were to have a virile contracting industry it seemed obvious that such an industry could not live under such conditions as this supply engineer would suggest. He had crushed out practically every contractor in his own area, and though he maintained that all the time he had made a profit out of his installation department, a cursory examination of his most recent accounts gave reason to suppose that such profit was only on paper and that the funds of the supply undertaking had stood the burden of the expenditure necessary to eliminate the private contractor from that area.

An essential condition for a real co-operative movement was a regular conference in each supply district between the supply authority and the contractors. For practical purposes in many districts this already existed; and all those who had had experience of it agreed that the closer and more intimate the acquaintance between the supply authority and the contractors the more successful and satisfactory was the business of both.

Out of such a conference many other lines of co-operative effort would develop. In areas where sufficient and adequate private showrooms were not available, showrooms might be set up on the co-operative principle in which the electricity supply authority, the manufacturer, the wholesaler and the contractors might all participate, both with advice and in management.

Another line in which co-operation could succeed was in the direction of recognising national regulations for installation work. Until it was possible to enforce regulations for sound installation work it was vain to talk about ruling out the work of the "kerbstoner." So long as the supply authority was bound to connect up an installation, provided it passed a certain test, so long would we have the cheap and shoddy installation. When proper Registration was obtained scamped work would disappear and the irresponsible contractor would vanish. The continuance of unqualified men in the trade, even spasmodically, was a danger to the whole industry. It was mostly due to their financial transactions that bad debts were incurred by electrical manufacturers and wholesalers.

The Discussion.

Mr. J. W. Beauchamp outlined the E.D.A.—E.L.M.A. campaign, which, with the wholehearted co-operation of the contractors, would help them to get an extra 25 000 home installations a year—all of which would offer a continuous market for more and more appliances.

Mr. J. Christie referred to the happy position of the Brighton electricity undertaking, which he attributed to the absence of restrictions. Mains were broadcast, and he always had the wholehearted co-operation of the local contractors, who were the best canvassers the undertaking had ever had. The Brighton undertaking did not sell or hire apparatus, but by showing consumers new electrical gadgets when paying their bills at the Department's office, they interested the public in

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additional applications. He thought free wiring was the most expensive form of wiring that could be had. With a small fully representative committee of the various interests it should be possible to devise a standard national hire-purchase arrangement on very favourable terms. To the new secondary schools at Brighton they had given a beautiful electric cooking apparatus, each cooker having its own meter so that girls should know the actual cost of every operation. This was very good publicity for electric cooking. Supply engineers should all work with their contractors. In his I.M.E.A. presidential address in 1911 he had set out his views on those relations and he could say that he had since had no occasion to revise those views.

Mr. R. Robson said that contractors derived great benefit from a proper relation with supply authorities, but some contractors took too parochial a view. In his own area—where the annual *per capita* electricity consumption was about 400 kWh—the supply company was doing 10 000 house installations, and was giving away an electric iron with each. The local contractors agreed to this, finding that it was to their own advantage. Contractors should try to form more local E.D.A. Committees and also Electrical Sections of local Chambers of Trade. Landlords who objected to the wiring of their premises could often be won over by means of a certain E.D.A. booklet.

Mr. A C. Cramb congratulated the E.C.A. Council on its changed policy and said they were fortunate to have in Mr. Alger a President who was very able and farseeing in tackling the question of relations with supply authorities. Personally, he had no ambition to become an installation engineer. General contracting work should be done by contractors, but in cases where work was commercially unremunerative to the contractors the supply authority should step in. He sincerely hoped that both sides would make a real effort to get together. The terms of the recent agreement were of little importance when compared with the spirit behind the arrangement.

Mr. W. R. Rawlings said there would be no trouble if the supply side was run by men of the Christie-Cramb type.

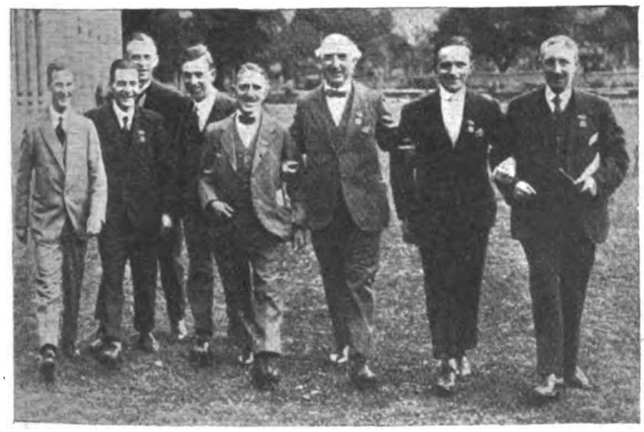
Mr. H. F. Smith thought that as the supply authority was more concerned with consumption than with how the wiring was done, there should be some definite authority to deal with wiring. The insurance companies should see that installation work was properly done.

Mr. H. Moss agreed that supply undertakings should give contractors lists of consumers on their mains, but in Bradford he had been unable to obtain this information.

APPRENTICESHIP.

Tackling the "Boy Labour" Problem—The E.C.A. Policy—Afternoon Classes Recommended—Apprenticing Boys to the E.C.A.

A MOST interesting account of the institution and development of the apprenticeship system in this country was given by Mr. Walter Riggs, in his paper on "Apprenticeship." The author showed how, under the old system, the apprentice was thoroughly equipped to follow his trade when he was out of his time, and how, with the disappearance of the power



Some of the Sheffield "blades" take a stroll. Needless to say they are all "keen" Association enthusiasts. (ELECTRICIAN *photo; exclusive.*)

of the Guilds, the problem of "uncovenanted" labour threw the apprenticeship question into a state of chaos, with some masters training apprentices and others getting the cheapest labour obtainable. From 1814 onwards apprenticeship became voluntary and not compulsory, and although in many trades apprenticeship had since been customary there had been no legislation of any moment in support of it. With apprenticeship fast becoming obsolete under present-day mass-production methods, men were taught to earn high wages at one job but were unable to do anything beyond one particular operation. Anything might happen to render their specialised skill of little further use and throw them out of work. However, this would not happen to the man who had received an all-round training in his trade, and it was this class of mechanic that the electrical contractor needed

Danger to Genuine Contractors.

It was necessary to differentiate particularly between the "boy labourer" and the "apprentice." Unfortunately the former class, with a smattering of wiring knowledge, being unable to obtain employment with genuine contractors, often started business as wiring contractors with credit facilities given by certain factors, and it was these unskilled young men who were a serious source of danger to the genuine contractor, not only in the cutting of prices, but by inferior workmanship.

The policy of the E.C.A. was to foster and assist the indentured apprentice by every possible means. Contractors' workmen were not one-job men, and the term "wireman" was a misnomer; an electrical contractor's workman should be called an "electrical fitter."

Mr. Riggs then detailed the steps taken by the E.C.A. to encourage apprenticeship and apprentice training, and of the definite effort made by the Association to encourage all indentured apprentices to take the Grade I and "Final" examinations of the City and Guilds of London Institute. With this end in view the Council had sanctioned certain annual money grants and had provided for the award, each year, of E.C.A. gold, silver and bronze medals to apprentices securing the best places in those examinations.

Technical Education.

In connection with the general and technical education of apprentices, there was a disinclination on the part of many boys to devote a substantial part of their evening leisure to study. Mr. Riggs suggested that employers might give at least one half-day weekly for the boys to attend afternoon classes, and might use that concession as a lever to secure regular attendance at evening classes on certain other days.

The existing educational system applying to electrical apprentices to-day was good, but should be amplified by practical workshop tests, and by the inspection, by local examiners, of installations actually carried out by the candidate in his own district.

Mr. W. Riggs and Mr. T. E. Alger snapped in happy mood at the garden party, with Miss Riggs and the Misses Walton. (ELECTRICIAN *photo; exclusive.*)

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In the electrical installation trade the financial aspect was the chief obstacle to the universal adoption of the apprenticeship system. A firm employing a large number of "boys" at a low rate of wage on certain classes of work could easily secure contracts at prices which another contractor, employing journeymen and a few apprentices, could not touch.

The Mazda girl came to life, and was seen on the lawn one morning. (ELECTRICIAN *photo: exclusive.*)

For this and other causes many firms did not now take apprentices. Could a system be devised to compensate the employer who did his duty to his trade and his boys by whole-hearted adoption of the indenture apprenticeship system? Such a system might include a compulsory fixed wage for all lads employed in the trade up to 21 years of age, no matter for whom they might be working. This system would involve apprenticeship, not to an individual employer (owing to the varying state of trade with individual firms) but to an Association, such as the E.C.A., working in conjunction with the educational authorities.

The Association would:—(1) Act as a clearing house to transfer an apprentice from one firm to another when necessary; (2) arrange periods of the apprenticeship term for the lad to attend day technical classes; and (3) supervise the lad's training throughout the term. The number of apprentices would have to be limited to the average number of men employed by members of the Association (or any other such proportion as might be arranged) and firms would have to apply to the Association for all the apprentices they required.

The importance of day classes as opposed to evening classes could not be over-estimated. A boy who had to work in the day and attend night classes could not be at his best at either time. Further, a lad attending evening classes would not be able to work away from home, and thus would lose perhaps the most valuable part of his training. The six or seven years' apprenticeship might be conveniently split up into two or more periods, say two years at a technical school and the remainder on the practical side—the technical training not necessarily being continuous.

An Indenturing Authority.

The author then suggested the formation of an Indenturing Authority, which would fix wages rates for apprentices, and allocate a proportion of those wages to cover the cost of technical education. The apprentice would not necessarily work in the same employ during the whole period. Some employers who only dealt with wiring might only require the boys during their first two or three years of practical work; while others, who did not want to be burdened with the younger boys, would be glad of the services of the fifth and sixth year apprentices. It would be advantageous for every boy to have an "Employment Book" which would ultimately become a complete history of his training and employment.

The Discussion.

Mr. R. Tweedy Smith said he found that the greatest difficulty in promoting technical education was trade union obstruction. In the electrical industry there was a great shortage of jointers, and some electricity departments robbed the contractors of the contractor-trained jointers. Surely municipalities should train their own jointers. Trade

THE GARDEN PARTY.

FOLLOWING the close of the business side of the E.C.A. Conference there was an enjoyable garden party in the grounds of the Royal Pavilion. The surroundings were ideal, and the weather very nearly so. Gaily decorated umbrellas attached to the tea tables made a blaze of colour, and there was music by the Royal Artillery (Mounted) Band from Aldershot.

(*"Electrician" photos: exclusive.*)

A portion of the large gathering at the E.C.A. garden party listening to the R.A. Band at the Royal Pavilion, Brighton, last Friday afternoon. In the front row is Mr. W. B Rawlings, the Association's first president. Next to him is Mr. A. G. Beaver.

The new president and Mrs. Miles (in foreground) with Mr. and Mrs. R. W. Kennedy, Mr. and Mrs. H. L. Smith and Mrs. H. J. Galliers at tea.

Another tea-table snapshot showing (left to right) Mr. F. H. Starling, Mrs. H. T. Young, Mr. W. E. Bush, Mr. H. T. Young and Mrs. Starling.

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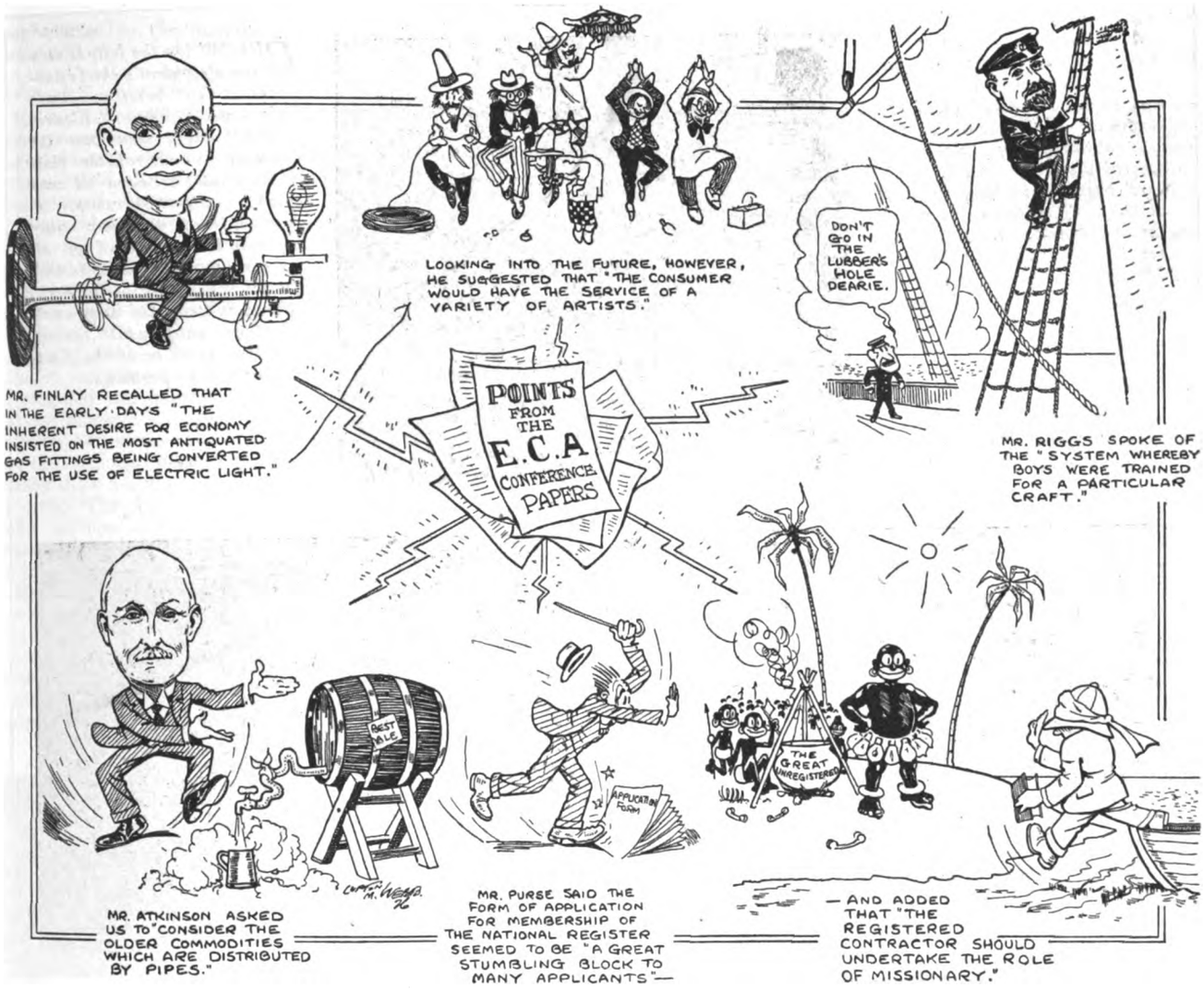

MR. FINLAY RECALLED THAT IN THE EARLY DAYS "THE INHERENT DESIRE FOR ECONOMY INSISTED ON THE MOST ANTIQUATED GAS FITTINGS BEING CONVERTED FOR THE USE OF ELECTRIC LIGHT."
LOOKING INTO THE FUTURE, HOWEVER, HE SUGGESTED THAT "THE CONSUMER WOULD HAVE THE SERVICE OF A VARIETY OF ARTISTS."
DON'T GO IN THE LUBBER'S HOLE DEARIE.
MR. RIGGS SPOKE OF THE "SYSTEM WHEREBY BOYS WERE TRAINED FOR A PARTICULAR CRAFT."
POINTS FROM THE E.C.A. CONFERENCE PAPERS
BEST ALE
APPLICATION FORM
THE GREAT UNREGISTERED
MR. ATKINSON ASKED US TO "CONSIDER THE OLDER COMMODITIES WHICH ARE DISTRIBUTED BY PIPES."
MR. PURSE SAID THE FORM OF APPLICATION FOR MEMBERSHIP OF THE NATIONAL REGISTER SEEMED TO BE "A GREAT STUMBLING BLOCK TO MANY APPLICANTS"—
—AND ADDED THAT "THE REGISTERED CONTRACTOR SHOULD UNDERTAKE THE ROLE OF MISSIONARY."

unionists objected to apprentices doing real work unless they were paid at full trade union rates.

Mr. A. E. Chesters took exception to the transfer of boys between employers even though this was effected through a clearing house. He also disagreed with the idea of non-continuous technical training.

Mr. J. Christie related how, owing to the shortage of jointers, Brighton Electricity Department had introduced an apprenticeship system, particulars of which he gave. Boys under 16 years old taken on as probationers were paid 10s. weekly; when they were indentured at the age of 16 their pay was increased to 15s., rising to 35s. in the fifth year. At the age of 22 these apprentices would normally be getting the full journeyman's rate of pay. During the winter months they were required to attend evening classes, and the fees for these classes were refunded by the Lighting Committee, if the student was satisfactory.

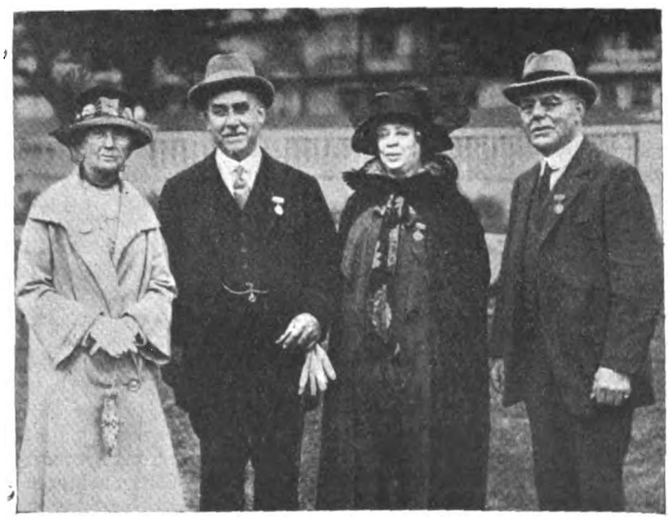
Mr. Leon Gaster thought provision should be made for instructing boys in the principles of good lighting.

Mr. W. R. Rawlings said the City and Guilds Institute was doing great work in forwarding the cause of technical education, and the E.C.A. should offer suggestions from time to time in connection with the syllabus. The trouble about passing on apprentices was that some contractors might want to retain borrowed apprentices permanently. He did not like giving boys time off to attend classes. It was recreation for a boy to study at night, and he was not so likely to spend his leisure time in a cinema. He also thought the rates of pay given by Mr. Christie were too high.

Mr. H. W. Heywood referred to the difficulty of trying to educate apprentices who might be working miles away from home for weeks at a time. The educational authorities demanded the matriculation standard, and this class could not be attracted to the contracting industry as workmen. They might, perhaps, have a sort of correspondence course to overcome the difficulties of training lads who were working out of town.

Mr. T. W. Sampson related how, in Sheffield, a large proportion of about 50 students attending classes there, were not electrical apprentices but lads who intended to get into the electrical business somehow. Last year they had a Grade I class of 70 students, not more than 20 per cent. of whom were directly connected with the electrical industry.

Mr. W. Riggs, in his reply, said his suggestion about day classes was made without prejudice to an apprentice's attendance at evening classes should he so desire. His reason for choosing the two-year period of day training was to allow a thorough training to be given to boys in one place.



The first president of the E.C.A., Mr. W. R. Rawlings, and the latest president, Mr. H. J. Miles, with Mrs. Rawlings (extreme left) and Mrs. Miles.
(ELECTRICIAN *photo; exclusive.*)

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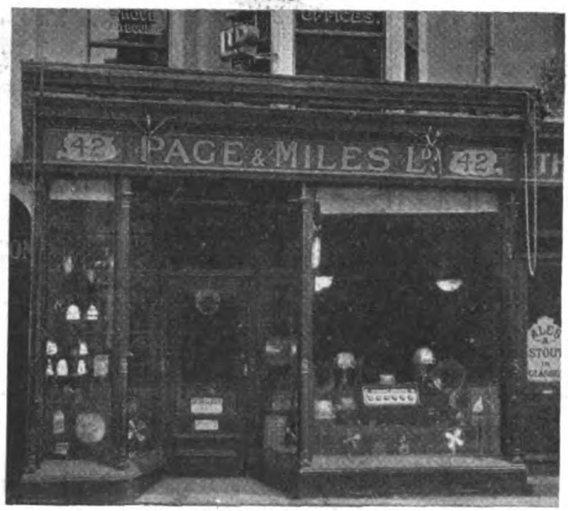
AS there was little time for contractors attending the E.C.A. Conference at Brighton last week to explore the local electrical contractors' shops, we reproduce in this issue several views of E.C.A. members' premises in Brighton and district. The three views on this page are of the establishments of Page and Miles, Ltd. Mr. H. J. Miles, who is joint managing director of this company, succeeds Mr. T. E. Alger as the Association's new President.



BELOW (on the left) is seen the President's chief establishment in Western Road, Brighton. The "Electric House" sign seen over the doorway is one of the most appropriate we have yet seen over a contractor's shop. A fragment of the box letter illuminated sign used on all the company's premises is seen on the other side of the door. Above is seen the company's Worthing shop, while the remaining view is of the Eastbourne premises.

NEED FOR STANDARD WIRING RULES.

Regulations Not Expensive—Experience in Other Countries—A Single Set Favoured—Cheapening Installation Material.

MR. Llewelyn B. Atkinson, in his paper on "The Need for Standard Wiring Rules," said that before considering whether a national or standard set was desirable he must answer those who argued that there should be no rules or, if there were any, that they should be so few in number that they would be of practically no importance. The argument supporting this view was that all rules add to expense, deter consumers from making installations, and generally slow the rate of progress.

Sub-division Suggested.

Dealing with the question from the point of view of experience, the author showed that with other commodities distributed by pipes regulations were necessary, if only to prevent wastage of the product. As a leakage of electricity was invisible, a certain amount of care was needed, and, quite early, supply authorities made regulations affecting the condition of electrical installations. Eventually the I.E.E. formulated authoritative regulations which were few and seemingly simple. With the growing complexity of the science and industry the rules were revised from time to time, and when the last edition was issued there was a considerable outcry, caused more by the form than the matter included. If it could have been possible to divide the subject into sections each complete in itself, such as Regulations for Isolated Plant Installations; Regulations for Direct Current Systems below 120 V; Regulations for Direct Current Systems over 120 V, and so on, and had each of these sections contained a complete story for the work which it was intended to cover, much of the outcry against complications would never have arisen.

It could hardly be maintained that there was any objection to the I.E.E. Rules as they stood, and regarding costs Mr. Atkinson said the evidence of recognised contracting authorities was to the effect that short of having no rules at all, and allowing almost anything to be done, there was no serious addition to the cost. In certain cases there was an actual lowering of cost relative to the older sets of rules.

Mr. Atkinson then went on to show that statements to the effect that the absence of regulations in other countries had aided electrical development in other countries were fallacious, and in support gave details of the extent of the rules applying in the U.S.A., Canada, New Zealand and Australia, most of which were more intricate than the I.E.E. Rules.

The teaching of experience pointed to the necessity of regulations, and it remained briefly to consider whether there should be a standard set applicable to all installation work throughout the country, or whether it was better that each locality or each supply authority should have its own special regulations based on local conditions.

Protecting the Purchaser.

On this point Mr. Atkinson thought the argument was strongly in the direction of a single set. It saved a great deal of work to designers, architects and specifying authorities, it simplified matters for contractors and installing authorities, and inexpert purchasers might at least protect themselves by specifying that work should be done in accordance with the standard regulations. Furthermore, a standard set of regulations led to cheapening of the installation material, because this could be made to satisfy those requirements with a minimum number of different patterns.

With all these considerations in view Mr. Atkinson suggested that the general adoption of the I.E.E. Wiring Rules was the

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best solution to the question of regulations as applied to installations.

The Discussion.

Mr. W. R. Rawlings thought that a body called the Wiring Rules Committee, representative of all interested, should be elected to deal with everything connected with wiring regulations. It would be an advantage to have a set of rules applicable to workmen's dwellings. There might be six sets of wiring rules, i.e. (1) for cheap property; (2) for better-class houses; (3) factories and workshops; (4) ships; (5) licensed premises; and (6) mines, etc. He proposed that the Committee should work on B.E.S.A. lines. Many of the severest critics of the I.E.E. rules had obviously not even read them.

Mr. H. J. Cash said that contractors generally were not only satisfied but pleased with the I.E.E. rules. Those who had investigated the question were convinced that these rules did not increase the cost of installations. Some individual rules might increase the cost of one part of an installation, but the rules applying to other parts of the same job would usually show a saving, so that there was no increase whatever in costs. The E.C.A. had been the greatest beneficiaries under the new rules, and the I.E.E. deserved the highest praise for the enormous amount of time and work expended on their preparation.

Mr. H. Moss said an effort should be made to make central station engineers, many of whom still had their own regulations, adopt the Institution's rules. Many of the local regulations made installations unnecessarily costly. Mr. Rawlings's proposed separate sets of rules would cause confusion, and there would be difficulty in deciding, for instance, where cheap property ended. There should be one set of rules—designed to give a reasonable minimum of safety—for all property.

Mr. R. A. Ure thought Mr. Atkinson should try to make the I.E.E. rules compulsory; otherwise inferior work would still be done. He did not like the idea of separate rules. A synopsis of the present I.E.E. rules would meet contractors' requirements, as there was much in the full set that did not apply to them. It would be helpful to contractors if manufacturers would stamp their goods to show that the materials used complied with B.E.S.A. requirements.

Mr. L. Gaster said all the insurance companies should insist on the I.E.E. rules being carried out.

Mr. T. H. Smith said they wanted with the rules some compulsory power of enforcement by insurance companies and municipalities.

Mr. T. E. Alger said he had consistently advocated the compulsory enforcement of the I.E.E. rules, and he could not understand why this was objected to. In mines and factories there were strict codes, with officials to inspect the work and apparatus. But in the home one could, without any restrictions, put into a nursery apparatus that was a real danger to children. Mr. Purse had asked the Electricity Commissioners to give him power to make the I.E.E. rules compulsory in his own borough and they had granted it. Why then, did not they do the same throughout the country? With compulsory rules every supply engineer would have authority to go in and inspect, and condemn or approve, all installations in his area.

Mr. Ll. B. Atkinson, in his reply, mentioned that the B.E.S.A. had now a standard mark for goods complying with their regulations, and manufacturers in certain trades were already using such marks. He thought electrical manufacturers would follow suit before long.

Some idea of the size of the E.C.A. gathering at Brighton last week can be gathered from the fact that the official photograph (taken by Panora, Ltd.) has had to be reproduced above in three parts. The left end of the group is shown in the top picture, the centre section below, and the right flank underneath it. The divisions have been slightly overlapped, so a few delegates appear more than once in our picture.

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THE NATIONAL REGISTER.

Mr. Purse Details Origin and Growth of the Register—Membership Should be Trebled in Next Two Years—A Compulsory Register?

MR. F. W. PURSE, engineer and manager of the West Ham Electricity Department, in his paper on "The National Register of Electrical Installation Contractors," referred at some length to the steps which led to the inception of the Register, to the procedure for examining the qualifications of applicants for membership, and to the objects for which the Register was established.

The author recalled that the first step towards the formation of the Register was taken in 1921 when the Wiring Rules Committee of the I.E.E. called a conference of representatives of interested parties to consider the case for a registration scheme. The first draft scheme, which was essentially that in operation to-day, was prepared by Mr. H. J. Cash, to whom all praise was due for the immense amount of time and thought devoted to the work.

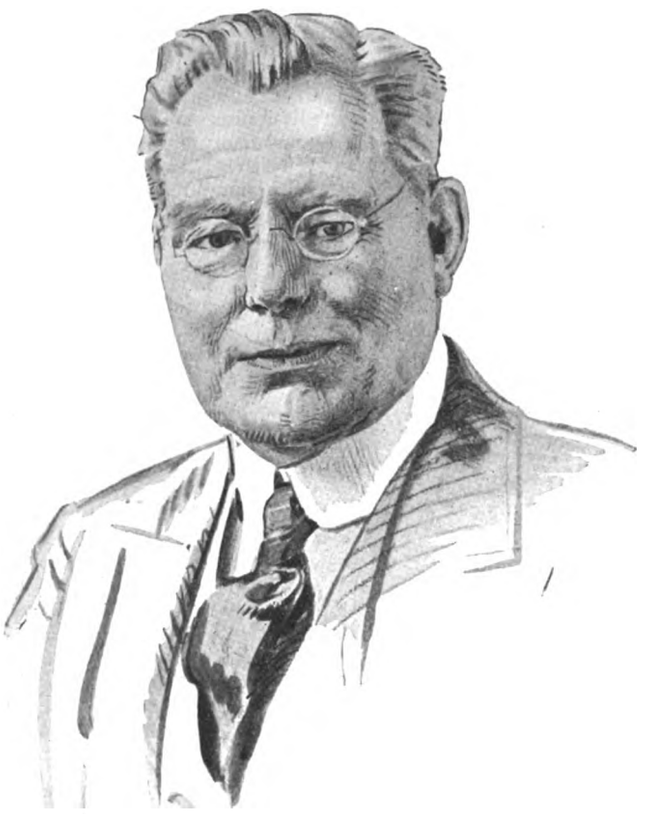
After giving extracts from the rules and conditions of registration, and of the work of the Executive Committee, Mr. Purse pointed out that the Form of Application seemed to be a great stumbling block to many applicants, as they appeared to think that they were all personally known to the authority and that it was unnecessary to give the information asked for. Numerous forms were received in which the applicants' qualifications were merely stated as "A.M.I.E.E., chartered electrical engineer." Such an applicant might or might not have had sufficient experience in electrical installation work, and it was the exact details of an applicant's experience in this direction that was required.

The aim of the Registration Board was to ensure that all applicants had satisfactorily carried on electrical contracting business for five years, or had held a supervisory position in such work for a like period. It was submitted that this was not too long a period for any man in which to acquire the necessary experience to carry out work as a registered contractor.

Detailing the very thorough steps taken to investigate the qualifications of all applicants, Mr. Purse said it was obvious that registration was not merely a matter of paying £5 and getting a certificate by return of post. Every care was taken to see that only fully qualified contractors were entered on the Register, and this could not be done in a few days.

With regard to fees, the author pointed out that although the initial registration fee was £5, the annual renewal fee was only £1, and in course of time the number of new applications would not be large each year, so that it was really the annual fee of £1 which would have to maintain the Register. Assuming that the total number of registered contractors reached 2 000 this would only represent an income of £2 000 per annum, and even such an amount would be insufficient to carry out all the ambitious propaganda suggested by some people. The development of the Register was entirely confined to the amount of its income, and this could only be augmented by increasing the number of members or by increasing the present annual renewal fee.

The Register had already done a great deal for its members. It had sent circulars and lists to thousands of people likely to place work with electrical contractors; it had investigated complaints of inferior workmanship; and it had been successful in getting a number of municipalities to give preference to registered contractors. In the latter case the Register's task was made harder by the fact that registered contractors were in the minority in certain towns.



An impression of Mr. H. J. Miles, the new E.C.A. President.

[*Specially drawn for* THE ELECTRICIAN *by "Spider."*]

Since the inception of the Register, 1 081 applications for registration had been received, and of this number 885 had been accepted, 97 had been withdrawn and declined, and the remainder were still receiving consideration. This number, however, was totally insufficient if the Register was to be as effective as its promoters desired, and every effort should be made to treble the total in the next two years. If such a number could be obtained the Register could demonstrate to the public that there were sufficient registered contractors available to deal effectively with all the work available. The public would be safe in the knowledge that any registered contractor who ceased to maintain the required standard of work would lose his certificate of registration. With registration, numbers would count, and the greater the membership the greater the influence of the Register.

Eligible contractors who were holding back to see how the Register would benefit them, were, Mr. Purse said, following a policy of negation. They should join at once and help the movement forward. At present, of course, registration was purely voluntary, but if it could ultimately be shown that the number of contractors on the National Register comprised a large majority of eligible contractors, there should not be much difficulty in making registration compulsory. It was really inconceivable that any contractor of repute should continue to be unregistered when the only essentials were the maintenance of a proper standard of work, and an annual fee of £1.

Discussing the question of the standard of work which registered contractors should be expected to adopt, and whether the Register should adopt a code of regulations, Mr. Purse said that until misguided critics of the I.E.E. Rules had seen the error of their ways it would be a little premature to adopt them in their entirety. Although it had been suggested that the Register should adopt the I.E.E. regulations or prepare a code of its own, neither course had been shown to be necessary. If every registered contractor followed the guiding principles laid down in the I.E.E. Rules, he need have

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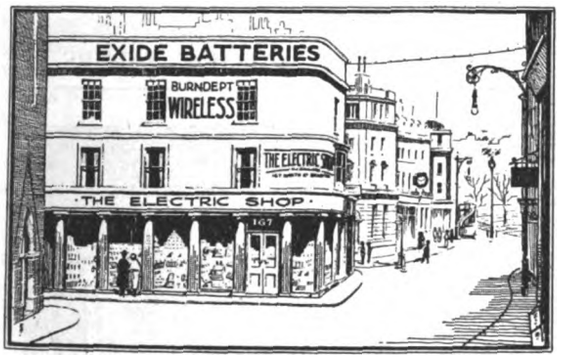
no fear of criticism. On occasion it might be necessary, while maintaining a reliable standard of work, to deviate somewhat from these regulations, and on these grounds it appeared better for the present for the Register to feel its way and not officially adopt any code of rules.

Mr. Purse said that the best way for the E.C.A. to set about making the I.E.E. Rules compulsory would be to make compliance with those rules an essential qualification of membership of the E.C.A.

In conclusion, the author paid tribute to the valuable services rendered to the Register by Mr. P. V. Hunter, the chairman, Mr. H. J. Cash, and Mr. T. Trimnell.

The Discussion.

Mr. H. T. Young paid tribute to the author's great work on behalf of Registration, a movement which benefited supply authority and electrical contractor alike. He thought the E.C.A. might endeavour to carry out Mr. Purse's suggestion about the adoption of the I.E.E. Rules. Three things would have to come sooner or later. In the first place there would have to be definite and compulsory rules; secondly, no man would be allowed to engage in installation work unless he was registered; and thirdly, there would have to be some form of inspection. In Ontario installations had to be sanctioned before begun, and were inspected during and after the work of installation. Closer co-operation between supply authorities and contractors would do much good, and every supply engineer should have a small committee of local contractors working with him. As a member of the Register's Advisory Committee he had noticed that many applicants



One of the Brighton establishments of Mr. H. J. Galliers.

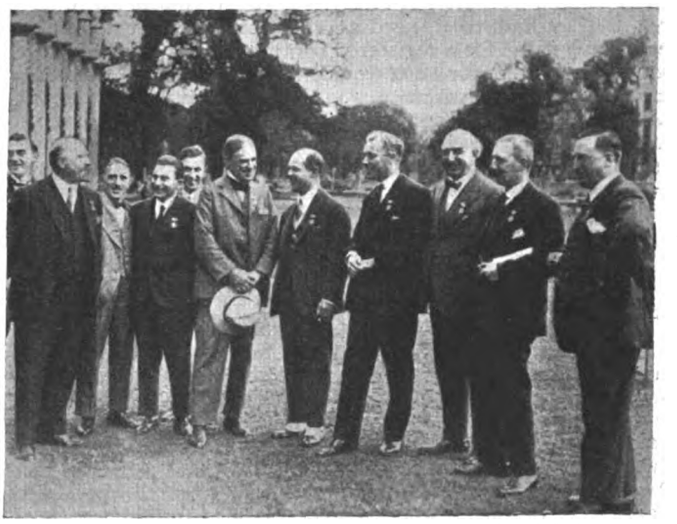
for registration expected to be admitted at once, and frankly explained that the haste was due to their anxiety to secure a contract that was only available for registered contractors. As time went on there would be many more who would have to be registered in order to get work. He thought more importance would be attached to the real object of the Register—the maintenance of a high standard of workmanship—if, when applying each year for the renewal of their certificates, registered contractors had to sign a simple form of declaration that they had done good work during the previous twelve months. "Registered electrical installation contractor" was a rather cumbersome title, the significance of which was not readily appreciated by the public. In America they used the term "Electragist," and though this was not suitable for use in this country, it might be possible to invent and register an appropriate word.

Registered Wiremen.

Mr. A. E. Hewett said he was not registered, and was not ashamed to confess it. In the early 'nineties he had obtained the City and Guilds certificate, and he had been in business for many years, and he was now asked to pay £5 to show that he was a competent electrical contractor. He wanted to know how a contractor with thirty or forty workmen could guarantee that all would do good work; the wireman as well as the master should be certified. Surely it was better for a contractor to state that he employed registered electricians only. If he liked he could then register himself as well.

Mr. R. Tweedy Smith thought they should link up the qualifications with the apprenticeship system. Anyone who had passed through an apprenticeship of five years should be able to apply for permission to set up in business at once, provided he had the necessary equipment.

Mr. L. Gaster said that as a consulting engineer he would not consider any tenders from unregistered contractors. To consultants the Register would be more valuable if it kept a record of jobs done by registered contractors. Then it would



Co-operation between the supply and contracting sections of the industry. (ELECTRICIAN *photo; exclusive.*)

be easy to see that the contractor who said "I wired Buckingham Palace" would not be the man to fit up a lighting point in a washhouse.

Inspecting Contractors' Work.

Mr. H. J. Cash said that those who asked why the Register had not done more should realise that it was only in its extreme infancy. The practice of giving work only to registered contractors was a question of habit, and this naturally took time. It was not easy to progress speedily, as all the nominating bodies had to be consulted on matters affecting policy. One contractor had asked the Register to appoint an inspector to inspect all work done by registered contractors. The Register, he thought, would be quite agreeable to inspect registered contractors' work if someone would provide the money. A cheaper way was for registered contractors to furnish the Register with evidence of faulty work by other registered contractors; it was their duty to report such cases so that offenders might be struck off the Register.

Mr. Rawlings paid high tribute to Mr. Cash's work, without which the Register would never have been brought into operation.

Mr. W. Finlay said that as a solicitor he appreciated the advantages of registration. With registration made compulsory contractors would be able to control their own trade. He regarded apprenticeship as vital, as every man should know his trade from the bottom up.

A view of Mr. H. L. Holford's premises at Church Road, Hove.

Mr. F. W. Purse, in his reply, said it should be emphasised that the Register was not a money-making enterprise. They had now 112 registered contractors in London, Manchester

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following with 82; Glasgow had only 31 and Edinburgh 14. He did not think the signed declaration on the application for renewal of certificates was necessary, as before each renewal fell due the application was sent to the local advisory committee, which could report on any registered contractor in its area. They had tried hard at the outset to get a simple descriptive name for a registered contractor, but with no success; suggestions for such would, however, be appreciated. The registration of wiremen would be a natural outcome of the full registration of contractors. The time-expired apprentice was not fit to start business at once, but if he followed up his apprenticeship with two years' practical work he might be suitable for registration. He did not think a list such as that suggested by Mr. Gaster would be worth while, as the information could be obtained much quicker direct.

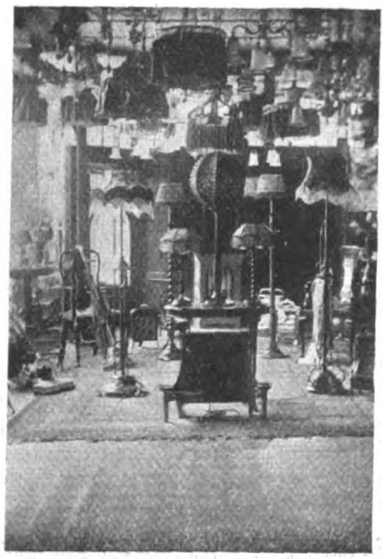
Concluding Address.

IN concluding the business session of the conference, Mr. H. J. Miles, the new President, said he was naturally proud that their first Conference had been held in his native town, and that it had been such an unqualified success. Their Associations were already large, and representative of the whole installation and retail trades in this country. On the other hand, there was ample room for expansion. In consequence of his own long experience in the trade and very lengthy experience of the E.C.A. allied associations, it was his firm opinion that every electrical contractor worthy of the name should be a member. It was equally time that all retail traders in electrical appliances, who were not actually electrical contractors, should become members of their trading association, the N.E.C.T.A., Ltd.

Real appreciation of the good work carried on by the E.C.A. allied associations could not be obtained by "looking on" from outside. It was necessary to come inside really to get to grips with the problems and to appreciate the immense work that was going forward in the direction of their solution. The greater part of their useful, applied knowledge had been obtained as a result of experience. Sometimes sad experience! But membership of the E.C.A. allied associations gave to new members the opportunity to benefit from the experience of others, and this must make them all very much better able to give the public that expert service which they had every right to expect. If all electrical contractors were in a position to give such expert service he was sure the electrical contracting industry would continue to go on and prosper side by side and in perfect harmony with all other sections of the great electrical industry.

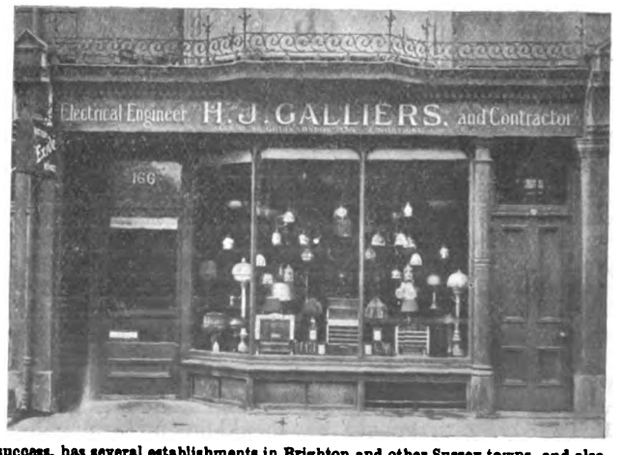
Finally Mr. Miles expressed the hope that during his year of office their membership would be greatly augmented, and also that all their members would become registered. It could not be too clearly appreciated that these "installation" organisations functioned in two distinctly different directions, and that both were essential to continued progress. The National Register secured the professional status of the contractor. But the E.C.A. allied associations secured his commercial welfare and stability—and it was in those directions that such a vast amount of spade work remained to be done. It was in those directions that the E.C.A. needed the moral and material support of every reputable contractor in the land.

MORE BRIGHTON CONTRACTORS' SHOPS



A corner in the Page and Miles showrooms at Brighton.

The outside of Mr. A. Geall's premises at George Street, Hove.



Mr. H. J. Galliers, who filled the rôle of hon. conference secretary with conspicuous success, has several establishments in Brighton and other Sussex towns, and also a London showroom. On the left is a view of the headquarters at 32, James's Street, Brighton. The other picture shows the Worthing branch.

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ELECTRICAL CONTRACTING.*

An Important Book—Knowledge for Big and Small Contractors—Salesmanship Hints—Avoiding "Floor-Slaughtering."

By H. T. YOUNG, A.M.I.E.E.

ELECTRICAL contracting is the section of our industry that calls for more individual ingenuity than any other, and the writer of "Electrical Contracting" is to be congratulated, first of all for placing his personal experience, deductions and views before the public in the form of a book, and then for the very concise and thorough manner in which he has dealt with his subject right from obtaining the necessary capital to "raking in" the profits on satisfactorily completed contracts.

There is something intriguing and interesting in its chapters for the experienced and successful contractor which should inspire even him to greater efforts. To the young beginner and the poor man who is always complaining about his business it is an education and an inspiration.

Importance of Personality.

It seems to me that the complaint an experienced electrical contractor might launch against this book is that it makes his work look too easy, and might put ideas into the minds of ambitious young men to try their luck at a most difficult and complex business. On page 4 we read, "The whole question depends chiefly upon the prospective contractor's personality. . . ." Here we have great wisdom. Many a clever engineer has failed for lack of personality; that *something* which everyone appreciates and so few really understand.

The author's example of capital estimate on page 5 is difficult to understand. A contractor with a turnover of £1 230 would not require to use capital of an equal amount to finance his jobs. He would expect to obtain cash as his contracts proceeded and sales were made, and would buy his material, and pay his labour and his own salary and rent, as the work proceeded and cash came in.

It is obvious that, with so small a turnover, the contractor would have to be engaged on productive work himself. £250 for rent, even if it included rates and light and heat, is too much for a man to pay who cannot expect more than £1 230 for his turnover in the first year, or double that amount in the second year. A rent of the amount mentioned should, in itself, produce a turnover of £2 000 in the first year if premises were selected with discretion and properly managed. It is, of course, very easy to be critical of figures, however they may be arranged, particularly as one contractor may be engaged chiefly on factory work, another on private house work, another with useful side lines in wireless, refrigerating and labour-saving devices, and so on.

General organisation varies to some extent with the size of contract and class of business, but the author has laid down certain rules which must never be departed from if success is to be achieved. One rule in particular, relating to the contractor charging his time to a job where he is engaged on actual work or supervision, would, if ignored, in all probability soon bring about a financial crash.

Indiscriminate Credit Sales.

The author—undoubtedly through lack of space—has given no warning against indiscriminate credit sales. The contractor of necessity has to do his job, or at least a part of it, before he can draw some cash, and one of his most serious pitfalls is in the giving of credit. Many have been ruined in their early days by this, and every contractor knows, to his sorrow, that he must make serious bad debts every year. Perhaps Mr. Purdie's next book will give some guidance in this matter.

In "Electrical Contracting" the suitable forms of advertising are placed in order of importance with studied accuracy. A shop window is the best investment for a contractor, small or large. Press advertising should be carried out with the advice of a reliable advertising agent, as suggested. The hints given on salesmanship should be read over twice; they are very condensed, but nevertheless compel the reader to think and to explore his own possible shortcomings and potentialities.

The suggestion of submitting plans (where not provided) when sending in specifications would be a good one if competition were less keen, or fewer inquiries were sent out. Where a dozen contractors tender for one job—which so often occurs—the chances of obtaining the order are somewhat remote, and the cost of preparing drawings for all of them becomes prohibitive. The lowest tender is accepted nine times out of ten, and the manner of presentation of tenders to-day is usually excellent; so it is really unlikely that the cost of drawings would be justified, except in a very few special instances. Here a contractor's common sense should be brought to bear. To enclose illustrations with estimates submitted to private consumers is a first-class idea. The advice on contract conditions is very sound; the author would do well to recommend the standard conditions of the E.C.A.

It is always questionable whether it is better to embody the actual estimate in the form of a letter or to keep it separate. The author suggests the first course, but many firms find it better to keep estimate, specification and schedule under their own headings on separate sheets of paper, and then to put in a nice letter as a thing apart or silent salesman, to sell the job, particularly to private inquiries.

Pages on estimating, overhead expenses, profit, in turn all lead up to under-priced estimates. The concluding paragraph to this heading is worth noting: "Every contractor should have a trading policy to which he should strictly adhere, and there is no more reliable one than that of a good job at a fair profit." A mere platitude, but how often is it forgotten?

The technical side of the book is very complete, and is expressed in a simple manner. The extracts from Institution regulations, tables and formulæ, with explanations of methods of supply, d.c. and a.c., cover the whole of the ground that the contractor requires. Illumination, which is now receiving the attention it rightly deserves, is dealt with somewhat exhaustively and in a manner which will give many readers who have not devoted time to this important subject an easy opportunity for assimilation. The illustrations of lighting installations are well selected and printed, and speak for themselves.

Modern Wiring Systems.

In dealing with all modern systems of wiring the author in one instance, when explaining C.T.S. cables, unfortunately uses serious words rather loosely regarding metal covering. The "difficulties and dangers" of modern wiring systems of all kinds are conspicuous by their absence. Experience convinces contractors of the importance of permanent mechanical protection for permanent work.

The pages given to what one might describe as "Tips to Wiremen" on house wiring should be studied by wiremen; there would then be fewer complaints of "floor-slaughtering." A nail punch might also be added to the tool kit suggested for the job. Heating, ventilation, power and bells all in turn receive attention, and most useful hints and suggestions are given. The book is conveniently divided into three parts and well indexed, which makes it most useful, both as a book of reference and one for instructive reading and study.

I would recommend "Electrical Contracting" to installation engineers and contractors. They have no time to waste, and this book is so well planned and up to date that the time given to reading it will certainly form a most profitable investment.

*"Electrical Contracting." By H. Ayres Purdie. (London: Ernest Benn, Ltd.) Pp. 371. 10s. 6d. net.

E.C.A. Conference Sayings.

I AM not a contractor, but a lawyer; I may be an ass, but not a silly ass.—*Mr. W. Finlay.*

* * *

I hope the afternoon will be a bright 'un.—*Mr. T. E. Alger.*

* * *

In summer, like the Christmas cracker makers, we try to get out something fresh for the coming winter.—*Mr. J. W. Beauchamp.*

* * *

For the benefit of speakers, when the green lamp is alight it means slow up. When the red light is on, it means shut up.—*Mr. H. J. Galliers.*

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NEWS IN BRIEF.

Mansfield Contractors and Assisted Wiring—Contractors' Municipal Trading Allegations at Morecambe—The Second Electro-Farming Conference.

CARDIFF R.D.C. has invited tenders for the erection of an electricity sub-station at Dinas Powis.

Barnsley T.C. has decided to appoint a lady demonstrator of electric cooking and the use of domestic electric appliances.

A faculty has been granted for electric light installations in the parish church of Dalton-in-Furness and the church of St. Margaret, Dalton-in-Furness.

Mansfield T.C. has arranged for local electrical contractors to carry out assisted wiring at £7 per house for six lamps and £7 10s. per house for seven or eight lamps.

Councillor A. H. Dykes, Chairman of Beckenham Electricity Committee, states that in time the fixed price light system will be available for everyone in the district.

"Some Deleterious Properties of Lubricating Oils" was discussed by Mr. J. E. Hackford last Friday in a paper read at a meeting of the Diesel Engine Users' Association.

Hull Corporation Telephone Department made a net profit last year of £11 427, apart from a contribution of £1 388 in relief of rates and the royalty paid to the Government, £10 926.

Dr. F. Behounck, a young Czech scientist, claims to have made an apparatus which has enabled him to determine the amount of radio-active matter in the atmosphere, together with the atmospheric ionisation.

Applications are invited for the post of principal of the Technical Institute, Dartford. The salary is £600, rising to £800. Application forms are obtainable from Mr. F. L. Notley, 8, Hythe Street, Dartford.

"Do you run your works by electricity? If not, why not?" is the query printed on Accrington tram tickets. It has been suggested that the question is addressed to the wrong section of the public and would be more effective on motor-car licences.

The Chief Constables' Association has passed a resolution urging the Minister of Transport to include in the projected Road Vehicles Bill a clause prohibiting motor vehicles from passing stationary tramcars while passengers are alighting or boarding.

Morecambe Corporation has secured premises in Victoria Street for an electrical showroom. The local electrical contractors allege that the Electricity Department is exceeding its powers with regard to municipal trading. The Electricity Committee has asked for particulars of specific instances.

Hull Corporation is equipping two houses on the West Hull housing site for electric lighting, cooking and heating, and proposes as an experiment to charge a flat rate for current. Employees of the municipal electricity department will occupy the two experimental houses. The electrical equipment will increase the price of each house by £90.

Mr. E. L. Cotterell stated, at a meeting of the Wolverhampton Archæological Society, that the first commercial use of the telephone took place in Wolverhampton, and that that town had the first telephone exchange in the world. He states that Dr. Alexander Bell made successful telephone experiments in 1876 over a telegraph line between the shop and works of Moses Ironmonger, a ropemaker, of Wolverhampton, and soon afterwards Dr. Bell telephoned from Birmingham to Mr. Ironmonger at Wolverhampton.

Mr. W. Revell, presiding at the Festival of the London Association of Foremen Engineers last Saturday, said it was a national disaster that a skilled operative in the engineering industry should, owing to the stress of international competition, be compelled to work at a rate of wages less than that of a tram conductor. The rate of wages that the sheltered trades had forced the employers to pay was one of the most serious difficulties their industry had to face. He did not believe the industry required Government interference.

At an inquest at Bradford on Monday into the cause of the death of a twelve-year-old boy, who died through touching a bath with one hand and a defective electric radiator with the other, the evidence showed that some other member of the family, in repairing the radiator, had not properly replaced the mica washers and porcelain bushes, so that a live wire came into contact with the framework. The Coroner said that the general public should realise the advisability of seeking expert advice in dealing with or repairing electrical appliances.

Reading Corporation Tramways Football Club held a dinner last week in celebration of the winning of the Reading Wednesday Cup and the Berks and Bucks Mid-Week Cup.

Said to be the highest beacon in the world a 5 000 000 c.p. electric beacon on Sherman Hill, Wyoming, situated 8 600 ft. above sea level, serves as a guide to night-flying air-mail pilots.

Under the auspices of the E.D.A., the Second British Electro-Farming Conference will be held at noon on July 8th in the Members' Tent on the Show Ground of the Royal Agricultural Society at Reading.

Two Stoke Newington (London) tradesmen were each ordered at the North London Police Court last week to pay £2 2s. costs for having used electricity for display lighting purposes, thus committing breaches of the Coal Emergency Regulations.

An electric locomotive, 60 ft. long, weighing 126 tons, and driven by six motors of an aggregate rating of 4 500 H.P., has been built by a Geneva firm and tested successfully at Berne. The locomotive is to be employed on the Berne-Loetschberg-Simplon line.

Mr. David Brownlie states that at the end of 1923 the total water power utilised for the generation of electricity in all the countries of the world was shown by the United States Geological Survey Report to be 29 000 000 H.P. compared with 23 000 000 in 1920, an increase of 26 per cent. in three years.

More than three-fifths of the operating expenses of the Bell telephone system in America represent wages. A similar preponderance is shown in the British telephone industry. It has been calculated that every £1 000 000 spent in the development of the service finds employment, directly or indirectly, for 6 500 people. There are very few other industries in which wages account for so large a percentage of operating expenses.

The Royal Commission on Awards to Inventors considered last week a claim by Mr. C. E. Stuart in respect of a system of electro-deposition of iron as applied to aeroplane engines. It was stated that the applicant conceived in 1916 the idea of building up a vat of wax round the part to be plated and he also employed a rocking arm to agitate the solution. An air mechanic named Lovelock was associated with him in the claim. The Commission reserved its decision.

The Secretary for Mines has approved for use in mines the following types of safety lamps: electric lamps—Pearson N.I. F.E., square; Pearson N.I. F.E., 5 V; Edison cap; Patterson cap, type J1 and K1; Wolf cap; Worsnops-Maxilux; Pearson N.I. F.E., official's pocket lamps; flame lamps—Patterson's Type E3, for officials. The Order also amends the schedules to previous safety lamps orders by substituting revised specifications, or amending the specifications of certain types of safety lamps already approved.

The new sports ground of the Waygood-Otis Club at Elmers End was opened last Saturday, and an interesting programme of athletic sports was carried out. The club's former ground at Bellingham was 5¼ acres in extent, and has been in use twenty years. The new ground comprises just over ten acres, and will provide accommodation for cricket, tennis, bowling, and football, as well as pedestrian and cycle races. The club, which also organises monthly indoor functions, such as dances, whist drives, concerts, etc., in the winter months, is well supported, both by Waygood-Otis, Ltd., and its employees.

M. Poirson, a French physicist, is reported by the "Scientific American" to have invented an apparatus, to which the name of cryptophone has been given, for preventing "listening-in" on the telephone. Starting from the realisation that audition is interfered with by the interruption of vibratory currents, M. Poirson found that if rapid inversions of the current were used instead of interruptions, the harmonic composition of the telephonic current was modified and the sounds produced became quite unintelligible if picked up anywhere along the line. It is claimed that at the proper receiving end the currents so treated can be re-established in proper order by inversions identical and synchronising with those at the transmitting end, and the message is produced as originally spoken.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

MR. W. C. Clinton has been appointed to the London University Chair of Electrical Engineering at University College.

Ilford U.D.C. has increased the salary of Mr. A. H. Shaw, the electrical engineer, from £997 per annum to £1 029 per annum.

Mr. Samuel Fildes, electrical contractor, of Stockport, has been nominated to fill a casual vacancy on the Town Council.

Faversham Town Council has increased the salary of the electrical engineer, Mr. G. Somerville, from £416 to £500 per annum.

The late Mr. L. Grant, a director of the Kettlewell Electricity Co., Ltd., and other companies, left gross estate valued at £188 970.

Mr. A. C. Evans, formerly deputy-manager of the electricity works at Newton Abbot, has been appointed to an important position in the Birmingham Electricity Department.

Mr. F. J. Bostock, proprietor of Bostock and Bramley, power transmission engineers, of Leeds, was married at Huddersfield on June 17th to Miss Beatrice M. Sykes.

Mr. W. J. E. Binnie, of Sir Alexander Binnie, Son and Deacon, has been elected chairman of the Committee of the Association of Consulting Engineers for the year 1926-1927.

Monmouth Town Council has decided to increase the salary of the resident electrical engineer, Mr. F. R. Windsor, by £26 per annum, and to grant him a coal allowance up to ten tons annually.

Mr. Robert Birkett, borough electrical engineer of Southend-on-Sea, was on June 23rd presented with a cheque for £345 in recognition of his services to the borough during the past twenty-one years.

Mr. G. A. Saunders, for many years with the British L.M. Ericsson Co., and latterly one of the superintendents at their Beeston factory, has been appointed production manager at the Dagenham works of the Sterling Telephone and Electric Co., Ltd., and takes up his new duties on July 5th.

Mr. William Matthews has been appointed works superintendent to Tunbridge Wells electricity undertaking. Mr. Matthews was a student at the Newport Electricity Works, and later joined the staff of the Midland Electric Corporation for Power Distribution, with whom he remained for eleven years.

Mr. Leslie Gordon has resigned the post of honorary secretary and Parliamentary agent of the Conference of Local Authorities owning Electricity Undertakings in Greater London, in consequence of his appointment as clerk, solicitor and Parliamentary agent of the London and Home Counties' Joint Electricity Authority.

Mr. Walter Leaf, chairman of the St. James's and Pall Mall Electric Light Co., Ltd., and deputy chairman of the Central Electric Supply Co., has been obliged to give up active work as president of the International Chamber of Commerce, although he is to retain the title of president. The Chamber has elected Sir Alan Anderson chairman of the Council of the Chamber and acting president.

We learn that by arrangement between Alfred Graham and Co. and the Sterling Telephone and Electric Co., Ltd., Mr. William Blogg, formerly sales manager to the Sterling Co., who is now in Australia in the capacity of managing director of the Australian Amplion Co., will act as agent in Australia for the Sterling Co.'s telephones, switchboards, and telephone apparatus, but not for their wireless apparatus.

OBITUARY.

The following deaths are announced:

Mr. Lucien Espir, managing director of General Electric de France, Ltd.

Mr. Harry Freeman, on June 21st. He was for some years head electrician at the Wharncliffe Silkstone Collieries.

Mr. Alfred Cestre Cross, of Birkdale, for many years a traveller in electrical appliances for the French firm of Gabriel and Co. He was 61 years old.

Mr. Charles P. Markham, chairman of the Staveley Coal and Iron Co., Ltd., who some time ago offered a prize (which has recently been awarded) of £1 000 for the most suitable electric battery locomotive for work in coal mines.

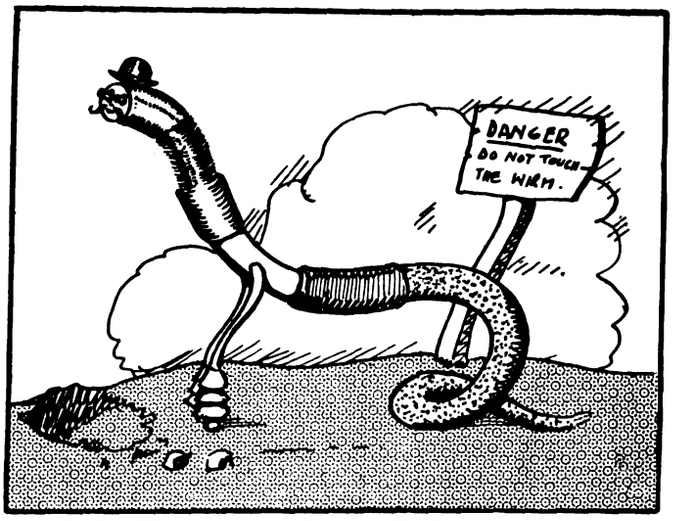
IN LIGHTER VEIN.

Random Comments and Reflections on Electrical Topics of the Week.

THE next of our series of electrical monstrosities is the Live Wirm, a very careful and fastidious reptile. Before going out he slowly and deliberately completes his toilet in accordance with the prevailing weather. He puts on his porcelain shoes for the rainy days, stepping over the puddles, for there are breakers ahead to trip him if he leaves the narrow path and touches the earth; for then he would be dead in a few seconds.

* * *

With his trailing tail of cabtyre carefully polished, his double silk collar nicely adjusted, and his wire-armoured body belt in position, he sets off in charge of his conductors.



The Live Wirm is a recent addition to "The Electrician's" Menagerie of Electrical Monstrosities.

One species (*Wirmus Mainus*) hibernates for long periods, peacefully sleeping unless prodded by a navvy's pick, when the Wirm (and the navvy!) is instantly galvanised into action. This disturbing of the sleep of the Wirmus is usually accompanied by phenomenal activity on the surface—navvies moving at unheard-of speeds—for the reptile is very dangerous in this disturbed condition.

* * *

Once more our tame poet has come to the rescue with a fitting account of the reptile:

From Oxford Street to Timbuctoo,
You'll find the Live Wirm squirming.
With coat of mail and armoured tail
He follows every turning.
But if perchance he comes to earth,
You'll find just where he landed
A blackened, twisted form—quite dead,
And his conductors stranded.

* * *

Talking of wire, the latest issue of "Country Pie" relates how a certain member of the "Clesco" staff arrived home with the milk, and was greeted by his wife with the question: "Wire you insulate?"

POINTS OF VIEW.

Interesting Pronouncements on a Variety of Topical Electrical Subjects.

IT is really inconceivable that there should be any contractor of repute who continues to be unregistered.—*Mr. F. W. Purse.*

* * *

The National Register is destined to play a singularly important part in raising the professional status of installation engineers.—*Mr. T. E. Alger.*

* * *

It is useless for any consumer or supply authority placing electrical contracts to look for good electrical installation work at a cheap-jack price.—*Mr. Walter Finlay.*

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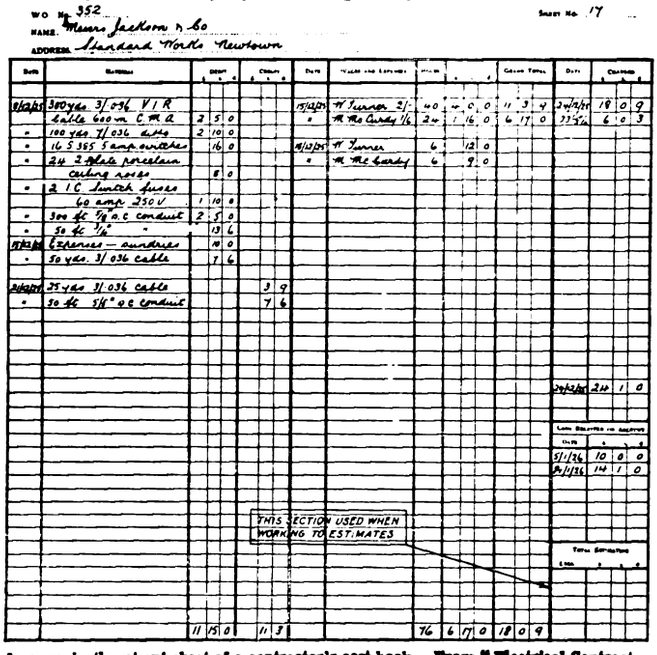
BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given. Unless otherwise stated, particulars are to be had from the Department of Overseas Trade, 35, Old Queen Street, Westminster, London, S.W.1.

HALIFAX HOSPITALS WIRELESS INSTALLATIONS FUND COMMITTEE.—Wireless installations. Particulars from Mr. W. Emmott, 35, Commercial Street, Halifax.

WARWICK GUARDIANS, July 1st–July 9th.—Electric light installation at the Institution, Union Road, Warwick. Specification from Henry Lea and Son, 151–153, Edmund Street, Birmingham, until July 1st; deposit £3 3s.



A conveniently set out sheet of a contractor's cost book. From "Electrical Contracting," an important book for contractors, which is reviewed on page 27.

INDIA STORE DEPARTMENT, July 2nd.—Extra high-tension armour clad switchgear. Tender forms from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1.

FIFE EDUCATION AUTHORITY, July 2nd–July 14th.—Electric lighting works in connection with additions to Cowdenbeath Secondary School. Schedules from Mr. Geo. Sandilands, Works Department, Education Offices, Kirkcaldy, until July 2nd; deposit, £1 1s.

SWANSEA EDUCATION COMMITTEE, July 2nd.—Electric light wiring at Terrace Road and Manselton Council schools. Specifications from Mr. E. E. Morgan, 3, Prospect Place, Swansea.

BARKING EDUCATION COMMITTEE, July 3rd.—Electric light wiring and fitting at the Park Central School, Wilmington Gardens. Tenders are required only from firms whose works are established in the London area. Specifications, etc., from Mr. C. J. Dawson, Clock House Chambers, Barking; deposit £3 3s.

CLACKMANNAN EDUCATION AUTHORITY, July 3rd.—Electric light wiring at new offices, Oakleigh, Glebe Terrace, Alloa. Schedule from J. Melvin and Sons, architects, Mar Street, Alloa.

DUBLIN BOROUGH COMMISSIONERS, July 3rd.—Storage battery, for Crooksling Sanatorium, Brittas, co. Dublin. Specification, etc., from the City Treasurer, Exchange Buildings, Lord Edward Street, Dublin; deposit £1 1s.

CROYDON CORPORATION, July 5th.—Electric locomotive coal-handling crane and grab. Specification from the Engineer and Manager, Electric House, 38, High Street, Croydon.

ERITH URBAN DISTRICT COUNCIL, July 5th.—Two centrifugal pumps, with electric motors. Specification, etc., from Mr. H. Hind, Engineer and Surveyor, Bexley Road, Erith; deposit, £1 1s.

MANCHESTER CORPORATION, July 5th.—Manufacture and laying of about 17 miles of 33 000 V trunk feeders, about 17 miles of pilot cables, and about 6 miles of telephone cables. Specification (No. 175) from Mr. H. C. Lamb, manager, Electricity Department, Town Hall, Manchester; deposit £3 3s.

NORMANTON URBAN DISTRICT COUNCIL, July 5th.—Wiring 34 houses on the Hanson estate and 86 houses at Sydale Road, Normanton. Specifications, etc., from Mr. J. Hopton, Council Offices, Normanton. Separate tenders are required for each scheme.

OUTWOOD WORKING MEN'S CLUB, July 5th.—Electric light installation. Specification can be seen at the Club.

SAFFRON WALDEN GUARDIANS, July 5th.—Electric or pull bells for the Poor Law Institution. Specifications can be seen at the Institution or the Clerk's office.

WEST HAM CORPORATION, July 5th.—(1) Ten double-deck electric tramcar bodies, with roof covers; and (2) ten carsets of centre bearing swing bolster trucks. Specifications, etc., from Mr. L. Slattery, general manager, Tramways Department, Greengate Street, Plaistow, London, E.13; deposit £5 per specification.

WIGAN CORPORATION, July 5th.—Electric lighting installation in Whelley New Schools, Wigan. Specification, etc., from Mr. R. B. Donald, borough engineer, Library Street, Wigan.

DUBLIN BOROUGH COMMISSIONERS, July 6th.—Electric wiring of 200 houses at Croydon Park. Particulars from the City Treasurer, Exchange Buildings, Lord Edward Street, Dublin; deposit £1 1s.

HUDDERSFIELD CORPORATION, July 6th.—Electric light installations at Beaumont Street, Gaitfield, Outlane and Stile Common Council Schools. Specification from the Borough Architect, 26, Ramsden Street, Huddersfield.

NOTTINGHAM CORPORATION, July 6th.—Twelve months' supply of general stores, for the Electricity Department. Particulars from the Engineer, Electricity Station, Talbot Street, Nottingham; deposit 5s.

ACTON EDUCATION COMMITTEE, July 7th.—Electric light installation at South Acton Girls' and Infants' School. Specification, etc., from the Borough Engineer, Municipal Offices, Acton, W.3.

CLACTON-ON-SEA URBAN DISTRICT COUNCIL, July 7th.—(a) Open type cooler and pipework; (b) 25 kW three-wire balancer; (c) fuel oil storage tank. Specifications for (a) and (b) from the Electrical Engineer, 1, Arcade Buildings, Station Road, Clacton-on-Sea.

MANCHESTER CORPORATION, July 7th.—Supply and erection in various installations of 6 600 V 3-phase switchgear (sheet steel cubicle type). Specifications, etc., from Mr. H. C. Lamb, manager, Electricity Department, Town Hall, Manchester; deposit £1 1s.

MANCHESTER CORPORATION, July 7th.—Supply and erection at Barton power station of two 130 000 lb. water-tube boilers (mechanical stokers) for a working pressure of 375 lb., with flues, coal chutes, ash hoppers, pipework and valves and induced and forced draught plants and chimneys (specification B.47); and one 40 000 kW turbo-alternator, with condenser, air and water extraction plant and pipework (specification B.48). Specifications and forms of tender from Mr. H. C. Lamb, manager, Electricity Department, Town Hall, Manchester; £3 3s. deposit for each specification.

GLASGOW CORPORATION, July 9th.—Electric lighting, bells, and fire alarms; and main supply cables, at Mearnskirk Sanatorium, Mearns, Renfrewshire. Specifications from the Office of Public Works, 64, Cochrane Street, Glasgow; deposit £5 5s.

ECCLES CORPORATION, July 10th.—Electric light wiring and fitting of 12 houses in Gashall Road, Eccles. Specification, etc., from the Borough Electrical Engineer, Electricity Works, Cawdor Road, Patricroft; deposit £1 1s.

GRIMSBY CORPORATION, July 10th.—Supply of paper insulated, lead covered, low tension cables during one year, estimated at 15 000 yards. Specification (No. 217), gratis, from Lt.-Col. W. A. Vignoles, borough electrical engineer, Grimsby.

PARISH CHURCH, BAMPTON, July 10th.—Electric light installation. Particulars from the Vicar.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, July 10th.—Supply and erection at Birchills power station, Walsall, of

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two turbo-alternators, condensing plant, etc. Specification, etc., from Mr. E. M. Lacey, 12, Victoria Street, Westminster, S.W.; deposit £5 5s.

KEIGHLEY CORPORATION, July 12th.—Wiring 20 houses on the Broomhill estate. Specifications from the Borough Architect.

NEWMILNS AND GREENHOLM TOWN COUNCIL.—July 12th.—Electric lighting work in 12 semi-detached cottages of three apartments, or six blocks of four three-apartment houses. Specifications can be seen at the Burgh Surveyor's office.

SANNA, ARDNAMURCHAN (SCOTLAND), July 14th.—Hydro-electric lighting installation for dwelling house. Schedules from G. M'Ritchie and V. Hodgson, architects, Fort William.

ST. HELENS CORPORATION, July 17th.—Three electrically driven pumps, with starting gear, switchboard, etc., for Sutton Road pumping station. Further information from Mr. A. W. Bradley, Borough and Water Engineer, Town Hall, St. Helens.

INDIA STORE DEPARTMENT, July 20th.—Four 10 000 kW turbo-alternators, condensing plants and auxiliary apparatus. Specifications (£2 per set, not returnable) from the Director-General, Branch No. 14, Belvedere Road, Lambeth, London, S.E.1.

CORK BOROUGH COMMISSIONER, July 23rd.—Repair by electric welding of turntable undercarriage at Parnell Bridge. Specification from Town Clerk: deposit, £1.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, July 24th.—Supply and erection at Birchills power station of three steam boilers, pulverised fuel plant, ash and coal handling plant, and boiler house auxiliaries. Specifications, etc., from Mr. E. M. Lacey, 12, Victoria Street, Westminster, S.W.1; deposit £5 5s.

BELFAST CORPORATION, July 31st.—One 15 625 kW turbo-alternator, with condensing plant and auxiliaries, and, alternatively, one 18 750 kW turbo-alternator, with condensing plant and auxiliaries. Specifications (Nos. W48 and W48a) from Mr. Johnstone Wright, City Electrical Engineer and Manager, East Bridge Street, Belfast; deposit, £3 3s.

Overseas.

Note.—An asterisk against the reference of an overseas contract denotes that local representation is essential.

STATE ELECTRICITY WORKS, MONTEVIDEO, July 6th.—Supply of 1 000 000 metres of insulated conductors. (Reference B.X. 2 523.)

PORTO ALEGRE (RIO DE JANEIRO) MUNICIPAL COUNCIL, July 8th.—Electrical material for street lighting.

STATE ELECTRICITY WORKS, MONTEVIDEO, July 9th.—Supply of 137 500 metres of rubber insulated wires and cables. (Reference B.X. 2 548.)

JOHANNESBURG MUNICIPALITY, July 10th.—Supply of 3 000 pin insulators and 500 shackle insulators. (Reference B.X. 2 619.)

ANTWERP MUNICIPALITY, July 12th.—One six-phase converter, one mercury vapour arc rectifier and four static transformers, for sub-stations, for the Port Equipment Department. (Reference B.X. 2 637.)

VICTORIAN RAILWAY COMMISSIONERS, July 14th.—Supply of a.c. power interlocking machine (contract 39 543). (Reference B.X. 2 596.)

SOUTH AFRICAN RAILWAYS AND HARBOURS ADMINISTRATION, July 15th.—Gasfilled and vacuum type lamps, for one year. (Reference B. 2 554.*)

STATE ELECTRICITY WORKS, MONTEVIDEO, July 15th.—Supply of 40 000 metres of coloured twin-conductor cords. (Reference B.X. 2 549.)

INDIA STORE DEPARTMENT, July 16th.—Rotary converters, 500 V, 200 V, with step-down transformers. Tender forms from the Director-General, Branch No. 1, Belvedere Road, Lambeth, London, S.E.1.

INDIA STORE DEPARTMENT, July 16th, July 30th, August 6th.—(1) Coal and ash handling plant for power station; (2) steel frame buildings and electric travelling crane; and (3) boiler house equipment, piping, etc., or, alternatively, complete boiler house installation, including pulverised fuel equipment, piping, etc., in connection with Great Indian Peninsular Railway electrification. Specifications from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1. Fees (not returnable) 5s. each for Nos. 1 and 2, and £2 for No. 3. Tenders by July 16th for No. 1, July 30th for No. 2, and August 6th for No. 3.

EGYPTIAN MINISTRY OF THE INTERIOR, July 20th.—Centrifugal pumps and electric motors, in connection with water supply works at Minieh. (Reference A.X. 3 230.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 20th.—Phase transformer, for Mangahao electric power scheme, section 184. (Reference B.X. 2 502.)

CAPE TOWN MUNICIPALITY, July 21st.—Electrically driven gravity bucket type coal conveyor, with driving mechanism, etc., for the Electricity Department. (Reference A.X. 3 149.*)

CAPE TOWN MUNICIPALITY, July 21st.—Two water-tube boilers, with stokers, mechanical draught plant and motors.

INDIA STORE DEPARTMENT, August 9th.—Electrical generating plant for the Peshawar power station of the North-Western Railway. (Reference B.X. 2 644.)

STATE ELECTRICITY WORKS, MONTEVIDEO, July 22nd.—Supply or 35 000 electric lamps. (Reference B.X. 2 575.)

JOHANNESBURG MUNICIPALITY, July 29th.—Supply of transformers (contract 647). (Reference B.X. 2 636.)

Power Plant for Luxor.

EGYPTIAN MINISTRY OF THE INTERIOR, August 1st.—Installation of electric power station equipment at Keneh and Luxor for production of three-phase current, 3 300 V, 50 cycles. (Reference B.X. 2 627.)

DEPUTY POSTMASTER-GENERAL, MELBOURNE, August 3rd.—Supply of telephones and dials. (Reference B.X. 2 564.)

STATE ELECTRICITY WORKS, MONTEVIDEO, August 5th.—Porcelain insulators, etc. (Reference B.X. 2 618.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, August 10th.—Dry cells. (Reference B.X. 2 649.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 10th.—Supply of telephone exchange indicators (schedule C. 99). (Reference B.X. 2 597.)

MELBOURNE CITY COUNCIL, August 11th.—Supply of high and low tension three-phase sub-station switchgear (specification No. 810). (Reference B.X. 2 565.)

SOUTH AFRICAN RAILWAYS AND HARBOURS ADMINISTRATION, August 12th.—Supply of cables and wires and bare copper wire during 1927 (tender No. 834). (Reference B.X. 2 639.)

CHILIAN STATE RAILWAYS, August 20th.—Signals, telegraphs, telephones, etc. (group 36); electrical materials for sub-stations, aerial lines and lighting, 1st-zone (group 37). (Reference C. 1 935.) Booklets (in Spanish) numbered to correspond with the group numbers, and giving further particulars, will be loaned to British firms in the order of application.

VICTORIAN ELECTRICITY COMMISSIONERS, August 23rd.—Supply of 10 in. diameter disc suspension insulators, with cotter split pin or similar coupling device. (Reference B.X. 2 614.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 24th.—Synchronous condensers (section 18, Waikaremoana). (Reference B.X. 2 608.)

CITY ELECTRIC LIGHT CO., LTD., BRISBANE, August 27th.—Supply, delivery and erection of one 12 500 kW turbo-alternator. (Reference A.X. 3 085.)

NEW ZEALAND RAILWAYS DEPARTMENT, August 30th.—Supply of slip-ring induction 400 V 50 cycle three-phase motors and starters. (Reference B.X. 2 561.)

DEPUTY-DIRECTOR OF POSTS AND TELEGRAPHS, MELBOURNE, August 31st.—Telegraph equipment (schedule C 109). (Reference B.X. 2 653.)

PERNIK STATE COAL MINES, BULGARIA, September 1st.—Electricity generating plant, consisting of two 4 000 kW steam turbo-generator sets, buildings, etc.

Automatic Sub-Station Equipment,

VICTORIAN RAILWAY COMMISSIONERS, September 1st.—Equipment for automatic control of two rotary converters at Seaford sub-station.

VICTORIAN RAILWAY COMMISSIONERS, September 1st.—Automatic sub-station equipment (contract No. 39 287), for Elwood sub-station. (Reference B.X. 2 598.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 7th.—Synchronous condenser, for Arapuni power scheme, section 165. (Reference B.X. 2654.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 28th.—Three motor-drawn low lift pumps with control apparatus, for Taieri drainage scheme. (Reference A.X. 3 274.)

CHRISTCHURCH (N.Z.) DRAINAGE BOARD, October 19th.—Supply and erection of three sets of electric centrifugal pumping plants (contract 26/329.) (Reference A.X. 3 215.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

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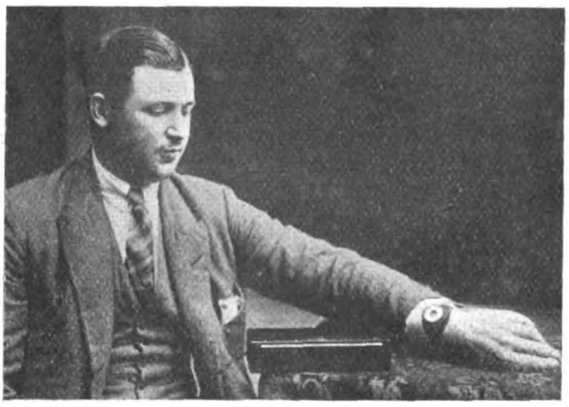
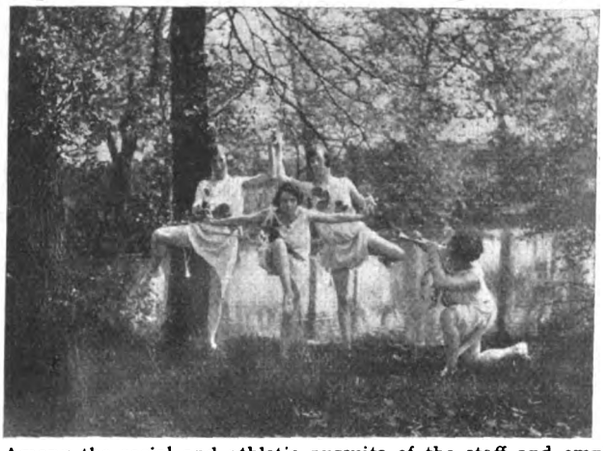
NEWS IN PICTURES

Mr. Andrew Nance, whose death we announced last week, was manager of the Belfast Tramways from 1881 until 1916. Sixty-two years ago he was employed on the preparation of the preliminary plans of the first tramway constructed in Great Britain.



Looking like a wrist watch, the device worn by the inventor (seen above) of an electrical device which is to be used by the German Police for self-defence, is capable of giving any aggressor a severe shock which renders him helpless for several minutes. The battery, normally carried in an inner pocket, is seen on the table.

The late Alexander Graham Bell, the inventor of the telephone, the jubilee of which has just been celebrated by the I.E.E. As illustrating the progress made since Bell's time, this photograph was recently telephoned from San Francisco to New York in 7½ minutes.



Among the social and athletic pursuits of the staff and employees of Siemens Brothers and Co. may be counted the somewhat unusual one—for an electrical firm—of a ladies' physical drill class. While physical fitness is the chief aim, some of the members of this class have specialised in classical dancing in appropriate surroundings. These pictures of a recent display were taken by the Misses Brett and Sheridan.

Tenders Accepted.

MANSFIELD CORPORATION.—G. Hooke and Co., electric wiring of hospital.

STIRLING CORPORATION.—W. and T. Marshall, electrical work at Guildhall House.

REIGATE CORPORATION.—General Electric Co., Ltd., h.t. switchboard, etc., £1 739.

ROCHDALE CORPORATION.—Cargo Fleet Iron Co., Ltd., 100 tons B.S.S. No. 7 tramway rails.

SOUTHEND-ON-SEA CORPORATION.—Chamberlain and Hookham, Ltd., 1 450 current limiters, £1 160.

LEIGH CORPORATION.—Electric Construction Co., Ltd., supply of 750 kW rotary converting plant.

MAIDENHEAD CORPORATION.—British Thomson-Houston Co., Ltd., extension of h.t. switchboard, £315.

EAST INDIAN RAILWAY.—General Electric Co., of India, Ltd., complete equipment of power house at Lucknow.

GREAT HORTON INDUSTRIAL SOCIETY.—Sackville Electrical Co., wiring new branch store at Shearbridge Road, Bradford.

STIRLING CORPORATION.—David Henderson, electric light wiring of 38 houses of the first development of the Drip Road site.

HUDDERSFIELD CORPORATION.—Bould and Sons, electric wiring of workmen's dwellings at Woodhouse Hill, Fartown Green.

DONCASTER CORPORATION.—Bruce Peebles and Co., Ltd., supply and erection of motor converter and switchgear, £5 294 15s. (recommended).

DUNDEE EDUCATION AUTHORITY.—Electric light installations at schools: A. Westwood and Co., Ann Street School, £430 3s.; John Smith, Clepington School, £455 8s. 9d.; John Smith, Dudhope School, £342 7s. 3d.; Quirk and Co., South Road School, £233 18s. 11d.

Business Items.

AN impression appears to have been created that recent financial difficulties would necessitate the closing down of Fuller's United Electric Works at Chadwell Heath. We are glad to be able to state, on good authority, that the business is being carried on as usual under the control of Sir John Mann, as receiver and manager, and that there is no intention whatever of bringing the company's activities to an end.

Marryat and Place have moved from 28 to 40, Hatton Garden, London, E.C.1.

Mr. W. A. Benger, of 102, Albion Street, Leeds, has taken over the Yorkshire representation of the Electrical Apparatus Co., Ltd., of London.

Owing to the expansion of their London business, Higgs Motors, of Witton, Birmingham, have removed to larger offices at 170, Strand, W.C.2.

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ELECTRICITY SUPPLY.

Good Progress with Lanark Scheme—Anomalies in Woolwich Domestic Tariff—Dundee Objections to Electricity Bill Finance.

BURNLEY electricity mains are to be extended in various streets of the borough.

Luton T.C. has applied for a loan of £38 369 for further mains extensions and sub-station equipment.

The consumption of electricity at Derby is to be reduced this week to 50 per cent. of the normal quantity.

Kingston-on-Thames T.C. has had to postpone a proposal for a reduction of charges for electrical energy, owing to the continuance of the coal strike.

Epsom U.D.C. has applied for a loan of £14 500 for the installation of two 300 kW Diesel sets, auxiliary plant, and extensions to the engine room.

Swansea Corporation has decided to apply to the Electricity Commissioners for sanction to a loan of £150 000 for prospective extensions of mains and for house services.

We are informed by the Shoreham and District Electric Lighting and Power Co., Ltd., that a supply of current was inaugurated at Shoreham-by-Sea on June 25th.

Epsom R.D.C. has decided to consent to the application of the Leatherhead and District Electricity Co., Ltd., for an Order to extend the area of supply, subject to certain roads being included in the compulsory area.

Good progress is being made with the new electricity scheme at Lanark. The water-pipes from the Falls of Clyde have been connected to the power station, and it is expected that the supply will be available by next spring.

Rushden and District Electric Supply Co. has secured the consent of the Irchester and Stanwick Parish Councils to its proposal to use overhead distribution lines. Higham Ferrers T.C. has referred the matter to a committee.

Lurgan U.D.C. has received 53 tenders for electrical apparatus in connection with the Council's electric lighting scheme. The Council's requirements include motor-driven pumps, switchboards, and underground and overhead mains.

Shop Lighting Charges.

At a recent meeting of the Council of the Sunderland Chamber of Trade a complaint was made by Sunderland grocers of alleged excessive charges made by the Corporation for electricity for lighting their business premises. A committee was appointed to go into the matter.

Marylebone (London) Electric Supply Committee has authorised the chief electrical engineer to continue engaging at his discretion men formerly employed in the Electricity Department. The question of superannuation and sick pay benefits to men temporarily employed has been referred to the General Purposes Committee.

Fulham (London) Electricity and Lighting Committee has decided that volunteers who were engaged by the Electricity Department during the General Strike are not to be discharged if they are efficient and desirous of retaining their positions. The Committee recommends that the volunteer workers be granted a bonus equal to 50 per cent. on the payment made to them.

South Molton R.D.C. has considered an application by Dr. J. A. Purves for consent to his application for a Special Order to supply electricity in the rural area and also in the borough. For lighting the maximum price will be 10d. per kWh, and the charge for power 4d. per kWh. The Council has referred the proposal to the various parishes in its area for their opinion.

Loughborough Corporation has adopted a scheme for an extension of the electricity mains to Nanpanton and for the laying of a new feeder from the electricity works to supply the energy needed in Nanpanton and the increased demands in the Outwoods Drive and Beacon Road area. The total cost is estimated at £3 450, and application is being made for a loan of £3 850.

Mr. F. L. Ogden, borough electrical engineer, has reported to Oldham Electricity Committee that good progress is being made with the laying of ducts for the e.h.t. supply to Birchinlee Mill, Rayton, and that the laying of ducts for e.h.t. and l.t. mains in Queen's Road, Chadderton, has been commenced. At the Park Mill, Hollinwood, the supply has been changed to alternating current.

Woolwich (London) Borough Council has been informed that some of the Council's tenants who are supplied with electricity at a flat rate of 2d. per kWh, because they have electric cookers, are not using the cookers. Councillor Davis, Chairman of the Electricity Committee, states, however, that so far as the Committee has been able to ascertain, this is only the case in regard to one house. A new tariff is contemplated which will obviate this and other anomalies.

Hackney (London) Borough Council has referred to the Electricity Committee a plea from the Hackney Trades Council for the reinstatement, without victimisation, of the Electricity Department's employees who were locked out during the general strike.—The Electricity Committee has, as an act of grace, authorised the Engineer to arrange for employees who came out on strike and have been re-engaged, to have the annual holiday to which they were formerly entitled.

The Urmston Order.

The Electricity Commissioners have made an Order constituting and incorporating a Joint Board consisting of representatives of Urmston Urban and Barton-upon-Irwell Rural District Councils and authorising the Board to supply electricity in Urmston urban district and part of Barton-upon-Irwell rural district. Copies of the Order can be obtained (2s. each) from the Urmston Council Offices; from Fayster, Waddington and Morgan, 40, Brazennose Street, Manchester; or from Lees and Co., Palace Chambers, Bridge Street, Westminster, S.W.1.

Dronfield U.D.C. has been advised by Col. T. C. Ekin that it is more advisable for Sheffield Corporation to supply electricity in bulk than for the Staveley Co. to do so, on the grounds that the periodicity required is 50 (Sheffield's frequency), whereas the Staveley figure is 30, and that he prefers a maximum demand rate, as quoted by Sheffield, to a flat rate, as quoted by the Staveley Co. The Council has expressed the opinion that a flat rate would be better than the m.d. rate for the first five years and that it would be illogical to agree to a minimum payment of £2 000 when the Council can get one of £1 000. The Council has asked Col. Ekin to use his influence to get Sheffield Corporation to make its offer as attractive as that of the Staveley Co.

At a meeting of Dundee Electricity Committee last week the Electrical Engineer and the Town Clerk submitted a report dealing with the probable effect of the Government Electricity Bill on the Dundee electricity undertaking. It is suggested that if the Carolina Port station became a selected station and the Government required extensions or alterations for meeting national needs it would appear to be unfair to saddle the Corporation with the capital expenditure. If risks had to be run that might bring loss and could not bring gain to the municipality the Government should run the risk. A resolution was passed to instruct the Corporation's representatives on the I.M.E.A. to press for all possible to be done to relieve owners of stations from the risks and costs of carrying out national work.—It is proposed to borrow £14 000 for three sub-stations.

Brighton Plant Extensions.

Brighton Lighting Committee recommends the Town Council to apply for sanction to a loan of £64 966 for additions to the buildings and plant at the Southwick power station. It is also recommended that the borough electrical engineer, Mr. J. C. Christie, should visit the United States to study electricity supply developments there, and particularly in relation to the type of machinery which it is proposed to purchase for Southwick. Mr. Christie has reported that the plant which it is proposed to instal is a new type of steam generator which he has seen under test at the Trafford Park Steel Works, and which is fired by pulverised fuel in such a manner as to produce a very high rate of evaporation. The boiler is not more than one-third the weight or size of others doing the same duty. The Combustion Steam Generator, Ltd., offer to provide the two complete units of the first section of the proposed extension for £44 966, and Mr. Christie proposes to extend the foundations, buildings, etc., for four boilers and coal treating plant, at a cost of about £20 000. The immediate purchase of a 1 000 kW motor-converter and switchgear for the North Road station, at a cost of £10 220 is also recommended.

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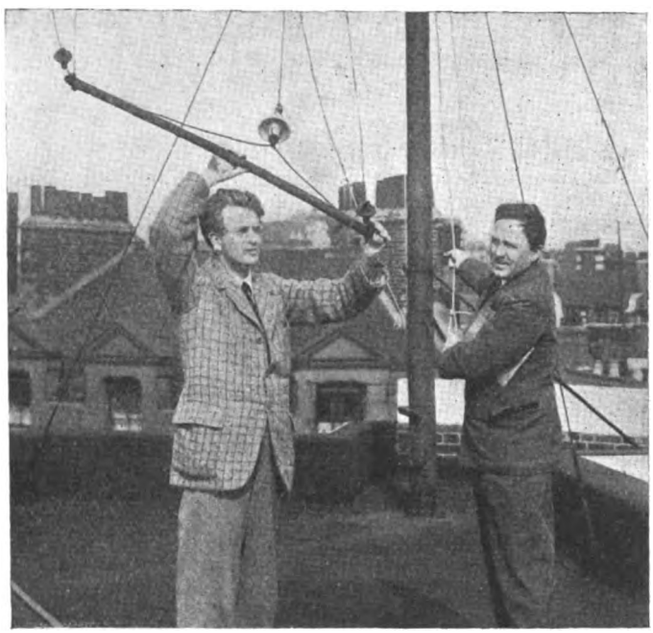
WIRELESS NEWS.

B.B.C.'s First Experiment with Alternative Programmes for Crystal Set Users.

IT is too early yet to decide whether the test carried out by the B.B.C. on Monday night with a view to discovering the possibilities of transmitting two distinct broadcast programmes with the same power from two adjacent stations in one centre, was completely successful. Our own experience, however, may be of interest.

With an ordinary straight circuit "Gecophone" crystal set at Upper Norwood, a representative of THE ELECTRICIAN was able without difficulty to change over at will from the Oxford Street station's programme to that being sent out



Mr. J. L. Baird (left) installing an aerial for use with the "Televisor," described in "The Electrician" last week.

simultaneously from the old Marconi House transmitter. The receiving set was used in conjunction with an indoor aerial and a "Crystavox" loud speaker, which reproduced each of the programmes at normal strength, without any fine tuning with headphones.

At the normal dial setting—in this case 30—the Oxford Street station came through as usual. At 50, 2LO was still fairly strong, but there was a faint trace of the Marconi House programme, while at 60 the two items became merged. When 90 was reached 2LO was completely cut out, with Marconi House at a fair strength. At 100 Marconi House was giving normal results.

If similar results were obtained by a majority of crystal set users, permanent arrangements for alternative programmes of this kind may be made. While such a prospect may not appeal to some radio manufacturers it will be welcomed by the many users of crystal sets, and particularly those who retain the crystal set with loud speaker for the superior reproduction that it undoubtedly gives.

ELECTRIC TRACTION.

IT has been reported to Bury Tramways Committee that the Manchester Road reconstruction scheme has been stopped in consequence of inability to obtain rails.

The L.C.C. and the South Metropolitan Electric Tramways Co. have made arrangements to run through tramcars from the L.C.C. termini to Cricket Green, Mitcham, *via* Tooting Junction. The service should be provided early in the autumn.

The Cannon Street (London) station of the Southern Railway was reopened on Monday, with a service of 36 electric trains between 5 and 11 o'clock in the morning and about 26 between 4.15 and 8 o'clock in the evening. The tracks have been replaced, the platforms reconstructed and the new electric system of light signalling installed. The full service will be introduced on July 11th.

IN PARLIAMENT.

Further Consideration of the Electricity (Supply) Bill.

THE consideration of the Electricity (Supply) Bill by Standing Committee C of the House of Commons has been continued this week.

The Attorney-General moved an amendment to clause 9, on June 24th, to safeguard the position of the railway companies. He explained that the object of the amendment was to make it clear that just as the Government was not taking a railway company's station it was not proposing to alter its frequency in conditions under which it could not be done at present. Under the Railways Act, 1921, the Minister of Transport had power to make orders regarding standardisation, including type, frequency pressure, etc., but before making an Order it had to be referred to a Committee so that interested parties could be heard. The amendment was adopted.

In the course of discussion on the motion for the adoption of clause 9 as amended, the Attorney-General said, in reply to Sir Joseph Nall, that delay in carrying out the standardisation proposed would cause increased expense, and damage the electrical industry. The clause was adopted.

The Committee dealt with clause 10 on Monday. The Attorney-General accepted an amendment, moved by Mr. Thomas Williams, to ensure that a power company should not stop authorised undertakers, who had not a right of veto in their area, getting a supply of electricity direct from the Board unless the power company was itself able and willing to supply on reasonable terms.

The amendment was agreed to without a division.

The Attorney-General said a proposal by Sir Joseph Nall to substitute "and" for "or" in the amendment would mean that although a power company unreasonably refused to supply, an authorised undertaker (unless it happened to have the right of veto) still could not get a supply from the Board.

Sub-section B of the clause provided that the Board should not supply authorised undertakers in a joint electricity authority's area without the consent of the Commissioners.

Col. Moore-Brabazon moved that the consent required should be that of the joint electricity authority. The amendment was agreed to.

The Edinburgh Case.

Mr. MacIntyre moved to add a proviso that the Board should not supply electricity to authorised undertakers in the Edinburgh and the Lothians district without the consent of Edinburgh Corporation. After the war the Corporation, at the suggestion of the Government, erected a super station at a cost of £2 000 000, on the understanding that a large area should be given it to supply.

The Attorney-General, accepting the amendment, said he was reluctant to give what appeared to be special privileges, but he was satisfied that Edinburgh, being unable to find anyone to share its responsibilities, was in the position stated by Mr. MacIntyre. The amendment was agreed to.

On Tuesday the Committee again discussed the provision that where an authorised undertaker demanded a supply of electricity from the Board the latter might impose a condition that such undertaker should take the whole of his supply from the Board. Sir Frederick Hall moved to add that if any such condition were imposed the Board should pay to the undertakers on whom it was imposed a sum representing the capital properly expended on plant and other assets rendered unsuitable by such condition. The Attorney-General said the amendment would compel the Board to buy a station it did not want, and it was negatived. Amendments were accepted that the cost of extra apparatus required in connection with taking a supply from the Board should be taken into account, and that the cost of taking a supply should be calculated over a period of not less than seven years. An amendment moved by Sir Frederick Hall that where undertakers felt aggrieved by the decision of the Commissioners in regard to the supply of electricity they could appeal to some neutral tribunal or court was accepted, the Attorney-General reserving the right of reconsideration on the report stage. Clause 10 having been passed, the Attorney-General accepted a suggestion by Mr. Attlee that the price of electricity fixed by the method set out in subsection 2 of Clause 11 should apply unless the price were otherwise determined by an order of the Electricity Commissioners. Clause 11 was then ap-

(*Concluded on page* 36.)

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COMPANY NEWS.

Dividend Deductions Reduce Many Electrical Share Quotations—B.I.'s in Request—Another J. and P. Advance—Ferranti Preference Improvement.

DIVIDEND deductions make the quotations of many electrical shares this week lower than when we last wrote; and Callender's shares are now quoted at 66s. 3d. ex the share bonus, as compared with 83s. 9d. a week ago. British Insulated's have remained in request, and are half a crown higher at 70s. At 65s. Johnson and Phillips' shares show a similar advance. Ferranti 6 per cent. preference have changed hands at 17s. 9d., an improvement of 1s. 6d. Ericssons have risen 7½d. English Electrics are quoted 7½d. lower at 15s. 7½d., and have been dealt in below that figure. G.E.C.'s were active at one time, but are 9d. lower on the week. Thomson-Houston preference have eased 3d. Metro-Vickers are 7½d. up. Marconi's Wireless have lost 1s. 3d. West Riding of Yorkshire Trams are 3s. down at 11s.

Last Annl. Divd.	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
%	**Electricity Supply.**				
0	Brompton & Kensington Ord.	31/10½	31/10½	45/-	24/-
4	Central Elec. Supp. 4% Deb..	90	90	100	67
15	Charing Cross Elec. Ord. (£1)..	45/7½	45/7½	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/-	17/-	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	48/1½	49/4½	52/6	20/3
6	,, ,, 6% C.P. ..	22/6	22/6	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	58/1½	58/1½	61/3	14/6
6	,, ,, 6% C.P. ..	22/6*	22/6	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	13½	13½	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	32/6	32/6	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	36/10½	36/10½	41/6	8/-
4½	,, ,, 4½% C.P...	17/-*	17/-	18/6	9/6
7	N'castle & Dist. Supp. Ord. ..	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/10½	21/10½	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	21/10½	21/10½	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10*	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord (£5) ..	16½	16	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	44/4½	44/4½	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/-*	17/6	21/6	13/-
8	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
6	,, ,, 6% C.P...	22/-	22/-	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	140*	143	123	24
6	,, 6% Pf. Stk.	110*	112	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69	69	89½	40½
4	,, ,, 4% Deb. ..	80	80	103	56½
4	City & S. Lon. 4% Perp. Deb.	78½	78½	102½	50
5	Lancs. Un.Trans. & Pow. 5% Deb.	97½*	99½	88	60
3½	Lon. Elec. Rly. Cons. Ord. Stk.	52½	52½	73½	10
4	,, ,, 4% Pf. Stk. ..	73½	73½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	77	77	89	65
4	Lon. Un. Trams. 1st Deb. ..	47*	49	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	64½*	66½	101½	49
5	,, ,, 5% Deb. ..	68½	68½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	64½	64½	84½	19
3½	,, 3½ Pf. Stk.	64½	64½	88½	40½
3½	,, 3½% Deb.	70½	70½	92½	51
3½	Met. Dis. Rly. Ord. Stk. ..	53½	54	58	12½
4½	,, ,, 4½% 1st Pref. ..	78½	78½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb.	65*	67	73½	48½
—	Underground Elec. Rlys. Ord.(£10)	3½	3½	5½	21/3
5	Yorks. (W.R.)Trams. Ord. ..	11/-	14/-	27/-	1/-
4½	,, ,, ,, 1st Deb.	72*	74	87	52
	Electrical Manufacturing.				
†3½	Brit. Elec. Transformer 7% C.P.	18/9	18/9	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	70/-	67/6	62/-	26/6
6	,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	22/9	23/-	23/4	19/7½
7	,, ,, 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	26/3*	27/6	29/-	10/-
‡15	Callender's Cable Ord.	66/3	83/9	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9*	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref...	26/3*	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)..	9/9	9/9	28/9½	1/11
7½	,, ,, 1st Pref...	22/6	22/6	26/-	5/-
10	Elec. Construction Ord. ..	31/10½*	32/6	30/4	6/7½
7	,, ,, 7% C.P. ..	23/1½*	23/1½	25/3½	16/-
—	English Elec. Ord.	15/7½*	16/3	29/3	7/3
6	,, ,, 6% C.P... ..	19/-	19/-	21/3	10/6
6	Ericsson Telephones 6% C.P...	21/3	20/7½	21/-	12/7½
6	Ferranti 6% Pref.	17/9	16/3	18/6	16/9
7	,, 7% 2nd Pref... ..	18/-	18/-	19/-	13/9
5	,, 1st Mort. Deb. Stock..	91½	91½	96½	80½
7½	General Elec. Ord.	29/3	30/-	59/-	13/6
20	W. T. Henley's Ord.	77/6*	80/-	86/6	23/3
10	Johnson & Phillips Ord. ..	65/-	62/6	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½*	23/9	27/6	17/6
8	Metro-Vickers Ord.	25/-	24/4½	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	50/-	50/-	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	28/9	28/9	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	28½	28½	56/2/6	19½
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	74*	74½	87½	60
10	Eastern Ord. Stk.	182½	182½	213½	113/2/6
3½	,, 3½% Pref. Stk.	63½	63½	84/17/6	49
4	,, 4% Deb. ..	79½	78½	103½	60
10	Eastern Extension Ord. (£10)..	18½	18½	21½	10/12/6
4	,, ,, 4% Deb. ..	79½	78½	97½	60
22	Gt. Northern Telegraph (£10)..	27½	27½	42/12/6	19
7	Indo-European (£25)	45½	45½	59½	25
15	Marconi's Wireless T. Ord. ..	22/6	23/9	9/16/3	20/9
7½	,, Int. Mar.	21/3	21/3	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	18	17½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	79½	79½	10	60/2/6

† For half-year to June, 1925. * Ex dividend. ‡ Ex share bonus.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—Div. at rate of 7 p.c. per annum, less tax, is payable on 7 p.c. cum. participating pref. shs.

ALTRINCHAM ELECTRIC SUPPLY, LTD.—Pft. for 1925, £29 180, agst. £23 348. To gen. res., £18 639. Divs. 7½ p.c. on ord. and 5s. on def. (1s.) shs.; fwd., £927.

RICHARD JOHNSON, CLAPHAM AND MORRIS, LTD.—Net pft. for yr. to March last £5 262, agst. net loss £7 459, plus £8 080 brt in. Pref. div. £5 143, agst. £3 879; fwd., £8 199, agst £8 080.

CROMPTON AND CO., LTD.—Net pft. for year ended March 31st, 1926, £16 445, agst. £20 136, after provision for depreciation, deb. int., etc., making, with amt. brt. in, £28 372, agst. £21 775. Pref. div. 7 p.c., fwd. £18 521, agst. £11 926.

EASTERN TELEGRAPH CO., LTD.—Div. at rate of 3½ p.c. per annum, less tax, on pref. stk. for quarter ending June 30th, and first quarterly intm. div. of 2½ p.c. on ord. stk., tax free, in respect of pfts. for year ending December 31st, 1926, payable July 15th.

MANILA ELECTRIC CORPORATION.—The board offers to sell stockholders at $33 per sh., 120 000 additional shs. of common stk. without par value, to defray cost of redeeming outstanding $3 419 300 principal amt. of 1st refunding gold bonds, 7 p.c. series, due 1942. Applications by July 20th.

UNDERGROUND ELECTRIC RAILWAYS CO. OF LONDON.—Mtgs. of different classes of shareholders will be held on July 29th to consider proposed rearrangement of share capital which will consolidate existing classes of shs. into one class and abolish present preferential div. rights of £10 ord. shs.

FALKIRK IRON CO., LTD.—Net pft. for year to March 31st, £39 477, making, with amt. brt. in, £62 164. Added to depreciation and gen. res., £16 610 (deb. trust res. not now required), and £7 736, making total £75 000. Blce. div. on ord. and employees' shs., 5 p.c., making 10 p.c., less tax, for year; fwd., £30 506.

CHLORIDE ELECTRICAL STORAGE CO., LTD.—Pft. for year to March 31st, £157 395, after providing for depreciation and taxation. After paying intm. divs. on pref. and ord. shs., surplus is £179 635, including £40 581 brought in. Pref. div. 6 p.c. for year; further div. on ord. shs. 5 p.c., plus bonus 2s. p. sh. To pension fund, £8 000, benefit fund, £2 000, res., £75 000; fwd., £43 331.

Company Meetings.

MEXICAN RAILWAY CO., LTD.—Mr. Vincent W. Yorke, presiding at the recent annual meeting, said the accounts for the last half-year showed a loss of over £10 000. There was considerable depression in business generally during the half-year and there were acute troubles at Vera Cruz which much diminished the traffic of the port. Since the end of January last there had been a marked improvement in the company's affairs. The gross traffics for February and March reached high figures. The total takings for March were the largest in their history, with the exception of three of the later months of 1921.

UNITED ELECTRIC TRAMWAYS OF MONTEVIDEO, LTD.—Mr. George Balfour, M.P., presiding at the annual meeting on Monday, said the gross receipts for the year to October last were £678 100, an increase of £13 438. Operating expenses were £499 808, increase £4 238. The company's petition to be allowed to increase its tariffs had not yet been dealt with by the Senate. The heavy expenditure imposed on the company by various new social laws had been borne for many years to the detriment of the holders of the company's securities. The dividend of 4 per cent. recommended on the ordinary shares compared with 3 per cent. a year ago. For some years before the war they paid a steady 7 per cent.

GLOBE TELEGRAPH AND TRUST CO., LTD.—Sir John Denison-Pender, presiding at the meeting last week, said the figures were once more of a very satisfactory nature. The net income was £337 109, making, with balance brought forward, £338 331, compared with £386 293 in the preceding year. The reduction of income from the investment in the American Telegraph and Cable Co. would continue in future years if the American income tax remained at 12½ per cent. The Great Northern Telegraph Co. had also reduced its dividend by 2 per cent. It was anticipated that by the time the next report was presented the Submarine Cables Trust would have come to an

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end, and the company would receive over £100 000 available to add to capital investments. The Indo. had paid an additional bonus of 1½ per cent., and Western Union dividend was increased by ½ per cent. The net result was a decrease of £1 513, but working expenses decreased £1 430 and deposits, etc., increased £483. They had for the 7th year in succession paid a dividend of 10 per cent., tax free, and had placed £15 000 to reserve and carried forward £50 990.

SEVENOAKS AND DISTRICT ELECTRICITY CO., LTD.—Mr. Carletan F. Tufnell, presiding at the annual meeting last week, said the sale of energy during the past year realised £18 488, and rental of meters £720, against £15 773 and £607, respectively, in the previous year. Profit on contracting was £401 and on trading £50. It was proposed to declare a dividend of 7 per cent. on the ordinary shares, and to carry forward £821, against £635. The company had just instituted a hire-purchase system, which the board felt convinced would bring the benefits of electricity supply within the reach of tenants and owners of smaller premises who had not been able to secure these benefits unaided. Acting on the advice of the Electricity Commissioners, they had approached the power company in closest proximity to their area and obtained from them the terms for a bulk supply. Those terms showed that, under existing conditions, it was much more economical for them to continue to produce electricity at their own station. When the figures were placed before the Electricity Commission they endorsed that view, and they had empowered the company to add to its generating plant.

EDMUNDSONS' ELECTRICITY CORPORATION, LTD.—At the meeting last week the chairman said the new Electricity Bill was more likely to hamper than promote the progress of the industry. The Government proposed to cheapen cost and facilitate distribution by the strange expedient of creating a new set of Government officials to add to the confusion, interference and expense from which the industry was already suffering. Until the Government intervened the industry was making rapid strides towards the attainment of the objects which the Government had in view. The company would continue to press its objections to the Bill, in the hope of modifying some of its worst features. The one sure remedy for most of the disabilities from which the industry suffered was less Government interference. The report submitted at the meeting shows that after providing for income tax and debenture stock charges, the net profit is £84 431, against £74 784, plus £15 160 brought forward. Interim dividends of 3½ per cent. and 3 per cent. have been paid on the cumulative preference and ordinary shares, respectively, leaving a balance of £73 590. It is proposed to place £20 000 to reserve, to pay a final dividend of 3½ per cent. on the preference shares, making 7 per cent., and 5 per cent. on the ordinary shares, making 8 per cent., and to carry forward £19 590.

WHITEHALL ELECTRIC INVESTMENTS, LTD.—Mr. Clive Pearson, presiding at the meeting last week, said the gross income for the past 12 months was £708 522, an increase of £96 000. Net income, after charging interest and providing for income tax, was £456 102, against £324 491. The preference share dividend absorbed £187 500, and the directors recommended a dividend of 2½ per cent. on the ordinary share capital. The balance of £143 602 had been applied in reduction of discount on debenture stock issues and stamp duty. The Compania Chilena in the year ended June, 1925, reached the position of paying 7 per cent. on its preference shares and the Compania Valparaiso paid 4 per cent. A new company was being formed subsidiary to the Compania Chilena, and called the Compania de Traccion of Alumbrado de Santiago, to which the Santiago tramway assets were being transferred, and which would operate the power and light distribution system in Santiago. It was his hope that they might look forward to an era in Chili of increasing commerce and prosperity. As to the operations of the companies in Mexico, the year 1925 was one of steady improvement, the net operating results showing a considerable advance over those of 1924. In Tampico the company, in paying 5½ per cent. on its preference shares, had largely regained its earning position.

New Companies.

PANEL HEATING CO., LTD.—Cap., £1 000. Electrical and general engineers, etc. Reg. office: Clun House, Surrey Street, Strand, London, W.C.2.

J. W. ELLIOTT AND CO., LTD.—Cap., £500. Electrical, radio and general engineers, etc. Director: E. J. Spreadborough, 83, Anson Road, London, N.7.

DUNCAN WHITE (ENGINEERS), LTD.—Cap., £3 000. To acquire business now carried on by H. D. White at Greasbro' Road, Rotherham, as Duncan White and Co., and to carry on business of electrical and general engineers, etc.

IN PARLIAMENT.

(*Concluded from page* 34.)

proved. An amendment moved by the Attorney-General that section 12 should not affect the price charged for any supply of electricity given in pursuance of a contract made before the passing of the Act was agreed to, and clause 12 was adopted.

Progress of Bills.

A Select Committee of the House of Commons last week approved a Bill to confirm a Provisional Order relating to the Leicester Corporation Tramways, and ordered it to be reported to the House. The purpose of the Order is to authorise the construction of a short tramway to serve a new housing estate.

The Committee of the House of Lords considering the Mexborough and Swinton Tramway Co.'s Bill decided on June 18th that clauses 6 and 7, which authorise new tramway routes and the abandonment of another section, should not apply to the parts of the tramway over which running powers were exercised by Rotherham Corporation, except with their consent.

The House of Lords last week agreed to the Hartlepool Corporation (Trolley Vehicles) Bill, and read for the first time the Shropshire, Worcestershire and Staffordshire Electric Power Co.'s Bill.

In the House of Commons on June 24th the Leicestershire and Warwickshire Electric Power Bill was considered and ordered to be read the third time.

Replies to Questions.

The following are points from answers to questions in the House of Commons this week :—

There are 13 000 orders for telephones in ordinary course of completion, which represents under three weeks' work, and in some 800 cases only are applications for service outstanding pending completion of new exchanges or other extensive works.

A wireless receiving licence entitles the licensee to use more than one set of apparatus on premises wholly in his occupation. A separate licence is necessary for apparatus in each tenement or flat in separate occupation.

The expenditure of the Department of Scientific and Industrial Research on fuel research was £48 145 in 1924, and £76 241 in 1925. The expenditure in 1926 is estimated to be from £92 000 to £102 000.

It is doubtful whether any of the existing schemes for low temperature carbonisation have got beyond the experimental stage. Low-temperature carbonisation cannot, therefore, as yet form part of any scheme for the reorganisation of the coal trade.

Metal and Chemical Prices.

TUESDAY, June 29th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£62 0 0	—	5s. 0d.
Electro Wirebars	,,	£65 0 0	—	10s. 0d.
H.C. Wire, basis	per lb.	9 7/16d.	—	1/16d.
Sheet	,,	9 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 1 7/16d.	—	1/16d.
Brass 60/40—				
Rod, basis	per lb.	7½d.	—	—
Sheet, basis	,,	9½d.	—	—
Wire, basis	,,	9½d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£4 4 0	4s. 0d.	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£13 10 0	—	—
Lead Pig—				
English	,,	£31 5 0	—	10s. 0d.
Foreign or Colonial	,,	£29 17 6	—	7s. 6d.
Tin—				
Ingot	,,	£272 5 0	£1 5s. 0d.	—
Wire, basis	per lb.	3s. 5½d.	—	—
Aluminium Ingots	per ton	£120 0 0	—	—
Spelter	,,	£33 2 6	—	—
Mercury	per bottle	£15 10 0	—	—

Sulphur (Flowers)—Ton £11 10 0 *Sodium Chlorate*—Per lb. 3d.
,, (Roll-Brimstone)—,, £10 5 0 *Sulphuric Acid* (Pyrites, 68°)
Copper Sulphate— ,, £25 to £25 10 0 per ton, £6 15 0
Boric Acid (Crystals) ,, £37 *Sodium Bichromate*—Per lb. 3½d.
Rubber—Para fine, 1s. 7½d.; plantation 1st latex, 1s. 8¼d. to 1s. 8½d.

The metal prices are supplied by British Insulated Cables Ltd.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

GOODCHILD AND CHAPMAN, 357, High Road, Wood Green, electrical engineers. £17 5s. 5d. May 1st.

HUGHES, F. Allen, 32, Preston Road, Westcliff-on-Sea, wholesale electrical supplier. £18 19s. 4d. May 11th.

WIRELESS SUPPLIES AND INSTALLATIONS, Town Hall Buildings, Banbury, wireless dealers. £11 9s. 8d. May 10th.

ZENITH RADIO CO., Park Street, Guildford, electrical engineers. £15 1s. May 4th.

Deed of Arrangement.

WALLER, John Dallas, 30, Alexander Crescent, Ilkley, electrical engineer. Filed June 28th. Trustee: A. H. Sharpe, The Chambers, Ilkley, accountant. (Filed by order on terms.) Liabilities, £236; assets, less secured claims, £66.

Receivership.

SUNDERLAND DISTRICT TRANSPORT CO., LTD.—Sir William H. Peat, K.B.E., of 11, Ironmonger Lane, E.C., C.A., was appointed receiver and manager by order of court dated June 18th, 1926, of the undertaking, property, and general assets comprised in the 5 per cent. first mortgage debenture issued by the company.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BIDEFORD AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Registered June 8th, £25 000 debentures (filed under section 93 (3) of the Companies (Consolidation) Act 1908), present issue £20 000, dated May 21st, 1926; general charge. * Nil. June 4th, 1926.

ELECTRICAL TRADING ASSOCIATION, LTD. (late NOTTINGHAM ELECTRICAL CONTRACTORS TRADING ASSOCIATION, LTD.).—Registered June 9th, debenture, to Bank; general charge. *Nil. February 19th, 1926.

HODGES (CECIL) AND CO., LTD., London, E., electricians. Reg. June 1, deb., to bank; general charge. *Nil. June 30th, 1925.

NEWCASTLE-UPON-TYNE ELECTRIC SUPPLY CO., LTD. Reg. June 1st, conveyance (supplemental to trust deed dated May 28th, 1926, etc., securing consolidated 1st deb. stock); charged on property at Front Street, Back Lane, Monkseaton, with plant, etc. *£3 811 058. April 8th, 1926.

RHAYADER ELECTRIC LIGHT AND POWER CO., LTD. Reg. June 4th. £300 mort., to A. G. Richardson, Bryncoed, Rhayader, medical practitioner: charged on property at Rhayader. *Nil. January 28th, 1925.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

ACME PRODUCTION CO., LTD., manufacturers of electrical and wireless appliances, Birmingham. Creditors met recently, at the Queen's Hotel, Birmingham, when the chair was occupied by Mr. T. G. Weavers, of 4, Drapers Gardens, London, E.C., who had been appointed to act as the receiver for the debenture holders. It was stated that the company was registered on May 12th, 1922, with a nominal capital of £3 000, and was formed to take over a business which had previously been carried on in partnership under the style of the Acme Production Co. It was then an electrical engineering concern, but later practically the whole of the attention of those interested was devoted to the radio business. In answer to a question it was stated that no detailed statement of affairs had been prepared. A balance sheet, however, was prepared at the end of last March and it disclosed assets of rather more than £5 000 against gross liabilities of £15 000. From time to time one of the directors advanced various amounts to the company to the extent of about £8 000. In April, 1924, a debenture was issued to a nominee of that director for £3 000, but during the present year the debenture had been transferred to another. In answer to a question it was stated that a receiver was appointed owing to proceedings being commenced by a creditor. It was suggested that a new company should be formed to carry on the business, and that the liabilities should be paid in full out of future profits. The turnover for the fifteen months to March 31st last was approximately £9 000.

The matter was discussed at some length, and the meeting eventually broke up without any resolution being passed.

COMTON WIRELESS MANUFACTURING CO., 26-28, Bartholomew Square, Old Street, London, E.C. At the adjourned meeting of creditors (*Electrician*, 18/6/26, p. 661), Mr. Mortimer, the accountant, reported that since the meeting on June 14th, the sheriff had sold stock by auction which had been seized under an execution. The stock so sold had realised £366, whilst there was other stock to the value of £50, making a total of £416. After allowing for costs, etc., the assets were estimated to realise approximately £400, and there were liabilities of £2 600. Mr. Mortimer added that unless the execution creditors were prepared to withdraw and instruct the sheriff to refund the money obtained from the sale of the stock there would be no alternative to the matter being dealt with in bankruptcy. He was instructed to state that if that course was agreed upon the assets would be distributed pro rata amongst the creditors, and in addition funds would be available to pay a further 1s. in the £ to the creditors. The matter was discussed at some length, but the meeting eventually broke up without any resolution being passed.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Bankruptcy Information.

GEORGE AND GEORGE (a firm), 434, Market Place, Broughton. Salford, electrical contractors. Receiving order, June 24th, Creditor's petition.

McMULLINS, Charles, 9, Tanygroes Street, Port Talbot, Glamorgan, electrician, etc. Receiving order, June 22. Debtor's petition.

PACY, Alexander, PACY, Jack, and FEITELSON, Raphael, trading as the COMPTON WIRELESS MANUFACTURING CO., 26-28, Bartholomew Square, Old Street, E.C.1. Receiving order, June 23rd. Debtor's petition. First meeting, July 7th, 11 a.m., and public examination, July 27th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

Notice of Intended Dividend.

BATE, Douglas Clavell, 16, John Dalton Street, Manchester, electrical supplier. Last day for receiving proofs, July 7th. Trustee, J. F. Warburton, 28, Queen Street, Manchester.

Bankruptcy Proceedings.

GREENALL, William Hampton, trading as HAMPTON ELECTRIC CO., Newerne Street, Lydney, electrician. The public examination of this debtor was held on June 22nd at the Town Hall, Newport, Mon. The statement of affairs showed liabilities of £472 against assets of £65, a deficiency of £407. Debtor attributed his failure to paying trade union wages and not getting the value for his money. The examination was closed.

MELLOR, Geoffrey, 59, New Oxford Street, London, W. Described in the receiving order as an employee in the service of a limited liability company, the debtor formerly carried on business as an agent for the sale of wireless apparatus. According to his statement of affairs the debtor owes £450 and he values his assets at £379, doubtful book debts of the face value of £2 020, and bad debts £265, being estimated to produce only £319. After serving in the Army during the war the debtor carried on business in partnership as a general merchant in the City. In November, 1924, he began business by himself as an agent for the sale of wireless apparatus at Vernon House, Sicilian Avenue, E.C. He traded under the style of "Mellor" until August, when he closed the business. From the previous February also until August last he carried on business in partnership with another person as manufacturers' agents, first at the last-mentioned address but afterwards at 2, Lisle Street, W.C. The debtor afterwards acted as a director of a limited company until its voluntary liquidation in February, and he has since been employed as manager to a limited company engaged in dealing in wireless apparatus, his salary being £10 a week. The debtor attributes his insolvency to his inability to collect moneys owing to him.

NICHOLS, Charles James, trading as C. J. NICHOLS AND CO., 7, Park Street, Bridgend, Glamorganshire, electrical engineer. At his public examination this debtor, whose statement of affairs showed a deficiency of £1 308, said that creditors had been pressing him for about two years. He admitted that he had continued trading after he was aware of his position, but he hoped that matters would improve. He commenced business in Brigdend in 1920 with £40 capital; competition had been very keen, and he had been obliged to estimate for work at low figures. His largest contract had been for £2 158, and he had lost money on it.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Applications for Patents.

May 25th.

13 230 Telefunken Ges. fur Drahtlose Telegraphie. Means for obviating interference in wireless telegraphy, etc. (23/5/25, Germany.)
13 207 Wired Radio, Inc. Polyphase high frequency current generator. (27/10/25, U.S.)

May 26th.

13 312 Callender's Cable and Construction Co., Ltd., and C. W. Kay. Catenary suspension systems for electric conductors.
13 368 C. J. V. Fery. Electric storage batteries.
13 307 E. Hill. Plug and socket connections.
13 360 W. D. Horsley, D. MacFarlane, Sir C. A. Parsons, and J. Rosen. Dynamo electric machines.
13 369 E. C. R. Marks (Lorenz Akt.-Ges.). Connection systems for branch telephone plants.
13 370, 13 371 E. C. R. Marks (Lorenz Akt.-Ges.). Automatic telephone plants.
13 365 E. C. R. Marks (Munning and Co.). Anode.
13 345 F. K. Moore. Electrical control of headlights.
13 385 L. N. Reddie (Pirelli and Co.). Electric cable systems.
13 288 D. A. Stevenson. Apparatus for wireless communication.
13 383 H. Wade (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). Device for converting electric oscillations into mechanical vibrations.
13 384 H. Wade (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). X ray tubes.

May 27th.

13 431 A. Barringer and Ormsby and Co., Ltd. Wireless tuning apparatus.
13 432 A. Barringer and Ormsby and Co., Ltd. Wireless high frequency transformer.
13 433 British Thomson-Houston Co., Ltd. Electric control systems. (27/5/25, U.S.)
13 452 W. E. Buck, T. de Calmer and Mail Motors, Ltd. Electric motors, etc., for wind screen wipers, etc.
13 438 L. J. J. B. Cheneau. Electric indicators. (19/6/25, Belgium.)
13 417 J. H. Deas. Aerials.
13 398 W. H. Duffett. Machinery for generating undirectional electricity.
13 420 J. C. Gibson, D. E. E. Hoare, G. R. Hoare, H. J. Hoare and F. Sanna. Electromagnetic massaging, etc.
13 443 Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). Electric heaters. (4/12/25.)
13 458 Liverpool Electric Cable Co., Ltd., and T. H. Tweedle. Insulated electric conductors.
13 477 Maschinenfabrik Esslingen. Dynamo electric machines. (28/5/25, Germany.)
13 459 Naamlooze Vennootschap Machinerieen en Apparaten Fabrieken. Means for compensating forces in voltage regulators. (27/5/25, Germany.)
13 441 J. T. Nichols. Wireless coils and coil-holders.
13 480 H. Rottenburg. Electrical plugs and sockets.

May 28th.

13 520 Crompton and Co., Ltd., and C. W. Major. Cooling and ventilation of dynamo electric machines.
13 610 E. E. Dutt and D. H. Macpherson. Electric cells.
13 556 O. Y. Imray (Gamewell Co.). Repeaters for signalling circuits.
13 527 Metropolitan-Vickers Electrical Co., Ltd., and T. W. Ross. Electric protective relays.
13 549 O. Muck. Electric generating sets.
13 606 Standard Telephones and Cables, Ltd. (Deakin). Telephone systems.
13 493 A. G. Westmoreland and S. Wiseman. Portable electric lamps.
13 522 S. J. Williams. Manufacture of accumulators, etc.

May 29th.

13 657 Eastern Telegraph Co., Ltd., and W. G. R. Jacob. Electric telegraphy.
13 634 H. E. Humphries, Siemens Bros. and Co., Ltd. Automatic telephone systems.

June 10th.

14 685 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Device for adjusting caps and bulbs of electric lamps, etc. (12/6/25, Holland.)
14 618 G. R. Sankey and J. Sankey and Sons, Ltd. Method of ascertaining electric losses in ferric metal sheets.
14 600 C. Sylvester. Electric lighting unit for illuminating roads.
14 603 G. F. Teasdale. Electric alarm switch.
14 602 M. Wilson. Transmission of wireless waves.

June 11th.

14 763 H. H. Berry. Reflectors for electric fires, etc.
14 795 S. G. Brown. Electric make-and-break devices.
14 755 H. A. Carney and Young, Osmond and Young, Ltd. Electric heating apparatus.
14 714 S. Hausford and L. J. Norton. Electric switches.
14 712 J. R. Kay. Variable electric condensers.
14 808 H. F. Loveland. Folding carrier for electric accumulators, etc.
14 786 A. Preen. Variable electric condensers.
14 723 A. J. Price and A. G. Salter. Electric timepiece.
14 709 W. M. Rolph. Portable wireless apparatus.

June 12th.

14 837 T. S. Andrew, B. H. Leeson and A. Reyrolle and Co., Ltd. Thermostatically-operated relays, etc.
14 861 C. R. Belling. Electric heating, etc. apparatus.
14 867 W. J. Cole and Telegraph Condenser Co., Ltd. Electric condensers.
14 847 International General Electric Co., Inc. Electric condensers. (13/6/25, Germany.)
14 817 F. T. O'Hanlon and D. Small. Electrical terminal pins.
14 855 Pirelli and Co. Joints for electric cables. (11/7/25, Italy.)
14 849 Standard Telephones and Cables, Ltd. Electron discharge devices.

June 14th.

14 924 A. H. Barker. Electrical heating apparatus.
14 948 Burndept Wireless, Ltd., and P. K. Turner. Frame, etc., aerials.
14 891 A. Ford-Lloyd. Galvanic batteries.
14 890 Lodge-Cottrell, Ltd. Apparatus for electrical precipitation of suspended particles from gaseous fluids.
14 956 F. Newton. Regulators for dynamo electric machinery.
14 955 H. D. Pattinson and Seal Co. (London), Ltd. Electrolytic apparatus.
14 927 Westinghouse Electric and Manufacturing Co. Electron emitting cathodes. (23/7/25, U.S.)
14 879 G. Wilkinson. Starting gear for electric motors.
14 895 C. B. Winzer. Time switches for electric circuits.

June 15th.

15 094 G. A. Anderegg and Western Electric Co., Inc. Loaded conductors.
15 027 British Thomson-Houston Co., Ltd. Systems of electric distribution. (25/6/25, U.S.)
15 028 British Thomson-Houston Co., Ltd. Power systems. (18/6/25, U.S.)
15 010 Hanovia Chemical and Manufacturing Co. Alternating-current vapour-electric devices. (23/2/26, U.S.)
15 041 C. L. Lipman, Nalder Bros., and Thompson, Ltd. Electric measuring instruments, etc.
15 068 J. Lucas, Ltd., and E. O. Turner. Magneto electric machines.
15 093 W. E. Mougey and Western Electric Co., Inc. Loaded conductors.
15 066 G. Old. Electric percussion tools, etc.
15 050 J. Rowell. Radio amplifiers.
15 035 L. G. Salmon and Siemens Bros. and Co., Ltd. Electric resistances.
15 060 Siemens-Schuckertwerke Ges. Electric rectifying plant. (16/6/25, Germany.)
15 073 M. Simsinovici. Insulating, etc., device for dry cells, etc. (8/5/26, France.)
15 058 Standard Telephones and Cables, Ltd. High frequency electric signalling.
15 036 F. Turner. Torsion meters.
15 087 X Rays, Ltd. Apparatus for X-ray photography.

June 16th.

15 160 C. B. Backer. Electric flat irons.
15 161, 15 168 C. B. Backer. Electric heaters.
15 175 British Thomson-Houston Co., Ltd. Photo electric systems. (19/6/25, U.S.)
15 174 B. Davies. Electro-medical apparatus.
15 159 D. R. Davies, Metropolitan-Vickers Electrical Co., Ltd. Electrical switchgear.
15 142 General Electric Co., Ltd., M. S. H. Hunt and A. Kinnes. Electric control systems.
15 154 W. T. Henley's Telegraph Works Co., Ltd., and C. A. Walker. Drums for electric cables, etc.
15 132 B. Hesketh. Mounting of electric inductances.
15 126 C. B. Jerred and J. G. Newey. Apparatus for electro-deposition of metals.
15 157 G. A. Juhlin and Metropolitan-Vickers Electrical Co., Ltd. Dynamo electric machines.
15 190 M. N. Leibowitz and S. Ruttenberg. Electric resistances.
15 155 Metropolitan-Vickers Electrical Co., Ltd., and C. Ryder. Electric control apparatus.
15 158 Metropolitan-Vickers Electrical Co., Ltd., and R. Townend. Ventilation of dynamo electric machines.
15 167 L. H. Reid. Coupling electric wires, etc.
15 111 W. Rogers and Wingrove and Rogers, Ltd. Variable condensers, etc.

June 17th.

15 313 Automatic Telephone Manufacturing Co., Ltd., and T. H. Turney. Telephone systems.
15 214 R. Bosch Akt.-Ges. Combined automatic switches and voltage regulators. (11/9/25, Germany.)
15 293 J. Brettmon. Electric current switches. (17/6/25, France.)
15 203 British Thomson-Houston Co., Ltd. Electro responsive devices. (22/6/25, U.S.).
15 222 F. Creedy. Dynamo electric machines.
15 289 A. P. C. J. E. L. Fernandez and S. P. Vazquez. Dynamo electric machines.
15 227 C. W. Marshall. Thermionic valves.
15 265 A. Mathisen. Thermionic valve holders.
15 286 Metropolitan-Vickers Electrical Co., Ltd. Alternating current distribution systems. (27/6/25, U.S.)
15 298 W. G. Patterson and Siemens Bros. and Co., Ltd. Telephone systems.
14 948 C. F. Phillips. Frame, etc., aerials.
15 219 H. B. Prentice. Quick make-and-break switches.
15 304 E. Rosenberg. Continuous current generators. (22/6/25, Austria.)
15 279 Standard Telephones and Cables, Ltd. Radio signalling systems.
15 280 Standard Telephones and Cables, Ltd. Loading of telephone transmission lines.
15 217 A. Tullet. Adjusting means for electric lamps.
15 254 L. J. Wakeman. Fitting electric immersion heating elements in boiler walls, etc.

June 18th.

15 392 Albo Kupplung Ges. Apparatus for starting electro motors. (18/6/25. Germany.)
15 419 G. Bainbridge and T. W. Moore. Ring nuts, etc., for electric lamp holders.
15 377 British Thomson-Houston Co., Ltd. Electric switches.
15 404 S. W. Russell and R. H. Dent. Telephone receivers.
15 405 S. W. Russell and R. H. Dent. Electric switch combined with telephone receiver.
15 386 R. I. Denham and W. D. Sell. Wireless aerials.
15 387 R. I. Denham and W. D. Sell. Wireless apparatus.
15 412 O. D. Edmonds. Electric earthing switches.
15 431 Felten und Guilleaume Carlswerk Akt.-Ges. Armouring for electric cables. (10/10/25, Germany.)
15 395 E. A. Graham and L. H. Paddle. Telephone transmitters.
15 378 International General Electric Co., Inc. Dynamo-electric machines. (22/6/25, Germany.)
15 413 L. Mellersh-Jackson. Circuit interrupters.
15 422 C. H. Lauth. Electric cooking apparatus, etc.
15 406 Marconi's Wireless Telegraph Co., Ltd. Wireless telegraphy, etc. (10/6/25, U.S.)
15 392 K. Obermoser. Apparatus for starting electro motors. (18/6/25, Germany.)
15 349 L. H. Paddle and W. J. Rickets. Telephonic apparatus.
15 325 B. M. Peel and H. J. Peel. Inductance coils.
15 380 J. Robinson. Apparatus for smoothing ripples in electric conductors.
15 322 F. G. Warbrook. Reduction gears for electric condensers, etc.
15 332 E. Whiteley. Electric switches, etc.
15 366 F. C. Withrich. Manufacture of electric stove discs.

COMING EVENTS.

A Diary of the Chief Electrical Arrangements for the Week.

Monday, July 5th.

Electrical Contractors' Association (Derby Branch).—Ordinary meeting.

Wednesday, July 7th.

Electrical Contractors' Association (London Branch).—Ordinary meeting.

Electrical Contractors' Association (Southern Section).—Ordinary meeting.

The Polytechnic (Electrical Engineering Department).—309, Regent Street, London. Lecture VI. on "The Thermionic Valve and Its Uses in Wireless Circuits," by Capt. W. H. Date. 6.30 *p.m.*

Thursday, July 8th.

Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.

Second British Electro-Farming Conference.—Royal Agricultural Society Show Stand. 12 *noon.*

Electrical Contractors' Association (East Yorks Branch).—Metropole Hall, Hull. Ordinary meeting. 3.30 *p.m.*

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HYDRO-ELECTRIC POWER.

IT is no exaggeration to say that hydro-electric power is a potent factor in the present serious situation in the coal industry. For though it is a platitude that electricity has revolutionised modern life, many electrical engineers do not realise the extent to which electricity has enabled water power to be developed so that the supremacy of coal no longer exists. The advance is really staggering, and of course has only been rendered possible because a large amount of energy in a given spot can be distributed by means of a network of wires almost to any distance. According to the United States Geological Survey, the potential inland horse power of the world, based on conservative figures of 70 per cent. of the normal output for 70 per cent. of the 24 hours, is 453 000 000 H.P., of which 190 000 000 H.P. is in Africa, the drainage area of the Congo representing the greatest of all sources of energy. At the end of 1921 the world's output of water power was 23 000 000 H.P., while in 1923 this had become 29 000 000 H.P., and to-day the figure is over 35 000 000 H.P. The rate of advance is therefore enormous, being, for example, 26 per cent. between 1921 and 1923.

No matter, therefore, what may happen as regards hours, wages or district agreements, it will be impossible for British coal to compete indefinitely with water power. The export trade to foreign countries, apart from steamships—averaging about 45 000 000 tons per annum based on a number of years—is therefore bound to be seriously reduced. In fact, to be on the safe side, we ought to regard it as lost in the immediate future. If therefore the coal industry cannot carry on to-day without heavy subsidies, the position will be still more hopeless as the export trade continues to decline, both 1925 and 1926 being bound to show a heavy slump.

That this must be the case is well indicated by taking the water power figures for Europe, the chief customer for British coal. In 1921 Europe had 8 877 000 H.P. at work from water, but by 1923 this had increased to no less than 12 300 000, that is, over 40 per cent., much more rapidly that is than in the United States and Canada, where the figures in 1921 were 12 210 000 H.P. and in 1923 13 700 000 H.P. The huge developments in the use of electricity because of water power in many different countries of the world are in fact almost incredible. Thus in 1923 Japan was generating 1 694 000 H.P. by water and France 2 100 000 H.P., whereas in 1921 the figure for France was 1 400 000 H.P. Every possible attempt is being made by the latter country to render herself independent of foreign coal and liquid fuel, and certainly to-day well over 2 500 000 H.P. is being obtained from water, so that we can regard the coal trade with this country as almost lost, while the same is beginning to apply to Italy. Further, it may be mentioned that some time ago there was opened up the River Barberine hydro-electric plant in the Canton of Valais, which will practically render Switzerland independent of imported coal.

Almost everywhere the same story is to be told, and in the Fifth Annual Report of the Federal Water Power Commission of the United States it is stated that during the five years of the Board's existence since the Water Power Act came into force in 1920 applications have been filed in America for water power projects totalling 24 000 000 H.P., and in this same period plant aggregating 2 646 000 H.P. has been set at work, representing 83 different schemes. In the year 1925, for example, there was put into service 1 500 000 H.P., and orders were received for water turbines and similar machinery to the extent of 1 000 000. The developments in Canada are almost as remarkable. In 1925 600 000 H.P. was set at work, including the Quebec Development Co.'s huge scheme of 400 000 H.P. at Isle Maligne on the Saguenay River near Quebec. This comprises eight 50 000 H.P. turbines. Further, it may be stated that the ninth unit of 58 000 H.P. was installed at the Queenston plant by the Hydro-Electric Power Commission of Ontario at the Niagara Falls.

Water power turbines to-day are of enormous size. There is now, for example, on order in America a 40 000 H.P. impulse turbine for Brazil, in which country also rapid developments are now commencing, the total power in operation in 1923 being 450 000 H.P. Brazil has immense potential water power reserves estimated at 25 000 000 H.P., and one of the most important schemes is the Parahyba, for the supply of electricity to Rio de Janeiro.

It is almost impossible to keep track of all the developments, but one of the most recent typical American medium-sized hydro-electric installations is the Catawba River scheme in South Carolina, for the Southern Power Co. of Carolina, on a site 20 miles south of the town of Charlotte. This is of 75 000 kW capacity, and comprises four Allis-Chalmers vertical single-runner Francis type turbines, operating at 70 ft. head at 100 lb. per min., driving General Electric alternators of 19 750 kW each.

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Further with regard to Canada, it may be stated that in April last the Ontario Hydro-Electric Power Commission completed an agreement for the ultimate delivery by the Gatineau Power Co. of 230 000 to 260 000 H.P., the transmission lines alone being 230 miles in length and costing 10 000 000 to 15 000 000 dollars. The first 80 000 H.P. is to be ready in 1928, the site being on the Gatineau River at Chelsea and Farmers Rapids, near Ottawa.

To-day, hydro-electric plants are at work from all heights of 7 ft. to 3 000 ft., and obviously they have very many advantages, being clean and efficient. Their wear and tear, maintenance and labour costs are small, and they give no trouble with dust, smoke, ash and clinker. More important still, they represent a steady and safe investment, much more so in fact than the steam-driven electricity station, and equal to irrigation schemes, which are also rapidly becoming one of the most important fields of engineering work.

The situation with regard to the British coal industry will be still further complicated by the fact that sooner or later we shall have to develop our own water power resources, not only of the inland type, but more particularly in the estuaries of rivers. The Severn in this respect is one of the most favourable sites in the world, while there are great possibilities in many other places, especially the Walney Channel at Barrow-in-Furness and the Menai Straits. The remedy for Great Britain seems to be to develop her own resources, and particularly to carbonise her rich bituminous coal and extract from it all the valuable by-products, including, above everything else, the production of liquid fuel for Diesel engine operation. In fact the developments in hydro-electric power on the Continent may easily prove to be a blessing in disguise if they prevent us from selling our precious coal as mere fuel and cause us to turn our attention definitely to more scientific methods both in winning and utilising coal.

Current Topics.

The Electricity Bill

DRRING the past week much better progress has been made with the Electricity (Supply) Bill, and 26 clauses out of 40 have now emerged with or without change from the examination by the Standing Committee. It is perhaps a little early to prophesy in what form the Bill will return to the House, but a number of the amendments that have been made are also improvements. This is due to the accommodating attitude of the Government, and especially the ATTORNEY-GENERAL, towards the large number of useful suggestions. This attitude makes it the more regrettable that a few members should have formed themselves into a sort of junta whose object is to maintain the *status quo*. Their policy in furtherance of this object has been to bring up the same sort of wrecking amendment over and over again, and the inevitable result has been delay. The probability therefore is that the final stages of the Bill will not be reached until the autumn session, and it is by no means impossible that, owing to lack of time a measure, which will mean subsequent legislation, will be rushed through. We have had one example of this in the 1919 Act, and no one wants another. Is it too late, therefore, to ask the obstructionists to hold their hands? They are not acting in the true interests of the industry. Some mention may be made of recent amendments. Clause 13, which deals with the limitation of price that may be charged by the Board to owners of selected stations, has been made applicable only to existing and not to future selected stations, and undertakings have been given the privilege of taking electricity from the Board at the price at which they could generate it for themselves indefinitely, and not for seven years only. On clause 14 an amendment was moved giving the Board power to close uneconomic stations instead of only "freezing" them out, and this was accepted after an interesting speech by the ATTORNEY-GENERAL. This is a real improvement, as it substitutes positivism for negativism.

Removing Trading Obstacles.

IN the work of getting back to normal trading conditions the world's business men are obviously fitted to play a leading part. It is therefore of interest to hear the views of this class as expressed at the Paris meeting of the Central Committee of the International Chamber of Commerce. They emphatically deplore the influence of unhealthy national finance on international trade, and call attention to the dangers caused by tampering with a nation's normal financial position and its tendency to set up feverish activity, leading more often than not to a disastrous reaction. Other matters to which the business men draw attention include the need for the removal of obstacles to easier transport of goods; the sudden changes to which ruling tariffs are said sometimes to be liable; the lack of uniformity and clear definition in tariffs and Customs classifications, and inequality of treatment between nationals and foreigners. These and other related questions are to be investigated by a series of sub-committees with a view to helping those in authority to speed up the machinery of international trade. The advice of such men may not be lightly disregarded, and that they are prepared to give it is a sign full of hope and encouragement for all traders.

A Title for Contractors.

OUR offer to award a prize of £5 5s. to any reader of THE ELECTRICIAN who suggests a suitable descriptive name for an electrical contractor has already aroused a good deal of interest, though the bulk of the suggestions that we have so far received will not receive the universal commendation that is needed for the general adoption of a "coined" word. As the result of a similar effort, made some time ago in the U.S.A., the title "electragist" was evolved and taken into use, but it is felt that a better word could be found for use in this country. As we stated last week, THE ELECTRICIAN is willing to receive suggestions—which will be forwarded to the National Register of Electrical Installation Contractors—and to award a prize of £5 5s. for the title that is officially adopted, provided that it is thus received and forwarded by us. There is no limit to the number of attempts that may be submitted, but each suggestion should bear the name and address of the inventor.

Tit for Tat.

IN most localities during the general strike the electricity supply was menaced from one flank only. The chief engineers and their staffs were, therefore, able to carry on, either with or without the aid of volunteers, but at any rate with the support of their committees or directors. In a few places, however, there was a menace on both flanks, for, in addition to the defalcation of the workmen, those in authority either actively or passively threw in their lot with the strikers. The outward and visible sign of this policy was generally that a supply was only given at night time, or under restrictions which varied with the taste and fancy of those concerned. This discrimination was, of course, illegal, and it is not surprising to learn that industrial users have under consideration the institution of proceedings for breach of contract. In the meantime, however, the Privy Council has taken action. Walthamstow was a district where the responsibilities of the local authority were taken lightly during the general strike. It omitted to recruit volunteers for the maintenance of essential services, and did, it is alleged, as little as possible to carrying out the emergency regulations. In addition, the electricity supply was, under menaces, cut off from the majority of factories in the area, and a contract for a supply of electricity in bulk to Leyton was broken. Unfortunately for Walthamstow, however, it has recently petitioned for a charter of incorporation, and a reply has now been received from the Privy Council postponing further

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action in the matter "on account of deliberate neglect of the local authority to do its duty during the general strike." The punishment, if not altogether and logically appropriate, is certainly poetic, for a local authority which thus fails in its duty can hardly expect to receive promotion. What will make the refusal all the harder to bear is that Leyton and Ilford are both to become boroughs next November.

Esperanto and Technical Literature.

AT the first International Congress of the Technical Press which was held in Paris last October, a resolution was passed suggesting that Esperanto should be used in the technical Press for drawing up summaries of the articles which appear in the columns of various papers. We have been asked what steps we have taken to put this resolution into force in THE ELECTRICIAN, and having quite an open mind on the subject we invite our readers' opinions on the matter. The real difficulty about translation is that if it follows the original closely it results in an inferior article. If, on the other hand, it is a paraphrase in a different language, though the quality may not suffer, the result is not strictly speaking a translation. An author not only writes in a language but thinks in it, and it is the latter process which it is difficult to translate. The difficulty is rather increased than diminished when a so-called universal language like Esperanto comes up for consideration. Esperanto by its nature is not a vehicle of thought, and from the literary standpoint translation into it may cause a serious reduction in quality. Perhaps in the case of the summary of a technical work this matter is not of great importance, always providing that a mere indication only is given of the contents of the original article. We had written thus far when we received the letter from Mr. T. A. SOUTHERN which appears elsewhere in this issue. He takes a statement that we made some time ago, and attempts to employ it as an argument in favour of the universal use of the metric system. There is in reality little similarity between a language and the metric system. One is hard to learn and still harder to use, not necessarily correctly, but as a native uses it, while the other is comparatively easy. Everyone from their birth is "runeised" in some language, generally not more than one, and uses it more or less unconsciously, no matter what other languages may be learnt in later life. A system of weights and measures is nothing more or less than a useful tool. Our objection to Esperanto is that it is not a natural but an artificial language.

Electricity in Manchester.

MR. H. C. LAMB is to be congratulated on the result of his first year's stewardship of the Manchester Electricity Undertaking. During the year ended March 31st, 1926, 387 008 090 kWh were generated, or 50 000 000 kWh more than in the previous year. The total quantity sold was 300 440 765 kWh. The total maximum demand was 136 110 kW, excluding the supply from batteries. All these figures form records which we have no doubt will speedily be beaten. On the other hand, the income fell about £19 000 on a total of £1 426 238, while the working expenditure increased by about £22 000 on a total of £789 314, in spite of the fact that the price of the 283 320 tons of coal consumed was 2s. 6d. less than last year. Considerable extensions were made to the sub-station plant, principally for dealing with the supply from Barton, and it is hoped that now the difficulties with the transmission system have been overcome more use will be made of this important station, which is now one of the most efficient generating stations in the world. Some changes have been made at Stuart Street, where an air preheater of the plate type has been introduced on one boiler, thus increasing its efficiency by 6 per cent. Great and increasing energy is being maintained in building up the domestic load in Manchester, and it cannot be gainsaid that the results amply justify the work.

A Glossary of Electrical Terms.

THE electrical vocabulary has grown so rapidly that the necessity for making an effort to secure that the meanings of the terms used are, as far as possible, permanently retained is urgent, and we, therefore, welcome the authoritative glossary of electrical terms and definitions which has just been published by the British Engineering Standards Association. The appearance of this work, the preparation of which was begun twenty years ago by the I.E.E., is an event of some significance. It represents the co-operative effort of a very wide circle of committees and engineers, and the editing committee, consisting of Lt.-Col. K. EDGCUMBE and Mr. C. C. WHARTON, have had a stupendous task. Not only had they to satisfy the individualists' outlook, but frequently there was the still harder task of getting committees to agree. It is gratifying to note that the glossary, further details of which are given on another page in this issue, has been adopted by the International Electrotechnical Commission as the basis for the arrangement of an international glossary which is now in course of preparation by that body.

A Modern Electrodeposition.

MR. S. FIELD presented a useful survey of progress in electrodeposition in an address recently given before the Electroplaters' and Depositors' Technical Society at the Northampton Institute. He remarked that the accomplishments of to-day were not dreamed of a few years ago, yet we seemed to be on the eve of even greater developments. All these advances are based on the original researches of FARADAY. Processes of electrodeposition are numerous and include (1) methods of extraction, (2) refining and (3) adaptation. The last group comprises electroplating and electrotyping and processes of manufacture and repair. Recent advances have been concerned largely with addition agents and the development of new processes, such as those involved in the deposition of tin, lead, iron, cobalt, cadmium and chromium. There have been many new applications—the copper matrices for moulding gramophone records form one example; others include the production of copper wire, the use of deposited copper to prevent carburisation and the deposition of iron and nickel in the repair of worn-out machinery. There is room for much further research. The properties of deposits require closer study, and then there is the long sought for "acid brass." The ever-present problem of spotting out, the use of inert susbtances in solutions, the absorption of deposits by die-casting metals—all these are problems on which more information is desired. The Department of Scientific and Industrial Research is now assisting no less than 21 industrial research associations, and has on hand much research work on electrodeposition. This is also a field where the benefits of standardisation might be very considerable—as has already been exemplified in the case of steel sections, to which the standards framed by the B.E.S.A. have been applied, with a resultant cheapening in the cost of production.

G.E.C. Progress.

THE General Electric Co.'s accounts for 1925 show that the company's net profits have not only increased progressively for four successive years but have also established a new high record, the figures being considerably in excess of those for the "boom" years of 1919-20 and 1920-21. Such a result shows that expansion does not necessarily depend on conditions of abnormal prosperity and that the will to progress frequently tends to cancel out the normal reactions of a general trade depression. While the year's results were sufficiently good to have permitted an increased distribution to shareholders it is explained in the directors' report that the existing unsettled industrial conditions render the time inopportune for initiating a higher dividend policy. The resumption of normal trading conditions may herald a change in this direction.

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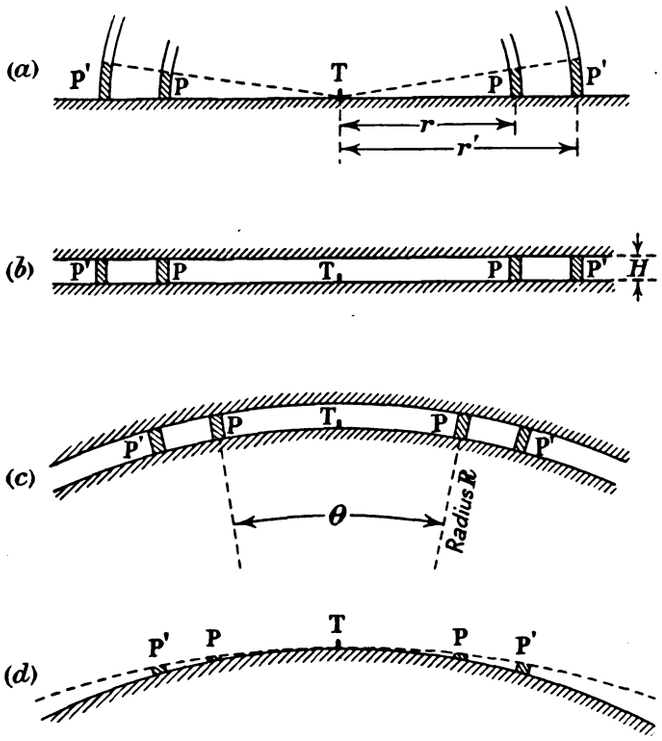
NOTES ON WIRELESS MATTERS.

Observation of Freak Ranges—Curvature of the Earth—The Heaviside Layer.

By L. B. TURNER, M.A., M.I.E.E.

SINCE wireless signalling passed, many years ago, from a purely experimental to a commercial stage in its development, numerous operators distributed all over the earth have been continuously listening to hear signals from ship and shore stations with which more or less regular communication was to be expected. From time to time listeners amongst this scattered host have been thrilled to hear signals from remote transmitters ordinarily far out of range. The apt terms, freak signals and freak ranges, have been commonly used to describe such phenomena. Every degree of freakishness has been observed—from a doubling or trebling of normal range for a stretch of hours to a momentary piercing of the veil between the listening operator and perhaps some ship



Comparison between the propagation which would occur in several ideal simple limiting cases which are referred to in the accompanying article.

near his antipodes. In such circumstances, it is not surprising that an imaginative optimism, aided no doubt by atmospherics, has more than once even suggested that the Man in the Moon, or some super-Rugby of the Martian Post Office, had broken through.

While appreciable penetration of the earth's atmosphere by radiation, of such wavelengths as are employed in wireless telegraphy, is no longer to be regarded as unscientific fantasy, it is not necessary to contemplate extra-terrestrial signals to find acute difficulties in the way of formulating any laws of wireless propagation. Observation of freak ranges between pairs of stations on the earth's surface have abundantly exposed our hitherto profound ignorance of the mode or modes by which the radiant energy is propagated over the surface of the globe, whether in normal or freak conditions. By dint of extended laborious observations—as in the well known pioneer work with which L. W. Austin's name is so closely associated—an empirical law may be formulated; but sometimes the law is ignominiously flouted, and the power received is thousands of times greater than the formula provides.

Some of the most recent research—to which reference has already been made in these notes—is at least beginning to offer a theory of propagation which will cover these exceptional cases, accounting, that is, for the widely different attenuations observed at different times on one wavelength and at the same time on different wavelengths. All such theory is directed towards providing a fuller account of the behaviour of the upper atmosphere in guiding or dissipating the wireless waves.

In studying this branch of wireless theory—of which much must be heard during the next few years—it is helpful to have a clear notion of the magnitudes of the vital factors, curvature of the earth and guidance by the Heaviside layer. In this article, therefore, a comparison is made between the propagation which would occur in several ideal simple limiting cases.

(*a*) The first case is that of a flat perfectly conducting ground bounded by a perfect vacuum. This is probably close to the conditions which would obtain if the earth were flat but possessed the same kind of solid surface that we know, and if the atmosphere throughout were as we know it near the earth's solid surface. For this case it is not difficult to prove that the electric field F produced at a large distance r from a vertical transmitting aerial T of height h, carrying current I alternating at a frequency corresponding to a wavelength λ, is given by the well known formula

$$F = 0{\cdot}377 \times 10^6 \cdot \frac{hI}{\lambda} \cdot \frac{1}{r} \text{ microvolts per metre} \quad . \quad (a)$$

where lengths are in kilometres and current in amperes.*

A rough attempt to show what is happening is made in Fig. (*a*), where the energy at one instant in the shaded volume shown in section at P is spread at a later instant over the larger volume at P¹. The shell at P¹ is of the same thickness as that at P, but the radius has increased from r to r^1, and the height of the shaded element has increased in the ratio r^1/r.

As a numerical example exposing the significance of the several formulæ to be considered, let the dimensions of the transmitter be :—

$$h = 0{\cdot}075 \text{ km} ; \quad \lambda = 14{\cdot}1 \text{ km} ; \quad I = 300 \text{ A}$$

Line (*a*) of the table then shows the electric field strengths produced at distances r between 1 000 and 15 000 km.

(*b*) The second case is the former one modified by the addition of a perfectly conducting (reflecting) layer, parallel to the ground and at a height H above it, so preventing the spread of energy in the vertical direction. This is indicated in Fig. (*b*). From the consideration of the fall of power density as r increases; and the fact that the power radiated is $I^2 \times 1\,580\, h^2/\lambda^2$ watts, it is easy to show that

$$F = 3{\cdot}09 \times 10^5 \cdot \frac{1}{\sqrt{H}} \cdot \frac{hI}{\lambda} \cdot \frac{1}{\sqrt{r}} \quad . \quad . \quad . \quad (b)$$

(*c*) The third case is the last case modified by making the ground spherical, of radius R, instead of flat, R being very large compared with H. This is shown in Fig. (*c*). If the distance r is still measured along the surface of the ground—i.e., along great circles instead of straight lines—the only modification to the last formula is an additional factor $\sqrt{\theta/\sin\theta}$ to cover the curvature. Thus

$$F = 3{\cdot}09 \times 10^5 \cdot \frac{1}{\sqrt{H}} \cdot \frac{hI}{\lambda} \cdot \frac{1}{\sqrt{r}} \cdot \sqrt{\frac{\theta}{\sin\theta}} \quad . \quad (c)$$

It is very interesting to compare (*b*) and (*c*). The curvature factor $\sqrt{\theta/\sin\theta}$ is always greater than unity; it is 1·25 at $\theta = \pi/2$ (i.e., half-way to the antipodes), and becomes infinity at the antipodes. In words: if the transmitter were situated at the North Pole, the length perpendicular to the paper of the element P would be the length of the circumference of the parallel of latitude through P. This increases to about 40 000 km when P is on the equator, and dwindles to zero again when P is at the South Pole. The field strength therefore falls towards a minimum as r rises towards about 10 000 km, and thereafter rises again towards the antipodes. In our imaginary case, since there is no dissipation of energy, we ought to take into account the waves travelling beyond the antipodes and back towards the transmitter; but this is unnecessary with dissipation even much less than that actually experienced, unless a point is under consideration which is much nearer to the antipodes than to the transmitter.

The effect of the sphericity of the earth and of the Heaviside layer in re-concentrating the power when once a distance of 10 000 km is passed is illustrated in the numerical example by a comparison of lines (*b*) and (*c*) in the table. These are calculated for a height of layer $H = 40$ km, which various researches have shown to be a reasonable value to take, and a radius of the earth $R = 20\,000/\pi$ km. It is clear that if anything like a perfectly conducting earth and a perfectly

* The same units for field strength, length and current are used throughout this article.

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conducting layer ever obtain, a range of (say) 15 000 km is little more remarkable than a range of 5 000 km. The recognition of 10 000 km as—apart from absorption—the hardest range to obtain in terrestrial communication relieves us from the necessity, which used to be felt, of picturing an occasional accidental channel of exceptionally good propagating quality connecting two stations between which freak ranges are observed; a kind of meteorological speaking tube happening to exist for a while between the two points, like that joy of the mountain walker, a rift in the clouds between summit and valley below.

Experience gained during the last few years, especially with very short waves, seems to indicate that sometimes and for some wavelengths the Heaviside layer really does behave as a good reflector. This confers a large measure of reality on the ideal we have been examining as case (*c*).

(*d*) The fourth case to be considered is the spherical earth without an atmosphere. This is case (*a*) modified from plane to sphere. Long distance propagation now depends wholly on diffraction. It is portrayed, very inadequately, in Fig. (*d*) in the series of diagrams. The formula for the field strength is due to G. N. Watson and van der Pol*, and with the symbols and units here employed is

$$F = 5{\cdot}36 \times 10^2 \cdot \frac{h\,I}{\lambda^{\frac{1}{2}}} \cdot \frac{\varepsilon^{\,23{\cdot}9\theta}\,\lambda^{\frac{1}{2}}}{(\sin\theta)^{\frac{1}{2}}} \quad . \quad . \quad . \quad (d)$$

The numerical significance of this formula is shown by line (*d*) of the table. Comparison of lines (*a*) and (*d*) makes it clear how essential to the wireless engineer a flat earth would be, had he no Heaviside layer in support; and comparison of lines (*c*) and (*d*) shows how immense the effect of a really good Heaviside layer may be.

(*e*) It is of interest to tabulate, with the four ideal limiting cases considered, field strengths as actually observed. The transmitter taken for the numerical examples was chosen to enable this to be done. It is Carnarvon ("M.U.U."); and in line (*e*) of the table are extracted * some observations of that station made during the Marconi Co.'s signal strength expedition reported in the paper already referred to.

TABLE.

Field strengths in microvolts per metre.

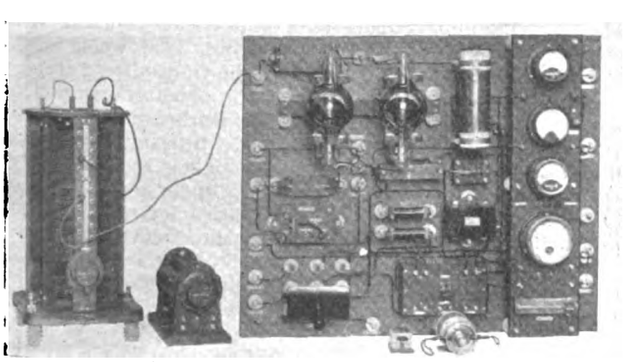
Case	Conditions	Distance from transmitter in kilometres				
		1 000	2 000	5 000	10 000	15 000
(*a*)	Flat ground; no reflecting layer.	600	300	120	60	40
(*b*)	Flat ground; reflecting layer 40 km above it.	760	530	340	240	195
(*c*)	Spherical earth; reflecting layer 40 km above it.	760	540	360	300	360
(*d*)	Spherical earth; no reflecting layer.	296	43	0·28	0·000,1	0·000,000,05
(*e*)	Real (measured strengths)	600	200	40	6	2

NOTE.—Great-circle semi-circumference of earth = 20 000 km.

WIRELESS AND POLAR EXPLORATION.

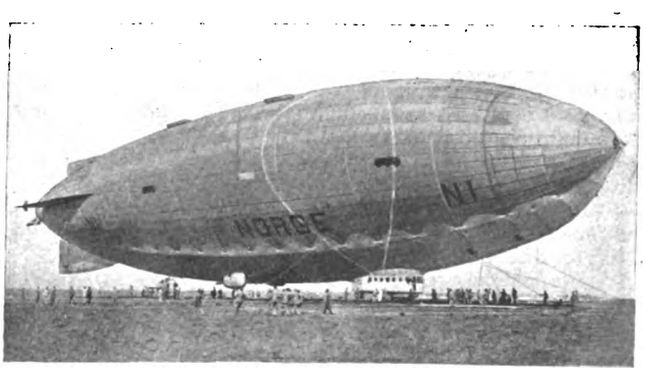
Details of the Equipment on the Airship "Norge I."—Maintaining Communication throughout the Voyage—The Direction-finding System.

IN the past most expeditions to the Polar regions have had to undergo long periods of complete isolation from the outside world, since it has not been possible to carry the means of communicating with civilisation. In the case of Captain Amundsen's recent flight, however, arrangements have been made whereby the Marconi Company equipped the airship "Norge I." with special transmitting and receiving apparatus, which enabled the commander to keep in touch with either ship or land stations up to very considerable distances. The airship was, in fact, in a position to maintain communication with the outside world throughout its entire voyage through Arctic solitudes. On the first stage of the airship's journey to the Pole—from Rome to Pulham, Norfolk—regular two-way communication with the Air Ministry, London, was established when the "Norge" was over the south coast of France, and was maintained throughout the remainder of the voyage. Reception appeared to be only limited by the interference of local stations. A good deal of interference can be eliminated by receiving on the D.F. loops and putting minimum on the interfering station.



A ½ kW Marconi transmitter panel specially set out for the "Norge I."

Of particular interest is the direction-finding system, which enabled the navigators accurately to determine their position and course despite the fact that the compasses have reduced navigational value in the region of the Pole itself, due to the earth's magnetic field effect and the fact that actually at the Pole all direction would be due south.



View of the "Norge I" showing arrangement of the loops of the Marconi direction finder aerial round the envelope.

Transmitting Apparatus.

Turning to the apparatus itself, the transmitter is an adaptation of the Marconi 0·5 kW Type U set and is suitable for continuous wave and tonic train signalling. In order to meet the special conditions obtaining in the airship, and to utilise to the best advantage the very limited space available, the principal components are mounted on a light teak baseboard. These components comprise:—Two Type T 250 valves, H.F. choke, reaction condensers, send-receive switch, C.W.–I.C.W. switch; and measuring instruments for indicating aerial current, feed current, high tension volts and filament volts. The aerial tuning inductance and variometer form separate units and, used in conjunction with the airship's trailing aerial, cover a wave-range of approximately 550 to 1 500 m. On the transmitter 6 to 7 A may be obtained in the aerial on the optimum waves and 4 to 5 A on the extremes.

The two oscillating valves are connected in parallel, and continuous wave signalling is effected by a manipulating key connected in the grid circuit. For tonic train signalling the grid circuit is interrupted by a small rotary interrupter. Power for the anode circuits of the transmitting valves and for charging the filament lighting batteries is derived from a

* Van der Pol: "On the propagation of electromagnetic waves round the earth." "Phil. Mag.", vol. 38 (1919).

† Valid for distances $r > 140\,\lambda^{\frac{1}{2}}$, and small enough to permit to neglect of the radiation arriving by the longer great-circle path. The reader is cautioned against two misprints occurring in this formula as quoted on p. 973 in the recent important paper, "Report on Measurements Made on Signal Strength at Great Distances," "Journal I.E.E.", vol. 63 (1925).

* From Fig. 19, "Journal I.E.E.", vol. 63, p. 946.

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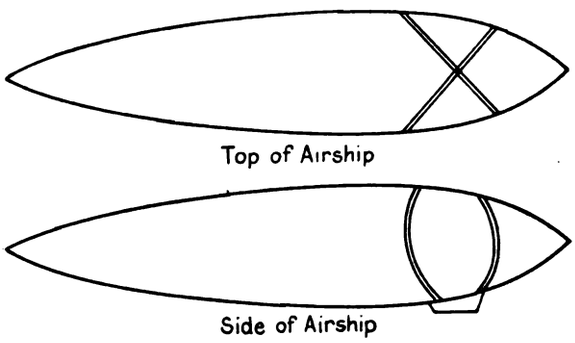
combined h.t. and l.t. direct current generator developing 133 mA at 3 000 V and 14 A at 14 V.

The Wireless Generator.

The generator is fitted just astern of the wireless cabin on a locker and is driven by an air-screw with a right-angled bevel drive. The centre of the propeller is about 5 ft. from



Sketch showing the method of fitting the d.f. aerial on the "Norge I."

the side of the gondola, and the angle at which the propeller faces the air stream can be varied from inside the cabin by a special lever, which may be adjusted and locked to suit the speed at which the ship is travelling or the rate required by the dynamo. The propeller is of the four-bladed type and is capable of developing about 3 H.P.

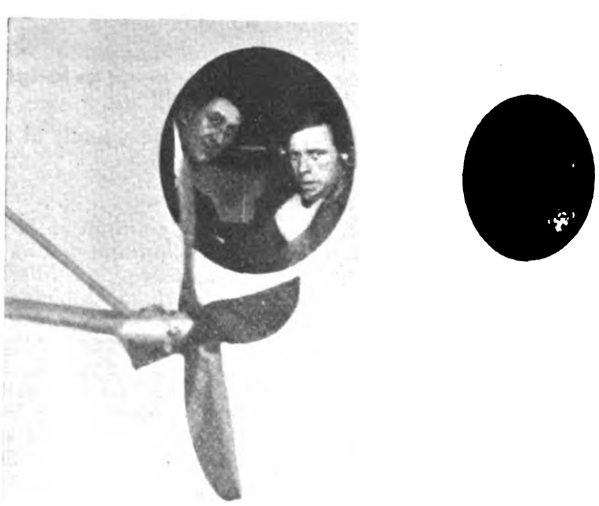
For emergency purposes a horizontally opposed twin cylinder petrol engine of 2¾ H.P. is mounted on a lightly constructed tubular steel framework, which can be quickly fixed just outside the gondola. The generator that is driven from the air-screw can be quickly attached to this framework.

A switchboard fitted with an automatic cut-out, ammeter, voltmeter and "W/T-Charge" change-over switch enables the low tension batteries to float across the low tension side of the generator during transmission or to be charged when the transmitter and receiver are not in use.

A special type of fairlead is fitted in the base of the gondola for the trailing aerial, which is 300 ft. long. This fairlead enables a new aerial and weight to be fitted while the airship is in flight should it be necessary.

Special Marconi receiving apparatus is utilised both for direction finding and for ordinary service reception. As in all aircraft, economy of space and the minimum of weight are essential features, and several of the units are utilised both for direction finding and service reception purposes.

A Marconi short wave two-valve receiver with a wave-



[*Photo: Central News.*

Wireless cabin on the "Norge I" showing wireless generator propeller. Owing to the small space it was impossible to secure a photo inside the airship.

range of 10-100 m. is carried. This is intended for communication with Point Barrow, where a short wave transmitter is installed. The aerial is a short wire between the wireless cabin and one of the engine gondolas. The receiver operates on the batteries carried for normal working.

Direction Finder.

The direction finder loops are fitted diagonally round the outside of the envelope, the centre of the loops coinciding with the lead-in to the wireless cabin. The loops consist of two turns of wire, spaced about nine inches apart.

Inside the cabin eight terminals are fitted on an ebonite panel to which the ends of the loops are connected. This enables the loops to be put in either parallel or series. Reception on the radiogoniometer utilises practically the same circuits as are used for service reception with the trailing aerial.

A radiogoniometer unit and a three-range transformer unit are used in conjunction with a high frequency amplifying detector and a low frequency magnifier. A low frequency note filter is also provided which can be inserted, when desired, into the circuit between the output terminals of the amplifier and the input terminals of the note magnifier. A local oscillation generator is provided to enable bearings to be taken on the long continuous wave stations.

The transformer unit comprises three air core transformers with condensers for secondary circuit tuning covering wave ranges of 2 000 to 5 000, 4 000 to 10 000, and 10 000 to 25 000 m.

The amplifier is provided with six Type V 24 valves with resistance-transformer coupling for high frequency magnification and a Type QX valve for rectification. The note filter circuit is provided with a single Type V 24 valve and an oscillating circuit tuned by means of a variable condenser. The low frequency magnifier has two transformer coupled Type V 24 valves which can be switched into circuit according to the conditions of reception. The local oscillation generator utilises one Type V 24 valve which can be switched into circuit for receiving continuous wave signals. A 66 V dry cell battery is tapped at suitable points for supplying current to the anode circuits of the receiving valves. The valve filaments are run off the battery used for lighting the filaments of the transmitting valves.

For the reception of continuous wave, spark and telephone service messages a "plug-in" coil tuner covering a wave range of 300 to 25 000 m. is connected to the high frequency amplifier in place of the transformer and radiogoniometer units.

The tuner is a coupled circuit instrument and is provided with reaction coupling to the grid circuit. Eleven "plug-in" coils are provided to cover the full wave range, any one of which can be inserted in the aerial, grid, or reaction circuit according to the wavelength being received.

The service receiver utilises the same aerial as that used for the transmitter, the aerial being connected either to the receiver or transmitter by means of the send-receive switch mounted on the transmitter panel.

General Lay-out of Apparatus.

The chief difficulty in fixing the apparatus in the wireless cabin of the Norge was lack of space, the operator's quarters being naturally somewhat cramped. In fixing the instruments it was necessary to give more attention to convenience of wiring than to appearance; but in spite of every economy in space and weight the general effect is very workmanlike. The receiving apparatus is fixed on two shelves one above the other on the interior wall of the cabin. The whole forward wall of the cabin is taken up with the transmitter panel.

A narrow table is provided for the operator's writing and for the manipulating key on the starboard outside wall. Under the left hand side of the table the transmitter inductance is fitted to the floor. A variometer for fine transmitter wave adjustments is also fitted on the left under the table. Next to these instruments is a small cupboard for carrying spares. The accumulators and dry batteries stand on the floor.

A double pole change over switch is fitted in the cabin and the 12 V lighting mains for the ship are brought to this as well as the wireless 12 V supply. This enables the ship's accumulator and the wireless accumulator to be charged in parallel from the wireless generator, and if the ship's main gives out current can be supplied from the wireless accumulator, and vice versa.

Books Received.

"Les Filtres Electriques." By P. David. (Paris: Gauthier-Villars et Cie.) Pp. 130. 25fr.

"Pitman's Electrical Educator." Part 21. (London: Sir Isaac Pitman and Sons.) 1s. 3d. net.

"Elektrische Schaltvorgange." By R. Rudenberg. (Berlin: Julius Springer.) Pp. viii.+510. RM. 24.

"Modern Telpherage and Ropeways." By H. Blyth. (London: Ernest Benn, Ltd.) Pp. xvi+156. 27s. 6d.

"Journal of the Institution of Electrical Engineers." Vol. 64, No. 354 (June). (London: E. and F. N. Spon.) 10s. 6d. net.

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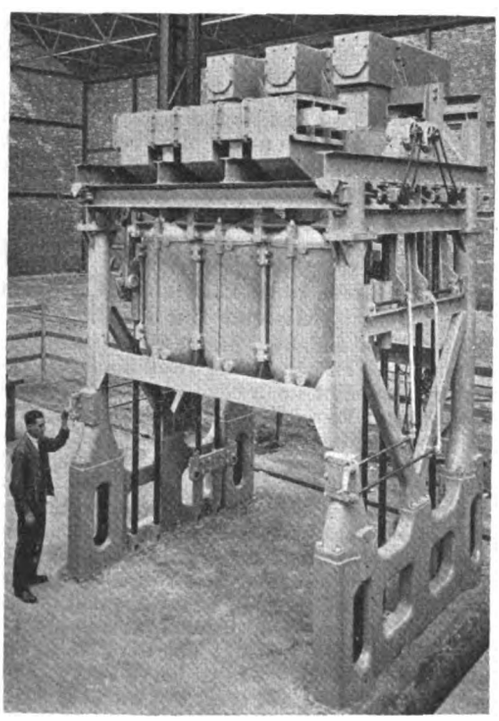
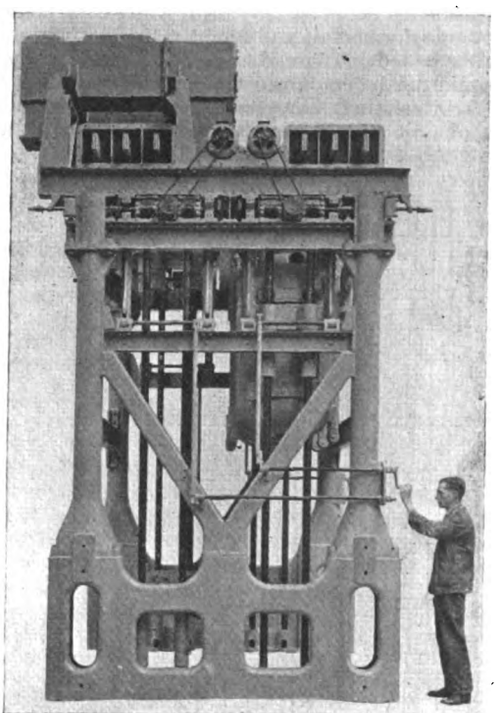
SUPER-POWER STATION SWITCHGEAR.

Another Ferguson Pailin Design of the Metal Clad Type for Systems up to 33 000 V—Single Breaker and Transfer Device.

AT one period in the development of electric supply stations it was thought that the limit to the concentration of power would be set by the switchgear necessary for its control. This has, however, proved to be wrong* as designs have been introduced capable of dealing with the heaviest power contemplated. We illustrate herewith an example of switchgear having a rated breaking capacity of 1 500 000 kVA. This should be more than ample to meet the needs of all the stations contemplated under the new legislation, as it is generally agreed that it is desirable to limit the maximum short circuit power by means of reactances to values much lower than the above.

A general view of the unit in question is given in Fig. 1. It has been designed for systems up to 33 000 V between phases, and at this voltage has a maximum current carrying capacity of 1 200 A. This increases to a figure of 3 000 A at 11 000 V.





Two views of a new ironclad switchgear unit, having a rated breaking capacity of 1 500 000 kVA, which is described in the article on this page and overleaf. To the left (Fig. 1) is a general view of the new gear. On the right (Fig. 2) is a side view of the single breaker arrangement referred to below.

The makers claim that the unit is unique in the following features :—

(*a*) Two separate three-phase circuit breakers may be utilised on each circuit. This arrangement, which is almost universal practice in U.S.A., facilitates busbar selection, provides a second line of defence and enables the circuit to be maintained whilst one breaker is being inspected or overhauled. Alternatively, a single three-phase circuit breaker together with a mechanical rack-over device may be installed. With this arrangement the second breaker may be fitted subsequently if desired.

(*b*) The busbar and connection chambers are designed so that either solid compound, liquid compound or mineral oil can be used for insulating purposes.

(*c*) The unit is self-contained and a separate motor-operated raising and lowering device is provided for each breaker so that no independent crane is necessary. The contacts, etc., can be inspected *in situ*.

(*d*) The vertical principle of isolation is adopted, carrying with it the numerous advantages detailed below.

(*e*) Each phase has a complete metal enclosure throughout so that should any faults develop they will be earth faults only.

(*f*) The gear is built up on the unit principle, each phase having its own component. This renders possible the provision of a separate switch room for each phase.

The various features summarised above are dealt with in more detail below :—

(*a*) The enormous powers controlled by gear of this type render it necessary that there should be no interruption of supply whatsoever. The system of having two independent breakers on each circuit means that the supply engineer has always two strings to his bow and gives him confidence in his ability to meet any emergency. When a circuit breaker has broken a heavy short circuit it is always advisable to inspect the contacts, and the two breakers enable this to be done without interrupting the supply. Not only is this system good as a second line of defence, but it greatly improves the scheme of busbar selection, and is a marked advance on either plug changing or oil selector switches.

The attendant advantages are :—

(1) Complete control of the switchgear is obtained from the control room. This fixes responsibility on the switchboard attendant and renders it unnecessary to visit the high tension switch room to change over on to the auxiliary busbars.

(2) The switchboard can be extended without interrupting the supply to any circuit, as the whole of the circuits can be changed over from one set of bars to the other without breaking load and in a minimum of time.

Normally interlocking features are provided to prevent the two breakers being closed on to the two sets of busbars at the same time. This interlock may, however, be removed by means of a padlocked switch on the control board.

(3) It enables the fullest use to be made of the auxiliary busbars —e.g., facilitating supplies from interconnected generating stations being received and distributed without running in parallel; the testing out of doubtful feeders on a separate machine; or obtaining a voltage boost on particular feeders.

(4) Each and every unit may be used as a busbar coupler by closing both of the breakers. It is thus unnecessary to provide a separate unit for the sole purpose of busbar coupling.

On the standard unit a separate oil breaker complete with its own isolating features and raising and lowering mechanism is utilised for connecting the circuit to each of the two sets of busbars. The two breakers are quite independent of each other, and one may be dismantled or inspected whilst the other is in commission.

* See Dr. C. C. Garrard's article, THE ELECTRICIAN, June 18th, 1924.

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As an alternative to this method a single breaker and transfer device may be employed. With this arrangement also two complete sets of isolating plugs are provided on the fixed portion of the unit, but one triple pole breaker only is supplied together with a horizontal transfer device. When it is required to transfer a circuit from one set of bars to the other the breaker is lowered to the isolated position, racked across to the other set of bars and then raised to the operating position. The raising and lowering movements are motor operated. It should be noted in this connection that the design is such that at any time a single breaker and transfer device may be replaced by the two separate breakers described above. A side view of the single breaker arrangement is shown in Fig. 2. (page 45).

Oil-filled Switchgear.

(*b*) At one period it was considered an impossibility to provide oil-filled switchgear. Investigation has, however, shown that this is practicable and a large number of units with this type of insulation has been in service for a considerable time. The endeavour to utilise oil as a dielectric in lieu of solid compound arose from the prejudices which a number of operating engineers entertained against the compound filled gear. It is generally admitted that instrument transformers should be accessible as occasion may arise when they have to be changed for transformers of a different ratio, or their accuracy and balance tested. There is no reason whatsoever why mineral oil should not be employed throughout, including the busbars. It is interesting, however, to note that we have here a design of unit suitable for both solid compound and mineral oil.

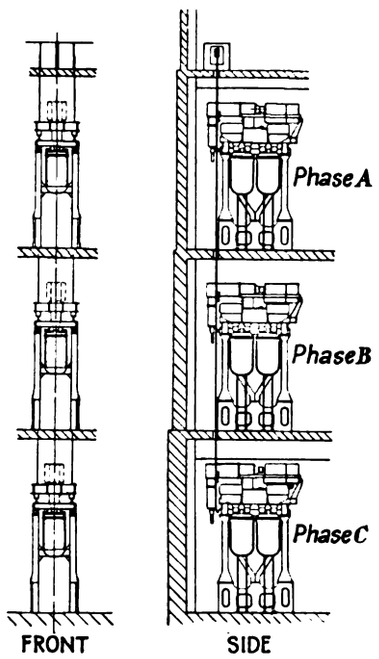

Fig. 3.—Type SVD metal clad unit, arranged for vertical phase separation.

There has recently been introduced a liquid compound which has a high dielectric strength and which is nothing like so searching as mineral oil. This is now being used extensively by engineers who are sceptical regarding the reliability of oil-tight joints, and may be used on this unit if desired.

(*c*) When the units are once erected on site there is no dependence on building cranes or external devices for the inspection of the parts. This work can be carried out *in situ* and in a minimum of time.

Vertical Isolating Principle.

(*d*) The following advantages are, it is claimed, obtained by the use of the vertical isolating principle :—

(1) Considerable space economy is achieved, due to no racking out rails being necessary. Moreover, inspection of the breaker contacts can be made without encroaching on the passage way in any manner whatsoever. The passage way is utilised only when it is necessary to remove the circuit breaker bodily from the unit.

(2) The connections are more direct and contain a less number of joints. The loop formation of the conductors is reduced to a minimum, thus increasing the robustness of the gear under short circuit conditions.

(3) As the breaker terminal bushing also forms the bushing for the isolating socket, the total number of insulators required is greatly reduced, with consequent increase in reliability.

(4) No compound filled hood is required on the circuit breaker as the disconnecting sockets are integral with the breaker terminal stems. Renewal of bushings is, therefore, simple and the weight of the moving member is reduced.

(5) Greater facilities are provided for handling the breaker, due to the movements for isolating same and removing the oil tank or removing the complete breaker, being unidirectional. This renders motor-operated raising and lowering mechanism possible.

(6) Due to the isolating features being arranged on a vertical axis and being situated beneath the fixed portion of the unit, the gear is drip proof and not affected by damp situations.

(*e*) The system of having a complete metal enclosure round each phase is universally admitted to be the safest practice, as any fault developing must go to earth first and the fault current is limited by the neutral earthing resistance. This minimises the effect of the shock on the system. Care is taken to provide non-magnetic materials for the enclosures in those cases where the current is large enough to make heating due to eddy currents objectionable. The metal enclosure of each phase facilitates the adoption of busbar leakage protective gear. It has even been suggested that in the event of an earth fault on one set of busbars it would be practicable to change over the whole of the circuits on to the other set of bars automatically and simultaneously before the synchronous machinery dropped out of step.

(*f*) A practice has grown up in U.S.A. of employing a separate floor for each phase, or, alternatively, providing separate rooms on one floor. This is obviously unnecessary where complete metal enclosure is provided round each phase, but this gear has been designed so that the two single pole breakers on each phase may be grouped together and mounted independently of the breakers on the other phases in the manner shown in Fig. 3.

UNNECESSARY WORK.

Shortsightedness of "Electrical Contractors" Who Mislead the Public.

EVEN in this enlighted age there are many electricity consumers who know nothing at all about electricity, and are misled by a type of small electrical contractor who uses their ignorance to make a job for himself, and often runs the unfortunate householder into needless expense. While this sort of thing would not occur if people consulted only registered contractors or members of the E.C.A., many people do not yet realise the need for careful discrimination in these matters.

A correspondent of THE ELECTRICIAN complains that there are still many so-called electrical contractors, who, on being called in to do some minor repair discover that no one on the premises knows anything about the installation and accordingly "humbug" the occupier of the house in some way or other.

"The last contractor did his work very badly." "The installation is in a very dangerous condition, and might cause a fire." "The insurance company would not pass it." "The only cure for these bells is to have new wires throughout." These (our correspondent states) are typical of the remarks passed by the "kerbstone" type of contractor in order to make a job for himself. Apart from the shortsightedness of such proceedings this kind of trading is a form of sharp practice that should be stopped whenever detected, though detection is usually very difficult. It amounts to obtaining money by false pretences and operates most unfairly against the interests of the public and of the reputable electrical contractor.

As an example our correspondent sends us particulars of a recent case in which his own mother had to pay £7 for work on her electrical installation which he, as a responsible electrical contractor, considered to be entirely unnecessary. The details are contained in the copy of a letter sent to him by his mother, and his reply to that letter.

In the former the writer refers to difficulties encountered in redecorating a certain room because "the man" had told her there were "live wires in the room!" Continuing she says: "In putting a new wire to the top bell, which is a necessity, the man found a join in the wires of the cellar, and live wires, and I had to have that made safe . . . It cost £7 or more altogether, but these repairs were absolutely necessary as we were living dangerously."

In his reply our correspondent points out that "in fact there are live wires all over the house—about a mile and a half of them altogether," and that as for joins, "there are about a hundred joins in all the wires all over the house and in all other houses. How do you suppose it could be done without joins?"

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CORRESPONDENCE.

BURIED CABLES REPORT.

[To the Editor.]

Sir,—In reply to the letter from Mr. W. T. Maccall, published in your issue of June 11 last, I have to say that practically all the items mentioned by Mr. Maccall have already been corrected in the list of *errata* in the "I.E.E. Journal," Vol. 61, page 948, at the end of the discussion of the report. In the separate copies of the paper the discussion and *errata* are all bound up together with the report. If Mr. Maccall will consult that list, he will see that the only omission is the error in the first line of the text following immediately after equation (49). Here, as is pointed out by Mr. Maccall, the reference in the text should be to equation (49) and not to (47) as printed.

It should, however, be noted that there are two points in which Mr. Maccall's corrections are themselves in error. In the first place, on page 565 below equation (49) the whole of that portion of the equation in the brackets should be raised to the nth power, and not only r_4 as suggested by Mr. Maccall, and on page 574, equation (62), the numerical value should be 0·477, and not 0·577 as per Mr. Maccall's letter.

It is most pleasing to find that the report is being used so widely, and I am grateful to Mr. Maccall for the trouble he has taken. Mr. Fawssett, who with myself presented the report to the Institution, is at present out of England, otherwise this would have been a joint reply to Mr. Maccall's letter.

May I now say just a little about the letters from Major Taylor in your issues of April 30 and May 28, and Mr. Fawssett's in your issue of May 28, in which there appears to have been some pother over the authorship of particular portions of the report; as it is left it is rather confusing. Actually, I, with my colleague, Mr. Booth of the N.P.L., was responsible for a large portion of the matter contained in the report, and certainly of the particular section now under discussion. I mention this because I do not wish to seem to be shirking any responsibility; but the whole matter is clearly set out in the usual Institution way on pages 517 and 561 of Volume 61 of the "I.E.E. Journal," and it would have been better if this way had been followed in the correspondence.

I am, etc.,

S. W. Melsom.

Belvedere, Kent.
July 5th.

LANGUAGE AND THE METRIC SYSTEM.

[To the Editor.]

Sir,—Referring to a statement in a recent issue of The Electrician that "a writer, unless he be a Conrad, will write better in his native language than in any other." This statement does not seem as logical as one would expect from an engineer; it seems a little distorted by the natural feelings of sentiment where national traditions and customs are concerned. For instance, the same argument would apply to our system of weights and measures, *because* it is our native system; yet the logical and artificial metric system becomes increasingly used by engineers and others engaged in scientific work for the sake of its convenience.

This argument, that it is easier to continue doing things as we have been used to doing them than to learn to do them in a simpler way, would rule out all possibility of progress, and it is fortunate that there have been many pioneers in all walks of life who were deaf to it. It may be granted, of course, that the new way, even if simpler, will not be easier until it has been *thoroughly learnt*.

An artificial system of measurements like the metric system derives its advantages from its very artificiality because it was consciously thought out on logical lines and so is unencumbered by the dead-weight that has been aimlessly added to a "natural" system. Progress has been defined as "decrease of dead-weight, as compared with efficiency." Consider the progress in transport. Traders of old (hawkers) used to carry their own goods along difficult tracks at the rate of about 15 miles per day; with our modern railways, a train, weighing 100 tons, in charge of three men, can transport 200 tons of goods at the rate of 40 miles per hour. Hence the railway, in proportion to its own weight, can carry twice as much as its forerunner, the hawker, and over 40 times faster and farther.

In language, efficiency consists of the degree of precision with which ideas can be conveyed; the dead-weight lies in the number of roots or words, rules and exceptions that have to be memorised. In the thousands of "natural" languages spoken to-day on the face of the earth the dead-weight is considerable, because every one of them is a compound of heterogeneous elements which were never completely assimilated. The result is that children in all countries have to waste many precious years in learning the senseless intricacies and abnormally large vocabulary of modern languages, and have little time left to learn the subjects which give knowledge about the world they live in, and which would develop to the full many of their most precious faculties. And in exchange for all this drudgery they acquire a means of expression which, in precision, falls short of an artificial, rational language with comparatively so small a dead-weight as Esperanto.

Your contributor appears to think that if, for the good of science, information is required from another nation, it might as well be translated directly into the native language of the inquirer. But think of the multiplicity of translations required to render scientific information available to all peoples in that way. Moreover, many languages do not provide adequate equivalents to express the exact shade of meaning desired, so that much of the value is lost in the translations.

A simple, well-constructed *auxiliary* language such as Esperanto (it is not claimed to be a *universal* language to replace national languages, as your contributor seems to imagine), when it becomes generally recognised and used, will provide a ready means of rendering the results of modern thought and experience available to all nations; only one translation will be required and the exact shade of meaning will be clear to all. Modern developments in the case of inter-communication between peoples render Esperanto more and more urgently necessary with every year that passes. Railways and aircraft, etc., only bring people together—they reduce the barrier of distance, while radio annihilates it altogether—but the language barrier can nullify all these advantages, for communication boils down, in the end, to oral or written intercourse.—I am, etc.,

Theo. E. A. Southern.

Cardiff.
June 28th.

NOTES ON WIRELESS MATTERS.

[To the Editor.]

Sir,—I am greatly obliged to Mr. J. F. Stanley for his letter in your issue of July 2nd, and for his whole-hearted agreement that it is eminently desirable to distinguish between the two quantities *anode resistance* and *anode impedance* (so called).

I certainly do not wish to support the use of the latter term, and am very glad to be able to accept the term *anode a.c. resistance* as recently suggested by the B.E.S.A.

I sincerely hope that the expression will not prove too cumbersome for its general adoption in valve manufacturers' catalogues.—I am, etc.,

W. H. Date,
Head of Wireless Section.

The Polytechnic,
Regent Street, London.
July 6th.

INDUSTRIAL CHEMISTRY AND NATIONAL PROGRESS.

[To the Editor.]

Sir,—The vital importance of applied chemistry to almost every form of national industry and its intimate relation to the stability and progress of British manufacturing processes are, happily, widely recognised to-day by our industrial leaders. From the point of view of keeping the research staff attached to industrial works in the closest possible touch with the latest developments, we venture to appeal to the heads of all industrial firms who employ chemical or other technical and scientific research staffs to provide facilities and even inducements to enable them to attend the forthcoming Congress of Chemists which is being organised in London for the week beginning July 19th by the Society of Chemical Industry.

Employers whose organisation includes research departments would, we feel sure, be serving their own interests and helping to maintain national efficiency and progress by giving their technical staffs access to the great advantages of such conferences and by encouraging their personal association with the societies that are working to keep British chemical science and industry abreast of the latest theoretical and industrial advances.—I am, etc.,

W. J. U. Woolcock,
President.

Society of Chemical Industry.
July 7th.

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NEWS IN BRIEF.

Electric Oil Baths for Eggs—Manchester's Cooker Hiring Progress—Supply Company's "Striking" Presents—New N.F.E.A. Wages Rates.

A memorial to Michael Faraday is to be erected in Southwark.

Shoreditch (London) Borough Council is extending its Evelyn Street sub station.

The special telephonic circuit for continuous day and night services between London and Berlin is now in use.

Since 1923 Preston electricity consumers have increased from 3 032 to 6 050, while the number of electric cookers has risen from 3 to 759.

There was a record attendance at the annual outing of the staff of Macdonald, Syer and Co., Ltd., last Saturday, the day being spent at Southend-on-Sea.

Auckland (N.Z.) Electric Power Board is inviting subscriptions for £250 000 in £100 bearer debentures, at £97. The list closes on or before to-morrow (Saturday).

In a fire at the Llangefni (North Wales) Electric Light and Power Co.'s works last week two dynamos and the main switchboard were destroyed, the damage done being estimated at over £1 000.

Contractors desiring to tender for the work in connection with the erection of a showroom and shops for the Keighley Electricity Department are asked to communicate with the Borough Architect.

By immersing eggs for 3½ seconds in an oil bath brought up to a temperature of 235 deg. by electric immersion heaters, the eggs are made to retain their pristine youthfulness, states the New Jersey Public Utility Information Committee.

Manchester Electricity Department's report for the past year states that good progress has been made in the development of the cooker hiring scheme. The total number of cookers installed on March 31st, 1926, was 1 496, an increase of 818 during the year.

Some excellent performances were seen at the General Electric Co.'s seventh annual sports at Wembley last Saturday. Prizes were distributed by Mrs. M. J. Railing. The band of the 23rd London's played during the afternoon and also for dancing in the evening.

At the company's sports ground at Olton, employees of Donovan and Co., Birmingham, on June 26th, held a sports meeting, features of which were a tennis tournament and a strawberry tea. Prizes were provided and presented by Mr. and Mrs. G. Donovan and Mr. and Mrs. W. Donovan.

At Lancaster recently R. C. Milner was fined £15 and £5 5s. costs for having made false representations when applying for an appointment as shift charge engineer at the Lancaster Corporation electricity works. The evidence showed that the defendant had not the experience which he had mentioned in his application.

The seventh annual sports and children's outing of the Yorkshire Electric Power Co., was held last Saturday, the attendance exceeding 1 300. The event is primarily a festival for the children of the company's staff, nearly the whole of the sports events being for children. Prizes were distributed by Mrs. W. B. Woodhouse.

Lord Strachie stated at a meeting of the Council of the Central Landowners' Association on July 1st, that the charges demanded for telephones in rural areas were in many cases prohibitive to the farmer, and suggested that cheaper and better telephone facilities should form part of the Governments' agricultural programme.

At a recent meeting of the Council of Birmingham Chamber of Commerce the opinion was expressed that it would be a great hardship if the new Electricity Act compelled manufacturers receiving a public supply of electricity to change their plant without compensation. A member said many of the manufacturing metal trades would be stopped for two months during the period of change of periodicity.

An official return of Spanish trade for 1925 shows that of imports of electrical machinery, Great Britain only supplied 530 tons out of 4 850 tons, while Germany supplied 1 480 tons, the United States 1 130 tons, and France 725 tons. Of telegraph and telephone apparatus 97 tons came from France, 55 tons from Belgium, 53 tons from the United Kingdom, 39 tons from the United States, and 35 tons from Sweden.

The autumn meeting of the Institute of Metals will be held in Liège from September 1st to 4th.

Electricity consumers in Lytham St. Annes in May numbered 7 998 against 6 671 a year ago.

During the past year the mileage of Liverpool streets lighted electrically increased from 54⅜ to 73⅞.

An old windmill at Preesall formerly used for grinding corn has been adapted for the generation of electricity.

It is claimed that the American electrical industry has effected a saving of 34 per cent. in the use of fuel since the war.

The English Electric Co.'s Girls' Club secured the second prize for tableau emblematic of Greek "Art" in a pageant in aid of the Staffordshire General Infirmary.

Owing to the depredations of rats and the absence of a proper water supply the use of lead-covered wiring is prohibited for electrical installations in Sutherland, New South Wales.

A joint conference is being arranged between representatives of the Retail Traders' Sections of Midland Chambers of Commerce with regard to the prevention, if possible, of any extension in municipal trading.

In the first four months of this year the U.S.A. financial institutions invested over $427 000 000 in electrical bonds. In the same period over $68 000 000 of electrical utility shares were sold to the public.

At the forthcoming annual meeting of the Institution of Public Lighting Engineers Mr. H. Dickinson, city electrical engineer of Liverpool, will read a paper on "Some Aspects of Electric Street Lighting in Liverpool."

Mr. J. L. Calvard made tests at the Hull Deaf and Dumb Institute last week with his device which comprises a microphone and headphones, and which, it is said, enabled 80 per cent. of the deaf children to hear for the first time.

The Brompton and Kensington Electricity Co., which carried on during the recent national crisis without either volunteers or naval ratings, has presented each member of its emergency staff with a silver match-box inscribed "Some strike! Others don't."

The Council of the Institution of Electrical Engineers has revised and extended the list of qualifications exempting candidates from the associate membership examination. Full particulars are obtainable from the Secretary, I.E.E., Savoy Place, London, W.C.2.

Electrical exhibitors at the Royal Show at Reading this week include R. J. and H. Wilder; Callas, Sons and May, Ltd.; Stuart Turner, Ltd.; Delco Light Co.; the Kohler Co., Ltd.; Glasgow Electrical Engineering Co., Ltd.; Fred G. Allden; and Hewson and Lown.

Under the national wages agreement between the N.F.E.A. and the E.T.U. the variation in the new cost-of-living figures justifies a 26⅜ per cent. reduction. The following rates will accordingly operate from the second pay-day of the present month and remain current up to and including the first pay-day in October: Grade A, 1s. 10d.; B, 1s. 7¾d.; C, 1s. 6¼d.; D, 1s. 5d.

Mr. Ray Finch, State Engineer to the Water Commission of the State of New York, has prepared a report suggesting that leases for fifty years should be granted to industrial companies for the use of the water power of the St. Lawrence river for generating electrical energy, and that after the expiration of the leases the rights should revert to the State, which would in the meantime benefit by the receipt of licence fees.

The C.S. "Dominia," which is to lay 3 500 miles of loaded cable between Vancouver and Fanning Island for the Pacific Cable Board, was inspected on June 30th by a large party of well-known people in the submarine telegraph world, including Sir John Denison-Pender and Sir William Mercer, chairman of the Pacific Cable Board. The Earl of Selborne, chairman of the Telegraph Construction and Maintenance Co., who received the guests, mentioned, incidentally, that when the present work was completed the Telegraph Construction and Maintenance Co. would have laid 335 000 nautical miles of submarine cables.

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AN E.C.A. VISIT.

Electrical Contractors Inspect Mr. Borlase Matthews's Electric Farm.

A VERY large field of work is now opening up for the electrical contractor in the applications of electricity to agriculture. It was, therefore, a happy conclusion to the first annual conference of the Electrical Contractors' Association—a full report of which appeared exclusively in THE ELECTRICIAN last week—that a visit should have been arranged to the all-electric farm of Mr. R. Borlase Matthews at East Grinstead. The party, which included Mr. T. E. Alger and the Association's new president, Mr. H. J. Miles, motored in private cars from Brighton.

On this 600-acre farm some 67 different applications of electricity were seen in use, and while a number of them would not be required on every farm, judging from the utility of those seen, it would be appreciated that no farm should be without at least 20 of them.

Electrical energy is generated on the farm by a water turbine with a fall of 14 ft., the water supply for which is stored in two lakes of 20 and 60 acres respectively, the dams for which were constructed in Roman times out of iron ore; 210 V d.c. generators are driven by the turbine, and supply the farm buildings, three-quarters of a mile away, on a three-wire system. All the farm labourers' cottages are electrically lighted on the 220 V outers of this system, while the work on the farm buildings themselves is carried out at 110 V. For the supply to the buildings themselves an overhead ring main is employed.

Various methods of wiring the interior of the buildings have been tried, and while almost any house wiring system has been found satisfactory for most of the buildings, the case is quite different in the instance of the cow byres, stables and poultry houses, where a certain amount of difficulty has been experienced, steel conduit and lead-covered cables being apparently not as satisfactory as they might be under conditions of exposure to ammonia and sulphuric acid, combined with a steamy humid atmosphere. The material at present being employed is "Maconite," which, Mr. Matthews states, has stood up exceedingly well over a number of years.

The visitors were particularly interested in the electrical haymaking apparatus, and in the electrically-lighted poultry houses. In this latter application the electrical contractors were shown a wide field for the extension of their activities.

A novel rural industry carried on at the farm in conjunction with the experimental engineering workshop is the manufacture of wireless receiving sets.

Wiring Costs.

N.E.L.A. Wiring Committee and the "All Metal" Code.

AS in this country, there have been long discussions in the U.S.A. around the question: "Are wiring costs too heavy?" The National Electric Light Association argues that the tendency to use all-metal covered wiring for concealed work is retarding the use of electricity, and favours the use of cheaper wiring. The electragists (electrical contractors) maintain that such a move would be a retrograde step.

The report of the Wiring Committee of the N.E.L.A. on this question says that the Committee has gone on record as being emphatically opposed to the propaganda for an all-metal code to the exclusion of any other wiring methods. At the meeting of the Wiring Committee in Chicago, in 1925, a resolution was adopted by the Committee as follows: "It is the desire of this Committee to go on record as advocating no particular system of wiring, as the Committee feels that any system of wiring should be encouraged which combines economy with adequate safety." It has seemed to your Committee (the report continues) that there would be a distinct encouragement toward the increasing of the cost of electrical wiring in advocating the all-metal method. The electrical industry does not want "cheap" wiring, which in this sense means unsafe, but what is needed are methods of wiring which are less expensive and, at the same time, combine with them adequate safety. The door must not be closed to inventive genius nor to any present or future wiring method which will bring about this economy, and the encouraging of municipal and underwriter authorities to legislate for an all-metal code to the exclusion of any other method would certainly retard progress in this direction.

BUSINESS ITEMS.

Changes of Address, Representatives, and other Developments.

THE Elektrotechnischer Verein has removed to Potsdamerstrasse 118A, Berlin, W.35.

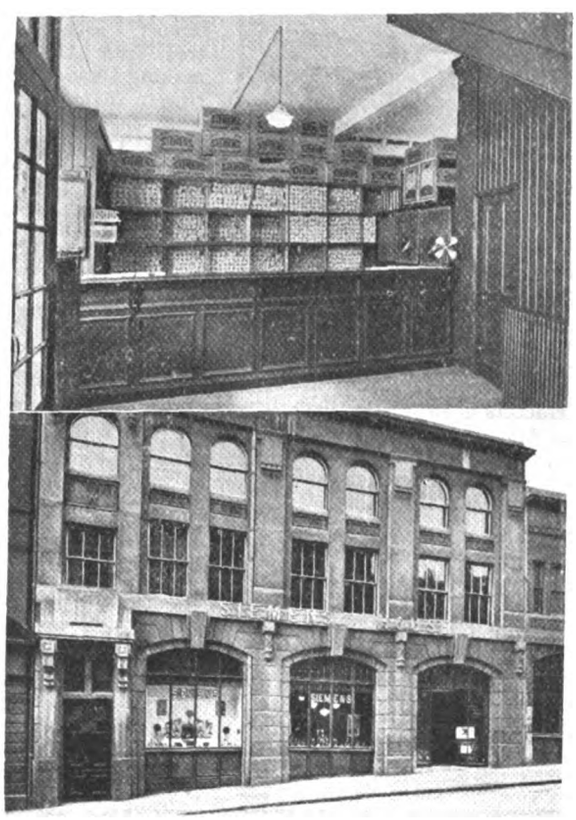
The Cardiff office of the Marconiphone Co., Ltd., has been removed to 35, Windsor Place.

Substantial reductions have been made in the prices of B.T.-H. radio apparatus as from June 21st.

The Birmingham branch of the Siemens and English Electric Lamp Co., Ltd., has been moved to larger premises at Siemens House, 8 and 10, Albert Street, Birmingham. The illustration below shows the outside of the building and a portion of the trade counter.

A firm in Budapest wishes to represent British manufacturers of crystal and valve receivers, voltmeters, amperemeters and crystal detectors. Particulars are obtainable from the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference 849.)

A firm of agents at Wellington is prepared to take up agencies or British manufacturers of electrical and other goods in the whole of New Zealand. Particulars may be had from the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference 826.)



The trade counter and the exterior of Siemens House, the new Birmingham premises of the Siemens & English Electric Lamp Co.

Mr. Louis J. Hunt, consulting electrical engineer, 4, Broad Street Place, London, E.C.2, has entered into an agreement with the Electric Construction Co., Ltd., whereby he will act for them in a consulting capacity in connection with the design and sale of "Cascade" motors.

An electrical sales agency in Montreal desires to represent in Eastern Canada British producers of electricity meters, porcelain for electrical purposes, etc. Inquiries should be addressed to the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. (Reference 824.)

Edison Swan Cables, Ltd., Lydbrook, Glos, announce that they have taken over the business of Lydbrook Cables, Ltd., formerly known as H. W. Smith and Co. (1920), Ltd., and propose to carry on and extend the manufacture of high-class cables and wires formerly made by these companies. Stocks will be maintained at and distributed by all the branches of the Edison Swan Electric Co., Ltd., as well as by Ediswan Cables, Ltd.

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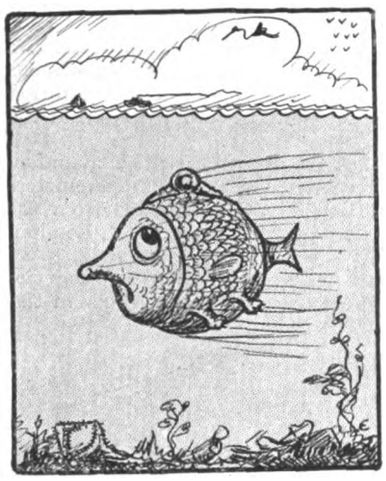
IN LIGHTER VEIN.

Random Comments and Reflections on Electrical Topics of the Week.

OUR electro-zoologist has been to the seaside and has brought back the following details and drawing of the Electric Blotor:



The Electric Blotor.

The Electric Blotor is an amphibious animal equally at home on land or sea, but rarely at sea. When found at sea they are caught by Cranes, using a hook and baited breath. An exciting struggle often takes place, for although a Crane can lift a Blotor—a Blotor can also lift a Crane. Even when hooked they have been known to slip rings and, taking a short circuit, escape Scott free from the Hunt, making Dick curse. The ring in them is to show that they are in the Ring. Their staple diet is caged Squirrels and salad oil when on land, and Star-delta fish and seaweed when in the water.

* * *

They make excellent pets, are often excited but easily controlled, and can be induced to perform many interesting parlour tricks such as spinning on the tale, and sitting up to beg for nuts until the teeth are saturated.

* * *

When well cooked they are regarded as delicacy, and many contractors grow fat on them, usually preferring them grilled. That famous actress, Miss Beatie H., has a great liking for them when breakfasting in bed, and has them served up on a bedplate, whilst in Yorkshire it is a well-known fact that "they're good for 'ating.'"

* * *

Our tame poet writes of the Blotor:—

O Blotor, Blotor, wag your rotor,
Turn and torque—it's free!
Your foot pounds on your hard iron bed;
Don't slide and rail to me.

When you from the Brook first started,
Did Dee see you—or you D.C.,
As you braved the crested wave
Or sailed the Gee E. Sea?

Currents exciting, fields delighting,
Dealt a Starfish such a blow,
That you nearly lost your bearings.
O careful when you change below.

* * *

A Swansea wireless "pirate" said he had given up his set as it was not loud enough, there being a baby in the house. Although the infantile loud-speaker was as good as gold during the day, it was not exactly a Sterling Baby.

Trade Publications.

The Jackson Electric Stove Co., Ltd., 143, Sloane Street, London, S.W.1, utilise a space on their May calendar blotter to advertise their new No. 84 open-type protected boiling plate, which, it is claimed, is positively stopping all boiling-over troubles.

Petters, Ltd., Yeovil, issue an elegant illustrated catalogue (No. 993) of their "S" type surface ignition oil engines for working on crude and residual oils or refined petroleum. The sizes listed are from 5 to 36 B.H.P. and the types dealt with are stationary, portable and marine.

Gent and Co., Ltd., Faraday Works, Leicester, have issued Book 2, section 1, of their catalogue, dealing with "Telephones for Office, Institute and Industry," and Book 2, section 2, on "Accessories for Telephones." Both sections are well illustrated, and prices and other details are given.

THE COLWYN BAY BILL.

Alterations in Wording of the Council's Wiring and Selling Clause.

SECTION A of the local Legislation Committee of the House of Commons considered the electricity clauses in the Colwyn and Colwyn Bay U.D.C. Bill on Wednesday. One of the clauses is that which gives the Council power to sell fittings and wire premises. This was the subject of opposition by the local electrical contractors in the House of Lords; but, as fully reported in THE ELECTRICIAN at the time, the powers asked for were granted by a Committee of that House.

The Amended Clause.

There was no opposition on the present occasion, but there have been some alterations in the wording of the clause, and it is now in the same form as that granted to the Guildford Corporation. The principal alteration concerns the recovery of sums due to the Council in respect of fittings, materials, and work done under the new powers. Whereas the original clause would have empowered the Council to recover such sums summarily up to a limit of £20, the clause as amended provides that they can only recover such sums in this way, up to £20, in cases where they are already proceeding for the summary recovery of sums due for electricity supply.

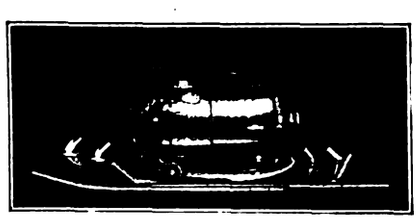
Evidence was given by Mr. Edward Wilson (Chairman of the Lighting Committee of the U.D.C.) and Mr. J. Smith (manager of the electricity and gas undertakings). Mr. Wilson said that the electricity undertaking was not going ahead so fast as he would like it to, and one of the reasons for that was the present difficulty with regard to fittings and wiring.

Sir Thomas Robinson (Chairman of the Committee), who questioned Mr. Smith, made clear the Committee's view in regard to the exercise of these powers (as he did in the Guildford case), that the Council should work with the local contractors as much as possible. Mr. Smith assured him that that was the intention. The Chairman added that the Committee did not wish the Council to start with a staff of six or seven persons, and pointed out that the Council had power to step in if there were profiteering by contractors. If the clause were used discreetly and wisely it would do good.

Vacuum Cleaners.

An Electric Cylinder Model Embodying New Features.

A NEW vacuum cleaner of particularly neat design which has just made its appearance on the market is the "Vac-Tric de Luxe" cylinder model, the product of Vac-Tric, Ltd., 12-13, Henrietta Street, London, W.C.2.



The new "Vac-Tric" cleaner.

Extremely light and portable, this model embodies several new features, including ball-bearing rubber tyred wheels and a cylindrical container made of compressed cork. This material, which is an efficient insulator, and non-inflammable, has the effect of deadening the sound of the motor, thus rendering the machine silent in action. The outside of this container is highly polished, giving the cleaner a very smart appearance.

A high standard of efficiency is claimed for the motor, which is designed to run on either a.c. or d.c. at any standard voltage from 50 to 250 V. Current consumption is only 190 W and the motor, which, by the way, is dust proof, is said to stand an insulation test of 1 000 to 1 200 V.

The dust collecting bag, which is housed in the cylindrical casing, is easily emptied, and no dust arises when the bag is removed. Accessories supplied with the cleaner include extension tubes, a plain nozzle for work on curtains, a large lino brush, and a special book case nozzle. A special service for spares is maintained, so that any part can be replaced at short notice. The selling price of the complete outfit is £12 12s.

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IN PARLIAMENT.

Commons' Committee Still Dealing With Electricity (Supply) Bill.

STANDING Committee C of the House of Commons has continued its discussion of the Electricity (Supply) Bill. The Attorney-General, at last Friday's sitting, said the Bill would not compel any people other than owners of generating stations to take their supplies from the Board.

Mr. Robert Hudson moved, and it was agreed, to add words to clause 13 to confine its operation to owners of existing stations which become selected stations.

The clause as drafted provided that if authorised undertakers proved that the cost of taking a supply from the Board in any year during the period of seven years from the commencement of the taking of such supply exceeded the cost at which the purchaser could have generated his own supply, the Board's charges should be adjusted so as not to exceed such cost. Sir John Marriott moved to omit the words limiting such obligation to seven years, and this was agreed to, as was the complete clause as amended.

Clause 14 deals with the abatement of the charges of electricity suppliers who decline to take a supply from the Central Electricity Board. An amendment, moved by Mr. Robert Hudson, to empower the Board to order the closing down of uneconomic stations and to compel their owners to take a bulk supply from the Board was agreed to, with a proviso that such owners shall have the right to refer to an arbitrator appointed by the Ministry of Transport the question of whether their costs had substantially exceeded the cost at which they could have purchased from the Board. Clauses 14 to 20 were then passed.

On Monday an amendment to Clause 21 moved by Sir John Marriott to give authorised undertakers the same powers as the Board as to the purchase of surplus electricity, was rejected. An amendment proposed by Mr. G. D. Hardie to permit "local authorities" to dispose of their surplus power was agreed to. Clause 21 was passed, and, after the addition of words to ensure that the annual report of the Central Electricity Board should be laid before Parliament, Clauses 22 and 23 were agreed to.

On Clause 24, Sir Philip Dawson moved that there should be repayment to the Commissioners of any expenses incurred by them in the preparation of any schemes under the Act, and this was agreed to.

On Tuesday, an amendment to Clause 24, moved by Sir Joseph Nall, to omit words which would permit the Board to capitalise interest on capital expenditure which is unremunerative for a period of years was rejected.

A subsection of the clause limits the borrowing powers of the Board to £33 500 000 unless further borrowing is authorised by a Special Order. Sir Joseph Nall moved to omit the words permitting borrowing powers in excess of £33 500 000, subject merely to a Special Order issued by the Electricity Commissioners. The Attorney-General said an Order must first be made by the Electricity Commissioners, it must then go to the Minister of Transport, and finally each House of Parliament must pass a resolution approving the Order. That seemed to him an efficient check and safeguard. The amendment was negatived and Clauses 24 and 25 were passed.

Dealing with Clause 26, Col. Burton moved to add a proviso "that no part of the moneys secured by the above-mentioned guarantees shall be expended on plant or machinery which has not been manufactured in the United Kingdom or the British Empire."

Col. Wilfrid Ashley said he could not accept the amendment.

Mr. Attlee said he was in favour of keeping all the work possible in this country, but the Electricity Board would have to deal with public money, much of which would have to be spent on cable. The amendment was negatived.

Mr. E. A. Radford moved to omit Clause 26. He said the Board under the present scheme would have a capital of 33 millions, of which 8½ millions would be spent in the standardisation of frequency. This guarantee of 33 million pounds would draw money from those from whom the Government alone could look for the money to enable them to reduce the present Government debt.

The Attorney-General said, in considering whether the guarantee should be given, the Chancellor of the Exchequer had carefully considered the effect of any guarantee on commercial relations. It was true the Board had assets, but they would not be marketable assets. It was decided that the Clause stand part of the Bill.

PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

THE honorary degree of Doctor of Science has been conferred upon Sir W. H. Bragg.

Mr. W. M. Citrine, the acting secretary, has been nominated for the post of secretary of the T.U.C. He was formerly connected with the E.T.U.

The accompanying portrait is of Mr. C. C. Roe who, as previously announced, has been appointed publicity manager for the Sterling Telephone and Electric Co., Ltd., in addition to his post as publicity manager of the Relay Automatic Telephone Co., Ltd.

Mr. C. C. Roe.

Dumfries T.C. has increased the salary of Mr. Johnston, electrical engineer, from £450 to £500 per annum as from November 11th, 1925.

Sir Ernest Rutherford, Cavendish professor of experimental physics at Cambridge University, has been elected a member of the Academy of Sciences at Cracow.

Leeds Tramways Committee has decided that the duties of chief electrical engineer of the undertaking shall be carried out by Mr. Wm. Chamberlain, the general manager.

Mr. Wilfred Taylor, B.Sc., has been awarded the Earl Grey Memorial Fellowship at Armstrong College. He took an honours degree in physics in 1923, and has since been engaged in research work.

Mr. J. L. Gunn, of Edinburgh, has been appointed manager of the Greenock and Port Glasgow Tramways, in succession to Mr. Archibald Robertson, who has been transferred to the Rothesay Tramways Co.

Mr. J. W. Thomas, assistant general secretary of the E.P.E.A., has been awarded the degree of LL.B. of the Victoria University, Manchester. Mr. Thomas is a B.Sc. and an associate member of the I.E.E.

Mr. P. Dunsheath, head of the research laboratories of W. T. Henley's Telegraph Works Co., Ltd., has been awarded the medal of the Royal Society of Arts for his paper on "Science in the Cable Industry."

Mr. W. T. Young, who, as previously announced, has relinquished the management of the Dundee tramways to take up a similar position in Halifax, has been presented by the Dundee staff with a silver tea service.

Maidstone T.C. has appointed Mr. C. H. Tritton, charge engineer, as station superintendent in succession to Mr. Wintle, who has resigned owing to ill-health. Mr. Wintle will be paid half-salary for three months, and should his health permit he will then be given another appointment.

Capt. S. R. Mullard has retired from the board of Philips Lamps, Ltd., and Mr. A. F. Philips has been re-elected a director. Sir R. Donald, Messrs. L. G. Sloan, C. J. Powell, A. de Jong, and D. C. F. van Eendenburg have been appointed directors, the two last named being appointed managing directors.

The King's Birthday Honours, announced last Saturday, include knighthoods conferred upon Ganendro Prosad Roy, Director-General of Indian Government Posts and Telegraphs, and George Mason Allard, representative of the Government of the Commonwealth of Australia on, and chairman of, Amalgamated Wireless (Australasia), Ltd.

Mr. Duncan Patterson Morrison, engineer and deputy manager of the Gateshead tramways, has been appointed engineer and general manager of the Dundee Corporation tramways. Mr. Morrison recently retired from the position of general manager of the Gateshead Tramway Co., after having been about seventeen years with that undertaking, serving under his father practically the whole of the time.

Obituary.

The following deaths have been announced:

Mr. JAMES GRANT, suddenly, at Rodriguez, Mauritius. Mr. Grant was with the Eastern Telegraph Co., and was a former member of the Post Office staff at Glasgow.

Mr. J. W. WHEELER-BENNETT, aged 78 years. He had been director of the Metropolitan Railway since 1919.

Mr. W. TEMPLE FRANKS, aged 63 years. Mr. Franks was until recently Comptroller of the Patent Office.

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ELECTRIC FARMING.

Some New Applications of Electricity for Agriculturists.

UNDER the auspices of the E.D.A. the second British Electro-Farming Conference was held during the Royal Agricultural Show at Reading yesterday (Thursday). In a paper on "The Economic Use of Electric Light on the Farm with Particular Reference to Poultry," Mr. R. Borlase Matthews said it was the universal experience of electricity supply authorities, that as soon as electricity was available in an agricultural district, the farmers first lighted their byres and stables, these outbuildings being thus lighted long before the farmhouse. The reason for this was that it paid. On his own farm the installation of electric light in the cow byres had practically stopped the milk loss through spillage, and the value of the milk so saved was more than the total cost of the current used. Good lighting also meant a saving of half-an-hour a day in the feeding of livestock.

The author then described the use of electric light on the poultry section of the farm, for the stimulation of egg production during the winter months. The system had now passed the experimental stage, and careful records had shown that the total cost of electric light for this purpose amounted to about the average price of one egg per hen per annum.

For testing the fertility of eggs in an incubator, there was nothing like "candling" them with a powerful electric lamp. An entirely new application of electric lamps was to prevent the crowding of young birds together at the side of a cold brooder house, by suspending a lamp in the centre, near the floor.

Another interesting application of electricity on the poultry farm was to be found in the use of ultra violet rays. Young chicks under this treatment for twenty minutes each day for two months, attained the size of three-months-old birds, and were ready for the market at least five weeks before untreated chicks. The death rate among treated chicks was reduced by more than 50 per cent., while weak legs and rickets were entirely eliminated.

Experiments had also been conducted to determine the effect of ultra violet light on laying hens, and it had been found that in one case, hens given a ten-minute ultra violet radiation daily during the winter months, laid 140 per cent. more eggs than untreated birds in a control pen. The exposure of any bird to ultra violet light, whatever its age, should not exceed twenty minutes per day.

As the result of experiments on the influence of very intensive electric light on the growth of plants, the author said he had definitely proved that really intensive artificial light would accelerate germination, give greater depth of colour, increase growth, and speed up flowering without any of the unsatisfactory signs that were usually found when artificial forcing was carried out. Daffodils and Lent lilies, when placed under the light of 1 000 W Mazda lamps and reflectors for six hours a night, flowered in four days, growing about three-quarters of an inch a day. Narcissi flowered in seven days. The control plants, placed away from the light took four weeks to flower. Further experiments had shown that when transplanted seedlings were exposed to intensive illumination for one night they did not wilt, but actually put on a week's growth and were exceptionally strong and healthy.

The Guildford Bill.

No Further Opposition from Contractors to the Wiring and Selling Clause.

ON Tuesday a House of Lords Committee considered the Guildford Corporation Bill, but—following the E.C.A.-I.M.E.A. agreement—there was no further opposition by the local electrical contractors to the clause giving the Corporation power to sell fittings and carry out wiring installations. The proceedings in the House of Commons, when the electrical contractors contested the clause, were very fully reported in THE ELECTRICIAN of March 26th and April 2nd last. The clause, it may be recalled, gives the Corporation full wiring and selling powers, and also empowers the Corporation, when commencing proceedings for the summary recovery of a debt under their existing powers, to include in the same summons any sum due in respect of the sale or hire of fittings, or materials, or work done in connection therewith, and to recover it summarily, so long as that sum does not exceed £20. This obviates the necessity for going to another court.

ELECTRICAL GLOSSARY.

British Standard List of Technical Terms Used in Electrical Engineering.

THE Glossary of Terms used in Electrical Engineering (B.E.S.A. Publication No. 205-1926), which has just been published by the British Engineering Standards Association, is divided into sections with appropriate sub-sections, and the terms are arranged in a logical technical order.

The main sections are as follows:—General; machines and transformers; switchgear and control gear; meters and measurement; transmission and distribution; electrochemistry; traction; lighting, heating and domestic appliances; telegraphs and telephones; radio communication; and miscellaneous applications.

It was originally proposed that the definitions should be arranged alphabetically, but it was found that with this method cognate terms were so far removed from one another that comparison was difficult. The method also had the disadvantage that specialised terms and general terms were intermixed. The terms are grouped, therefore, according to the particular branch of the electrical industry in which they are used. An alphabetical index enables any particular term or definition to be found without difficulty.

An important development in regard to the spelling of certain terms. It has been considered desirable to standardise as far as possible the termination "or" as designating a piece of apparatus or a machine for accomplishing a certain purpose, leaving the termination "er" to be applied to the person who carries out an operation. There are certain cases, however, where, owing to long-established usage, this rule has not been applied; such exceptions are tabulated.

The book is one which should be in the hands of every electrical engineer and student, and is obtainable from the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, price 5s. 6d., post free.

Retail Trading at Sydney.

Municipality to Embark on Scheme Despite Opposition of Electrical Employers' Association.

MUNICIPAL retail electrical trading is arousing as much opposition in Australia as it has done in this country, and the Sydney City Council has definitely decided, in the face of strong opposition, to embark on its scheme of retail trading in domestic electrical appliances, and house wiring on a cash or a deferred payment basis.

According to the "Electrical Engineer of Australia" the Electrical Employers' Association of New South Wales has registered an emphatic protest against the scheme.

It is pointed out that the scheme cannot be justified by an assertion that the use of electricity is not being sufficiently advocated by the electrical traders. Figures are quoted which show that the city section of the electrical trades spent, during the past 12 months, £44 234 in advertisements alone, and that in addition many thousands were spent in other propaganda work. This resulted in the demand for electricity being greater than the municipality could supply.

Inspecting Wiring.

Two E.C.A. Branches Favour Independent Examination of Installations.

THE desirability of having wiring installations inspected during and after work is completed was tacitly agreed at the E.C.A. Conference at Brighton. It is, therefore, interesting to note that the E.C.A. Londonderry Branch has passed a resolution unanimously in favour of the inspection of wiring work during the course of installation, it being considered that the procedure will be to the mutual advantage of all reputable firms carrying out sound work. We understand that the City Electrical Engineer at Londonderry is willing to arrange for such inspection to be carried out. It was reported to the last meeting of the E.C.A. East Yorkshire Branch that a wiring inspector had been appointed by the City of Hull.

The Association's Londonderry Branch has also considered the question of the supply of wiring material by wholesalers to individuals carrying on installation work without proper equipment or business premises, and suggests that wholesalers should issue a "Query Sheet" to all new or unknown customers before supplying them at trade terms.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given. Unless otherwise stated, particulars are to be had from the Department of Overseas Trade, 35, Old Queen Street, Westminster, London, S.W.1.

AYRSHIRE COUNTY COUNCIL.—Electrical work for 240 houses. Particulars from John H. Allen and Sons, 224, St. Vincent Street, Glasgow.

DUNDEE CORPORATION.—Electric wiring of houses included in Craigiebank housing scheme (4th development). Particulars from Mr. G. Baxter, 91, Commercial Street, Dundee.

KEIGHLEY CORPORATION.—Electric wiring of 20 houses on Broomhill housing estate. Specifications, etc., from the Borough Architect, Town Hall, Keighley.

LANARKSHIRE COUNTY COUNCIL.—Electric lighting work in connection with housing schemes. Particulars from Mr. John M'Clement, district engineer, Lanark.

EASTBOURNE GUARDIANS, July 9th.—Electric light installation in the Institution. Particulars from Mr. F. G. Cooke, 2, Hyde Gardens, Eastbourne; deposit £1 1s.

GLASGOW CORPORATION, July 9th.—Electric lighting, bells, and fire alarms; and main supply cables, at Mearnskirk Sanatorium, Mearns, Renfrewshire. Specifications from the Office of Public Works, 64, Cochrane Street, Glasgow; deposit £5 5s.

ECCLES CORPORATION, July 10th.—Electric light wiring and fitting of 12 houses in Gashall Road, Eccles. Specification, etc., from the Borough Electrical Engineer, Electricity Works, Cawdor Road, Patricroft; deposit £1 1s.

GRIMSBY CORPORATION, July 10th.—Supply of paper insulated, lead covered, low tension cables during one year, estimated at 15 000 yards. Specification (No. 217), gratis, from Lt.-Col. W. A. Vignoles, borough electrical engineer, Grimsby.

PARISH CHURCH, BAMPTON, July 10th.—Electric light installation. Particulars from the Vicar.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, July 10th.—Supply and erection at Birchills power station, Walsall, of two turbo-alternators, condensing plant, etc. Specification, etc., from Mr. E. M. Lacey, 12, Victoria Street, Westminster, S.W.; deposit £5 5s.

KEIGHLEY CORPORATION, July 12th.—Wiring 20 houses on the Broomhill estate. Specifications from the Borough Architect.

NEWMILNS AND GREENHOLM TOWN COUNCIL, July 12th.—Electric lighting work in 12 semi-detached cottages of three apartments, or six blocks of four three-apartment houses. Specifications can be seen at the Burgh Surveyor's office.

SPENBOROUGH EDUCATION COMMITTEE, July 12th.—Electric light installation at Millbridge Council Mixed and Infants' Schools, Vernon Road, Liversedge. Specifications, etc., from the Director of Education, Bradford Road, Cleckheaton.

MANCHESTER EDUCATION COMMITTEE, July 13th.—Electric lighting installations at Wilbraham Road (Withington), Ravensbury Street (Clayton) and Claremont Road (Moss Side) Municipal Schools. Specifications, etc., from the Education Offices, Deansgate, Manchester; deposit £1 1s.

SANNA, ARDNAMURCHAN (SCOTLAND), July 14th.—Hydro-electric lighting installation for dwelling house. Schedules from G. M'Ritchie and V. Hodgson, architects, Fort William.

LANCASHIRE EDUCATION COMMITTEE, July 15th.—Electric light installation at Byron Street Council School, Roydon. Specifications from Mr. H. Littler, 16, Ribblesdale Place, Preston.

PLYMOUTH CORPORATION, July 15th.—Supply of three-phase transformers and sub-station e.h.t. switchgear. Specification from Mr. E. G. Okell, borough electrical engineer.

BRISTOL CORPORATION, July 16th.—Supply, delivery and erection of two wooden natural-draught cooling towers, each of 450 000 gallons per hour capacity, at the Feeder Road power station. Specification, etc., from Mr. H. Faraday Proctor, Electricity Offices, Colston Avenue, Bristol; deposit £1 1s.

FORT WILLIAM TOWN COUNCIL, July 16th.—Electric light installation work in 32 houses on a site between Alma Road and Victoria Road. Schedules, etc., from Mr. Geo. MacRitchie, architect, Fort William.

ST. HELENS CORPORATION, July 17th.—Three electrically driven pumps, with starting gear, switchboard, etc., for Sutton Road pumping station. Further information from Mr. A. W. Bradley, Borough and Water Engineer, Town Hall, St. Helens.

DOVER CORPORATION, July 19th.—Transformers and Brookhirst switchgear, for voltage regulation on 6 600 V, three-phase, 50 period supply. Specification from the Borough Electrical Engineer; deposit £1 1s.

GRIMSBY CORPORATION, July 19th.—Electric light installation at Victoria Street new Council Schools. Specification, etc., from Lt.-Col. W. A. Vignoles, borough electrical engineer.

INDIA STORE DEPARTMENT, July 20th.—Four 10 000 kW turbo-alternators, condensing plants and auxiliary apparatus. Specifications (£2 per set, not returnable) from the Director-General, Branch No. 14, Belvedere Road, Lambeth, London, S.E.1.

WARRINGTON CORPORATION, July 20th.—Twelve months' supply of e.h.t. and l.t. paper-insulated lead-covered cables. Specifications, etc., from Mr. F. V. L. Mathias, borough electrical and tramways engineer; deposit £1 1s.

CARDIFF RURAL DISTRICT COUNCIL, July 22nd.—Supply, erection and connecting up of substation equipment, overhead lines, etc., at Dinas Powis, near Cardiff. Specification can be seen at the offices of Mr. R. Howard Fletcher, 3, Park Place, Cardiff.

CORK BOROUGH COMMISSIONER, July 23rd.—Repair by electric welding of turntable undercarriage at Parnell Bridge. Specification from Town Clerk; deposit, £1.

SAFFRON WALDEN CORPORATION, July 24th.—Engine and dynamo, switchgear, booster, balancer, batteries and mains. Specification from Mr. R. A. Smith, 14, Victoria Street, Westminster, S.W.1.; deposit £1 1s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, July 24th.—Supply and erection at Birchills power station of three steam boilers, pulverised fuel plant, ash and coal handling plant, and boiler house auxiliaries. Specifications, etc., from Mr. E. M. Lacey, 12, Victoria Street, Westminster, S.W.1; deposit £5 5s.

MANCHESTER CORPORATION, July 26th.—One 500 kVA static transformer, for sub-station on the premises of Beyer, Peacock and Co. Specification (No. 167) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

BETHNAL GREEN (LONDON) GUARDIANS, July 29th.—Installation of internal telephone system at Children's Homes High Road, Leytonstone, E.11. Specification, etc., from Mr. C. Faulkner Jones, Clerk to the Guardians, Bishop's Road, London, E.2; deposit £2 2s.

WATERFORD CORPORATION, July 29th.—About 5 miles of 10 000 V three-phase overhead line, with three-phase four-wire medium pressure lines on same supports; medium pressure four-wire overhead distribution network; and street lighting system. Specifications, etc., from McEntee and O'Kelly, 22, Nassau Street, Dublin; deposit £2 2s.

BELFAST CORPORATION, July 31st.—One 15 625 kW turbo-alternator, with condensing plant and auxiliaries, and, alternatively, one 18 750 kW turbo-alternator, with condensing plant and auxiliaries. Specifications (Nos. W48 and W48a) from Mr. Johnstone Wright, City Electrical Engineer and Manager, East Bridge Street, Belfast; deposit, £3 3s.

KILKEEL RURAL DISTRICT COUNCIL, August 5th.—(*a*) Cold-starting crude oil engine; (*b*) generator booster and switchboard; (*c*) storage battery; (*d*) pole erection work; (*e*) line erection work; and (*f*) erection of power house for electric lighting of Rostrevor. Specifications for each section (deposit £1 1s.) from Mr. P. T. White, 50, Queen Street, Newry.

Overseas.

Note.—An asterisk against the reference of an overseas contract denotes that local representation is essential.

STATE ELECTRICITY WORKS, MONTEVIDEO, July 9th.—Supply of 137 500 metres of rubber insulated wires and cables. (Reference B.X. 2 548.)

JOHANNESBURG MUNICIPALITY, July 10th.—Supply of 3 000 pin insulators and 500 shackle insulators. (Reference B.X. 2 619.)

ANTWERP MUNICIPALITY, July 12th.—One six-phase converter, one mercury vapour arc rectifier and four static trans-

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formers, for sub-stations, for the Port Equipment Department. (Reference B.X. 2 637.)

Victorian Railway Commissioners, July 14th.—Supply of a.c. power interlocking machine (contract 39 543). (Reference B.X. 2 596.)

South African Railways and Harbours Administration, July 15th.—Gasfilled and vacuum type lamps, for one year. (Reference B. 2 554.*)

State Electricity Works, Montevideo, July 15th.—Supply of 40 000 metres of coloured twin-conductor cords. (Reference B.X. 2 549.)

India Store Department, July 16th.—Rotary converters, 500 V, 200 V, with step-down transformers. Tender forms from the Director-General, Branch No. 1, Belvedere Road, Lambeth, London, S.E.1.

India Store Department, July 16th, July 30th, August 6th.—(1) Coal and ash handling plant for power station; (2) steel frame buildings and electric travelling crane; and (3) boiler house equipment, piping, etc., or, alternatively, complete boiler house installation, including pulverised fuel equipment, piping, etc., in connection with Great Indian Peninsular Railway electrification. Specifications from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1. Fees (not returnable) 5s. each for Nos. 1 and 2, and £2 for No. 3. Tenders by July 16th for No. 1, July 30th for No. 2, and August 6th for No. 3.

Egyptian Ministry of the Interior, July 20th.—Centrifugal pumps and electric motors, in connection with water supply works at Minieh. (Reference A.X. 3 230.*)

India Store Department, July 20th.—Four 10 000 kW turbo-alternators, condensing plants, and auxiliary apparatus for Great Indian Peninsula Railway electrification. Specification (£2) from the Director-General, Belvedere Road, Lambeth, London, S.E.1.

New Zealand Public Works Department, July 20th.—Phase transformer, for Mangahao electric power scheme, section 184. (Reference B.X. 2 502.)

Cape Town Municipality, July 21st.—Electrically driven gravity bucket type coal conveyor, with driving mechanism, etc., for the Electricity Department. (Reference A.X. 3 149.*)

Cape Town Municipality, July 21st.—Two water-tube boilers, with stokers, mechanical draught plant and motors.

India Store Department, August 9th.—Electrical generating plant for the Peshawar power station of the North-Western Railway. (Reference B.X. 2 644.)

State Electricity Works, Montevideo, July 22nd.—Supply of 35 000 electric lamps. (Reference B.X. 2 575.)

Johannesburg Municipality, July 29th.—Supply of transformers (contract 647). (Reference B.X. 2 636.)

Johannesburg Municipality, July 29th.—Supply of 10 miles of copper trolley wire and 50 miles of underwriters' wire.

Johannesburg Municipal Council, July 31st.—Supply and erection of electrically driven triplex plunger sewage pump.

Egyptian Ministry of the Interior, August 1st.—Installation of electric power station equipment at Keneh and Luxor for production of three-phase current, 3 300 V, 50 cycles. (Reference B.X. 2 627.)

Deputy Postmaster-General, Melbourne, August 3rd.—Supply of telephones and dials. (Reference B.X. 2 564.)

State Electricity Works, Montevideo, August 5th.—Porcelain insulators, etc. (Reference B.X. 2 618.)

India Store Department, August 6th.—Boiler-house equipment with other plant and piping for power house, or, alternatively, complete boiler house installation, including pulverised fuel equipment, etc. Specification (£2) from the Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1.

New Zealand Post and Telegraph Department, August 10th.—Dry cells. (Reference B.X. 2 649.)

Postmaster-General's Department, Melbourne, August 10th.—Supply of telephone exchange indicators (schedule C. 99). (Reference B.X. 2 597.)

Melbourne City Council, August 11th.—Supply of high and low tension three-phase sub-station switchgear (specification No. 810). (Reference B.X. 2 565.)

South African Railways and Harbours Administration, August 12th.—Supply of cables and wires and bare copper wire, during 1927 (tender No. 834). (Reference B.X. 2 639.)

Chilian State Railways, August 20th.—Signals, telegraphs, telephones, etc. (group 36); electrical materials for sub-stations, aerial lines and lighting, 1st-zone (group 37). (Reference C. 1 935.) Booklets (in Spanish) numbered to correspond with the group numbers, and giving further particulars, will be loaned to British firms in the order of application.

Victorian Electricity Commissioners, August 23rd.—Supply of 10 in. diameter disc suspension insulators, with cotton split pin or similar coupling device. (Reference B.X. 2 614.)

New Zealand Public Works Department, August 24th.—Synchronous condensers (section 18, Waikaremoana). (Reference B.X. 2 608.)

South African Railways and Harbours Administration, August 26th.—Material for distribution system in connection with the Capetown suburban electrification. Reference B.X. 2 680.)

City Electric Light Co., Ltd., Brisbane, August 27th.—Supply, delivery and erection of one 12 500 kW turbo-alternator. (Reference A.X. 3 085.)

New Zealand Railways Department, August 30th.—Supply of slip-ring induction 400 V 50 cycle three-phase motors and starters. (Reference B.X. 2 561.)

Deputy-Director of Posts and Telegraphs, Melbourne, August 31st.—Telegraph equipment (schedule C 109). (Reference B.X. 2 653.)

Pernik State Coal Mines, Bulgaria, September 1st.—Electricity generating plant, consisting of two 4 000 kW steam turbo-generator sets, buildings, etc.

Victorian Railway Commissioners, September 1st.—Equipment for automatic control of two rotary converters at Seaford sub-station.

Victorian Railway Commissioners, September 1st.—Automatic sub-station equipment (contract No. 39 287), for Elwood sub-station. (Reference B.X. 2 598.)

New Zealand Public Works Department, September 7th.—Synchronous condenser for Arapuni power scheme, section 165. (Reference B.X. 2 654.)

Legal Intelligence.

Staffordshire Electrical Contractor Acquitted—An Interesting Point.

A CASE of importance to electrical contractors—the preliminary stages of which were reported in our issue of April 23rd last—was heard at Newcastle-under-Lyme Quarter Sessions last Friday, when Mr. John Stanley Cook, electrical contractor, was acquitted on a charge of fraudulently using electricity belonging to the Corporation.

The prosecution's case was that defendant wrongfully connected a 200 W lamp in his shop window to a power meter, thus obtaining energy at 2d. instead of 7d. per kWh. Evidence was called to prove that the lamp in question was used to light the defendant's shop.

The defence was that the use of the lamp for lighting was only incidental, and that the main purpose of the lamp was as a resistance for charging wireless accumulators. Witnesses for the defence said that the practice was common in Birmingham and other places, it being customary for such lamps to be used and charged for at the power rate.

The jury returned a verdict of "Not guilty."

An Employees' Pension Fund.

In the Chancery Division, on Tuesday, Mr. Justice Eve confirmed an alteration of the objects of the St. James' and Pall Mall Electric Light Co., Ltd., so as to enable the company to establish a pension fund for its employees.

Bogota Telephone Co., Ltd.

Mr. Justice Eve, in the Chancery Division on Tuesday, sanctioned a scheme of arrangement by which the holders of deferred shares in the Bogota Telephone Co., Ltd., gave up a portion of their shares in exchange for having the remainder of them turned into ordinary shares. Mr. Heckscher, for the company, said the profits for the last year were £20 000.

A Reduction of Capital.

A petition by Duram, Ltd., to confirm a reduction of capital of the company, came before Mr. Justice Eve in the Chancery Division on Tuesday. Counsel said it was proposed to cancel capital that had been lost or was unrepresented by available assets. It was proposed to write off certain patent rights which were no longer of value.

His Lordship confirmed the reduction.

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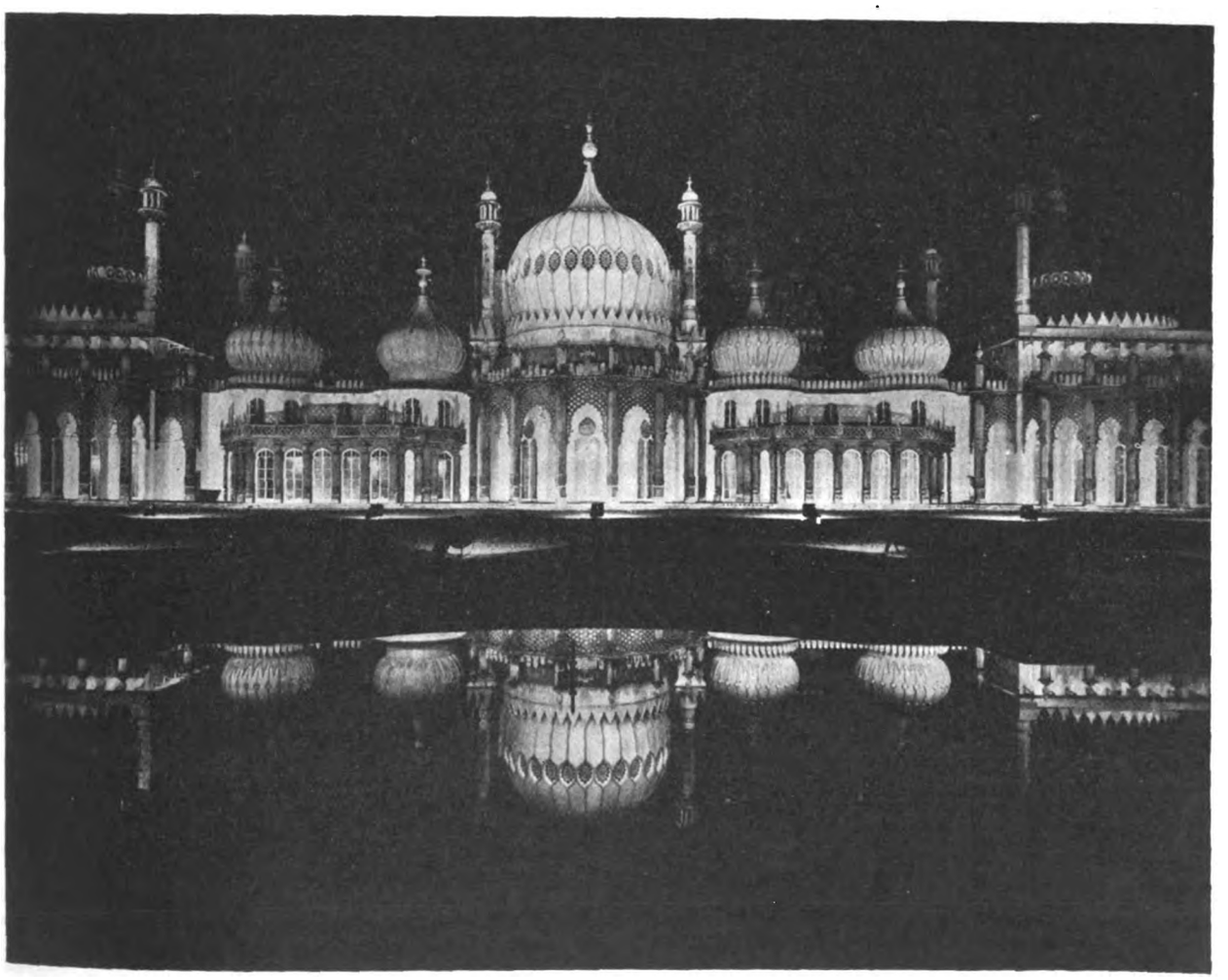
ELECTRICAL NEWS IN PICTURES

A new electrical device which is being tested in a New York cinema theatre in an endeavour to discover the type of screen humour that causes the public to laugh most.

In spite of dull weather the Western Union Telegraph Co.'s sports meeting at Merton Abbey on Monday was a great success. Our photo shows the Threadneedle Race in progress.



This remarkable picture was taken by Mr. G. W. King, of Brighton Corporation Electricity Department when the Royal Pavilion was floodlighted for the E.C.A. Conference. Arranged by the G.E.C., in conjunction with Mr. J. Christie and Mr. King, the display formed one of the finest examples of spectacular floodlighting that has yet been presented. The shadow effect seen in the picture was obtained by setting the camera as near the ground as possible. Considering that the pool only measures about 15 ft. by 10 ft. the result is very striking.

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WIRELESS NEWS.

Preliminary List of Exhibitors at the National Radio Exhibition.

AMONG the exhibitors at the National Radio Exhibition to be held at Olympia, London, from September 4th to 18th are :

Alphian Wireless, Ltd.; " The Amplion Magazine " ; Autoveyors, Ltd.; Auto Sundries, Ltd.

B.S.A. Radio, Ltd.; Beard and Fitch, Ltd.; Belling and Lee ; Benjamin Electric, Ltd.; Blackadda Radio Co., Ltd.; G. Bowerman, Ltd.; Bowyer-Lowe Co., Ltd.; Brandes, Ltd.; Bretwood, Ltd.; Britain's Best Crystal, Ltd.; British Ebonite, Co., Ltd.; British Thomson-Houston Co., Ltd.; S. G. Brown, Ltd.; Brownie Wireless Co., Ltd.; Burndept Wireless, Ltd.; Burne Jones, and Co., Ltd.

Cable Printing and Publishing Co., Ltd.; Cahill and Co., Ltd.; Camden Engineering Co., Ltd.; Cassell and Co. (of Great Britain), Ltd.; Celestion Radio Co.; Chloride Electrical Storage Co., Ltd.; Clarke Bros. (Leicester), Ltd.; Clayton Rubber Co., Ltd.; Cleartron Radio, Ltd.; Climax Radio Electric, Ltd.; E. K. Cole ; Collinson and Co.; Collinson's Precision Screw Co., Ltd.; Colonial and Technical Press, Ltd.; A. C. Cossor, Ltd.; Peter Curtis, Ltd.

D. P. Battery Co., Ltd.; Detex Distributors, Ltd.; A. J. Dew and Co.; Wm. Dibbon and Sons ; Dirigold, Ltd.; Dubilier Condenser Co. (1925), Ltd.

Eagle Engineering Co., Ltd.; East London Rubber Co.; J. J. Eastick and Sons ; Edison Bell, Ltd.; Edison Swan Electric Co., Ltd.; Electron Co., Ltd.; Ericsson Telephones, Ltd.; Ever Ready Battery Co.

Falk Stadelmann and Co., Ltd.; J. Fallowfield, Ltd.; Felcourt Products, Ltd.; Fellows Magneto Co.,' Ltd.; Finston Manufacturing Co., Ltd.; Formo Co.

H. J. Galliers ; A. W. Gamage, Ltd.; Garnett, Whiteley and Co., Ltd.; General Electric Co., Ltd.; Gent and Co., Ltd.; Alfred Graham and Co.

Halcyon Wireless Supply Co., Ltd.; Hart Accumulator Co., Ltd.; Hart Collins, Ltd.; W. J. Henderson and Co., Ltd.; A. Hinderlich ; Hobday Bros., Ltd.; Houghton Butcher (Great Britain), Ltd.

Igranic Electric Co., Ltd.; Iliffe and Sons, Ltd.

S. A. Lamplugh, Ltd.; Lisenin Wireless Co., Ltd.; Lissen, Ltd.; Lithanode Co., Ltd.; London Electric Stores, Ltd.; London and Provincial Radio Co., Ltd.

M. P. A. Wireless ; L. McMichael, Ltd.; Manufacturers' Accessories Co., Ltd.; Marconiphone Co., Ltd.; Masson Seeley and Co., Ltd.; Metro-Vick Supplies, Ltd.; Mullard Radio Valve Co., Ltd.

Odhams Press, Ltd.; Ormond Engineering Co., Ltd.; Oxford Wireless Telephony Co.

Paragon Rubber Manufacturing Co., Ltd.; Penton Engineering Co.; Peto Scott and Co., Ltd.; Portable Utilities Co., Ltd.; W. G. Pye and Co.; H. Quartermaine.

Radiax, Ltd.; Radi-Arc Electrical Co., Ltd.; Radio Communication Co., Ltd.; Radio Instruments, Ltd.; Radio Press, Ltd.; Radio Reception Co.; Radiolian Co.; M. Raybould ; Rectalloy, Ltd.; Redferns Rubber Works, Ltd.; Louis H. Reid ; Ripaults, Ltd.; Rotax (Motor Accessories), Ltd.

J. W. See and Son ; " Sel-Ezi " Wireless Supply Co., Ltd.; Selfridge and Co., Ltd.; Siemens Brothers and Co., Ltd.; Spring Washers, Ltd.; A. J. Stevens and Co. (1914), Ltd.; Stratton and Co., Ltd.; Sun Electrical Co., Ltd.; Sylvex, Ltd.

Trader Publishing Co., Ltd.; Trelleborg's Ebonite Works, Ltd.; Tudoradio Co., Ltd.; Tungstone Accumulator Co., Ltd.; Tunometer Works ; Universal Bracket Co.; C. A. Vandervell and Co., Ltd.

Watmel Wireless Co., Ltd.; Weston Accumulator Co., Ltd.; Whittingham Smith and Co., Ltd.; Wilkins and Wright, Ltd.; Worsnop and Co., Ltd.; and Wright and Weaire, Ltd.

Institute of Wireless Technology.

In order that prospective candidates for the October examinations of the Institute of Wireless Technology may have every assistance in obtaining full particulars, we are asked by the hon. secretary, Mr. Y. W. P. Evans, 71, Kingsway, London, to give the following list of the Institute's official representatives at home and abroad :—

LONDON AND S.E. AREA : H. King, 2, Henslowe Road, East Dulwich, London, S.E.22 ; Capt. J. H. Tanton, " Torrington," Alan Road, Wimbledon Hill, London, S.W.19 ; A. F. H. Baldry, 69, Philbeach Gardens, Earls Court, London, S.W.5. MIDLAND AREA : H. W. Gambrell, 36, Manor Road, Rugby. N.E. AREA : A. Woodmansey, Royal Baths Laboratory, Harrogate. N.W. AREA : A. V. Simpson, 28, Westgate, Burnley ; J. S. McLeod, 327, Blackburn Road, Bolton. S.W. AREA : T. A. F. Lowe, 12, Bedford Park, Plymouth. SCOTLAND : J. L. Cannon, 14, Woodcroft Avenue, Broomhill, Glasgow. IRISH FREE STATE : W. J. Byrne, 5, Lower Buckingham Street, Dublin. CHANNEL ISLANDS : A. M. Houston-Fergus, La Cotte, La Moye, Jersey. INDIA : Capt. P. Ryan, Post and Telegraphs, Simla ; R. Nesbit Hawes, Divisional Wireless Engineer, Calcutta. AUSTRALIA : T. E. Moore, 4, Doem Street, East Kew, Melbourne. NORTH BORNEO : C. F. Newton Wade, Jesselton. MALAY STATES : Andrew H. Carson, Kuala Lumpur, Federal Malay States. TURKEY : Donald T. Lee, 370, Pera, Constantinople.

Confiding in the Retailer.

In view of the somewhat unhappy relations between certain radio manufacturers and traders, particularly with regard to the making of price reductions without warning, retailers will be interested to learn that one well-known manufacturing firm announces its decision to take the trade into its confidence, and intimates that alterations will be made in the prices of its products in the near future and in the discounts on them. In the meantime (the firm adds) the trade are advised to buy small quantities and often—just sufficient for current needs.

Wireless News in Brief.

In Durban the annual wireless receiving licence fee of £2 5s. is to be paid by monthly instalments.

A Toronto firm desires to receive quotations for seven-strand aerial wire and three types of insulated ground wire. Particulars are obtainable from the Department of Overseas Trade, 35, Old Queen Street, Westminster, S.W.1.

It is understood that representatives of members of the N.A.R.M.A.T. and the Society of Radio Manufacturers have found a basis upon which to form a joint organisation to be called the Radio Manufacturers' and Distributors' Association.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

THE maximum 2d. fare, which was introduced last week on the Glasgow Corporation tramways has met with considerable success. The revenue on the first day was £6 679, compared with £6 271 on the corresponding day last year, and £6 148 on the corresponding day of the previous week.

Scarborough Corporation has appointed a special subcommittee to consider generally the question of transport facilities in the borough, including the suggested acquisition of the Scarborough Tramways Co.'s undertaking, and the subcommittee has been authorised to obtain any necessary advice.

The Ministry of Transport has approved the scheme for the construction of a passenger tube railway under the river Tyne, promoted by Mr. E. Chalmers Kearney and the Kearney High Speed Tube Railway Co. The railway is to connect North and South Shields. The Ministry of Transport is prepared to bring in a Bill to authorise the carrying out of the project.

It was reported recently to Oldham Tramway Committee that no agreement had been reached with the Royton Council in regard to the proposed reconstruction of the tramway track from Sheepfoot Lane to Royton Town Hall. The Oldham Tramway Committee is of opinion that the reconstruction is long overdue, but Royton Council will not agree to have the work done.

The Portsmouth Trades Council and Labour Party have decided to ask the Prince of Wales to receive a deputation of workers when he visits Portsmouth this month to receive the Freedom of the City. The matter which it is desired to place before the Prince is the position of 102 tramwaymen who were dismissed during the General Strike on account of their refusal to return to work.

The Passimeter system of issuing tickets is to be introduced at the Temple, Putney Bridge, Mile End, Baker Street, Hammersmith, West Kensington, Finsbury Park and Holborn " Underground " stations. There are already 27 stations on the system equipped with Passimeters. The Berlin Underground Railways have decided recently to adopt the Passimeter system of booking as originally introduced on the London Underground Railways.

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ELECTRICITY SUPPLY.

Birmingham's Proposed New £1 371 400 Station—A Special Tariff for Poultry Farms—Dalkeith Conversion Scheme—Special Orders.

THE Editor will be glad if the managers of municipal electricity undertakings will send him copies of the accounts of such undertakings when ready.

Leyton U.D.C. has received sanction to a loan of £19 500 for converting plant and switchgear.

The Derbyshire and Nottinghamshire Electric Power Co. has applied for an Order to supply electricity in the Leake rural district.

Accrington Electricity Committee has agreed to the electricity staff's suggestion for a re-classification of the undertaking from Class E to Class F.

Sedgefield R.D.C. has withdrawn its objection to the erection of overhead cables across public highways or footpaths on the route from Fishburn to Sedgefield.

Shoebury U.D.C. has applied for a Special Order to supply electricity in Shoebury Urban District. Objections to the Electricity Commission by July 14th.

In view of the coal dispute, Blackpool Electricity Committee has agreed to suspend the minimum guaranteed consumption for light, heat and power for the June quarter.

The Ayrshire Electricity Board has submitted to Ayr T.C. plans showing roads and streets in which it is proposed to lay new cables and kiosks and section pillars which it is intended to erect.

Darwen T.C. is applying for sanction to instal a 2 000 kW turbo-alternator and a Lancashire boiler. The application was first made to the Mid-Lancashire Advisory Board, but was unsuccessful.

Preston Electricity Committee has adopted the following scale of charges for electricity for commercial poultry farms: First 1 000 kWh per quarter, 2d. per kWh; beyond, 1½d.; discount, 5 per cent.

Birmingham Electric Supply Committee recommends the City Council to approve the scheme for the erection and equipment of a generating station at Hams Hall, at a total expenditure of £1 371 400.

Dr. J. A. Purves has applied for an Order to generate and supply electricity in the borough of South Molton and the rural district of South Molton. Objections to the Electricity Commission by July 29th.

Part of the new control room which has just been completed at Belfast Electricity Department's Harbour power station.

An application has been made by the West Lancashire R.D.C. for an Order to generate and distribute electricity in the parishes of Maghull and Lydiate. Objections to the Electricity Commission by July 26th.

Pudsey T.C. is seeking permission to borrow £10 000 for the reorganisation and extension of its electricity undertaking. The Council has an agreement to take a bulk supply from the Yorkshire Electric Power Co. until 1945.

The Linton Mills Estates Co., Ltd., has applied for a Special Order to supply and distribute electricity in Grassington, Threshfield and Linton, in the rural district of Skipton. Objections to the Electricity Commission before July 16th.

Whitehaven R.D.C. has received an offer from the Moresby Colliery Co. to give a bulk supply for public lighting at Moresby at 1d. per kWh, metered at the colliery switchboard at Walkmill. An estimate of the cost of standards and main laying is to be prepared.

Bristol Corporation has made an application for an Order to extend its area of supply so as to include certain parishes in Chipping Sodbury, Thornbury, Warnley, and Keynsham rural districts. Objections to the Electricity Commission by July 23rd.

Another view in the new control room at the Harbour power station at Belfast.

Dalkeith T.C. decided last week to adopt a scheme for the conversion of the electricity supply in the burgh from d.c. to a.c. at a cost of £13 200, in addition to the purchase of the existing undertaking from the Electric Supply Corporation at £18 000.

Lowestoft Corporation has applied for a Special Order to extend its electricity supply area to the borough of Southwold and parts of Mutford and Lothingland, Wangford and Blything rural districts. Objections to the Electricity Commission by July 24th.

Sutton Coldfield T.C. intends to apply for a Special Order to extend its area for electricity supply to part of the parish of Great Barr in Walsall rural district and part of the parish of Shenstone in Lichfield rural district. Objections to the Electricity Commission by July 30th.

At the meeting of Edinburgh T.C. on July 1st the recommendation to accept the tender of the British Brown-Boveri Co. for two turbo-alternators, at £138 000, was adopted by 43 votes to 8. It was stated that the contractors had agreed to spend 35 per cent. of the cost in this country.

Bedford Electricity Committee has decided to lay a power cable from the generating station in Lurke Street, with transformers and switchgear, at a cost of £1 700; and lighting cables from Bromham to Church End, Kempston, £1 450; to Milton Ernest village, £4 800; and to Stagsden Road, £568.

Electrical Distribution of Yorkshire, Ltd., is applying for a Special Order to generate and distribute electricity in numerous towns and rural districts in the West and North Ridings of Yorkshire, including the borough and rural district of Ripon, the rural districts of Knaresborough, Great Ouseburn, Thirsk, etc. Copies of the draft Order can be obtained (2s. each) from Torr, Durnford and Co., 2, Millbank House, Westminster, S.W.1. Objections to the Electricity Commissioners by July 31st.

The Minister of Transport proposes to confirm the Bolsover Electricity Special Order (objections to the Ministry of Transport by July 10th), the Hastings Electricity (Extension) Special Order (objections by July 12th), the Ryburn Valley and District Special Order (objections by July 19th), the Yarmouth (Isle of Wight) Special Order (objections by July 19th), the Herne Bay and District Special Order (objections by July 17th), the Nantwich Special Order (objections by July 19th), the Salcombe and Kingsbridge Special Order (objections by July 19th), the Barton and Urmston Special Order (objections by July 19th), and the Uphill Special Order (objections by July 17th).

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COMPANY NEWS.

No Great Activity in Electrical Shares—Manufacturing Descriptions Quietly in Demand—British Broadcasting Company's Results.

WHILE no great degree of activity has been witnessed during the past week in the market for electrical shares, equipment companies' descriptions have been quietly in demand, though without any very marked effect upon prices. Edison Swan 4s. shares, with a threepenny rise, are up to 10s., and General Electrics have advanced 1s. 3d., to 30s. 6d. English Electric and Siemens shares are both 7½d. lower. Telegraph Construction £12 shares have improved 5s., and are now 28½. Eastern Telegraph ordinary stock is 2 points higher at 184½, and Eastern Extension £10 shares are ¼ up at 18½. Western Telegraph shares of like denomination have risen ¼, but Great Northerns at 27 have shed ½. In the lighting group County of London shares have been supported and have gained 1s. 3d.; Westminsters have lost the same amount.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest
	Electricity Supply.				
0	Brompton & Kensington Ord.	31/10½	31/10½	45/-	24/-
4	Central Elec. Supp. 4% Deb..	90	90	100	67
15	Charing Cross Elec. Ord. (£1)..	45/7½	45/7½	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/-	17/-	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	48/1½	48/1½	52/6	20/3
6	,, ,, 6% C.P. ..	22/6	22/6	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	59/4½	58/1½	61/3	14/6
6	,, ,, 6% C.P. ..	22/6	22/6*	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	13¾	13¾	13½	3¾
10	Lon. Elec. Sup. Ord. (£1) ..	32/6	32/6	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	36/10½	36/10½	41/6	8/-
4½	,, ,, 4½% C.P...	17/-	17/-	18/6	9/6
7	N'castle & Dist. Supp. Ord. ..	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/10½	21/10½	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	21/10½	21/10½	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord (£5) ..	16½	16½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	43/1½	44/4½	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/-	17/-	21/6	13/-
8	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
6	,, ,, 6% C.P...	22/-	22/-	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	140	140	123	24
6	,, 6% Pf. Stk.	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69	69	89½	40½
4	,, ,, 4% Deb. ..	80	80	103	56½
4	City & S. Lon. 4% Perp. Deb.	78½	78½	102½	50
5	Lancs. Un. Trans. & Pow. 5% Deb.	97½	97½	88	60
3½	Lon. Elec. Rly. Cons. Ord. Stk.	52½	52½	73½	10
4	,, ,, 4% Pf. Stk. ..	73½	73½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	77	77	89	65
4	Lon. Un. Trams. 1st Deb. ..	47	47	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	64½	64½	101½	49
5	,, 5% Deb. ..	68½	68½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	64½	64½	84½	19
3½	,, 3½ Pf. Stk.	64½	64½	88½	40½
3½	,, 3½% Deb.	70½	70½	92½	51
3½	Met. Dis. Rly. Ord. Stk. ..	53½	53½	58	12½
4½	,, ,, 4½% 1st Pref. ..	78½	78½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb	65	65	73½	48½
—	Underground Elec. Rlys. Ord. (£10)	3½	3½	5½	21/3
5	Yorks. (W.R.) Trams. Ord. ..	11/-	11/-	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
†3½	Brit. Elec. Transformer 7% C.P.	18/9	18/9	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	70/-	70/-	62/-	26/6
6	,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	22/9	22/9	23/4	19/7½
7	,, ,, ,, 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	26/3	26/3	29/-	10/-
‡15	Callender's Cable Ord.	66/3	66/3	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref...	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)..	10/-	9/9	28/9½	1/11
7½	,, ,, 1st Pref...	22/6	22/6	26/-	5/-
10	Elec. Construction Ord. ..	31/10½	31/10½	30/4	6/7½
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	15/-	15/7½	29/3	7/3
6	,, ,, 6% C.P... ..	19/-	19/-	21/3	10/6
6	Ericsson Telephones 6% C.P...	21/3	21/3	21/-	12/7½
6	Ferranti 6% Pref.	16/3	17/9	18/6	16/9
7	,, 7% 2nd Pref... ..	18/1½	18/-	19/-	13/9
5	,, 1st Mort. Deb. Stock..	91½	91½	96½	80½
7½	General Elec. Ord.	30/6	29/3	59/-	13/6
20	W. T. Henley's Ord.	77/6	77/6	86/6	23/3
10	Johnson & Phillips Ord. ..	65/-	65/-	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	25/-	25/-	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	50/-	50/-	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	28/1½	28/9	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	28½	28½	56/2/6	19½
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb ..	74½	74*	87½	60
10	Eastern Ord. Stk.	184½	182½	213½	113/2/6
3½	,, 3½% Pref. Stk.	63½	63½	84/17/6	49
4	,, 4% Deb. ..	79½	79½	103½	60
10	Eastern Extension Ord. (£10)..	18½	18½	21½	10/12/6
4	,, ,, 4% Deb. ..	79½	79½	97½	60
22	Gt. Northern Telegraph (£10)..	27	27½	42/12/6	19
7	Indo-European (£25)	45½	45½	59½	25
15	Marconi's Wireless T. Ord. ..	22/6	22/6	9/16/3	20/9
7½	,, Int. Mar.	21/3	21/3	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	18¾	18	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	79½	79½	10	60/2/6

† For half year to June, 1925. ‡ Ex share bonus.

TELEPHONE CONSTRUCTION CO., LTD.—Intm. div. 6s. p. sh. tax free.

BOURNEMOUTH AND POOLE ELECTRICITY SUPPLY CO., LTD.—Intm. div. on a/c of 1926, 4½ p.c. on ord. shs.

CHILI TELEPHONE CO., LTD.—Fin. div. 3 p.c. for six months ended March 31st, making 6 p.c., tax free, for year.

RICHMOND (SURREY) ELECTRIC LIGHT AND POWER CO., LTD.—Intm. div. 4 p.c., less tax, on ord. shs. on a/c of 1926.

BRITISH BROADCASTING CO., LTD.—Rept. states that income from licences having been limited by Government to £500 000, progress has been retarded. A sum of £159 463 out of rev. has been placed to cap. and depreciation res. After providing for cap. and appreciation res., taxes and provident fund, blce. is £6 418. Div. 7½ p.c., fwd., £1 110.

UNDERGROUND GROUP.—Following intm. divs. for half yr. to June 30th are announced :—*Metropolitan District Railway :* 2 p.c. on 4 p.c. guaranteed stk. ; 2½ p.c. on 4½ p.c. 1st pref. stk. ; 2½ p.c. on 5 p.c. 2nd pref. stk. ; 1½ p.c. on ord. stk. *London Electric Railway :* 2 p.c. on 4 p.c. pref. stk. ; 1¾ p.c. on consol. ord. stk. *City and South London Railway Co. :* 2½ p.c. on 5 p.c. pref. stks. ; 1½ p.c. on consol. ord. stk. *Central London Railway :* 2 p.c. on undivided ord. stk. ; 2 p.c. on prefd. ord. stk. *Underground Electric Railways Co. of London, Ltd. :* 3 p.c. on 6 p.c. 1st cum. income deb. stk. ; 3 p.c., tax free, on 6 p.c. income bonds. *Associated Equipment Co., Ltd. :* Directors will deal with question of dividend when whole yr.'s accts. are available.

BRITISH EMPIRE TRUST CO., LTD.—At the recent annual meeting dividends were approved of 5 per cent. on the cumulative perpetual preference shares 5 per cent. and 3 per cent., making 8 per cent. for the year, on the employees profit participating shares, 5 per cent. on the preferred ordinary shares and 7 per cent. on the deferred ordinary shares, and the carry forward is £80 838, against £87 043. Mr. J. Davidson, who presided, gave particulars of the companies with which the Trust is associated, including the British Columbia Electric Railway Co., Canadian Western Natural Gas, Light, Heat and Power Co., Monterey Railway, Light and Power Co., and West Gloucestershire Power Co.

CROMPTON AND CO., LTD.—Mr. A. A. Campbell Swinton, at the annual meeting, said the trading profit was £25 371, against £29 672. It was proposed to pay a dividend of 3½ per cent. on the preference shares, making 7 per cent. The position during the latter half of 1925 was anything but satisfactory, but from January there appeared to be a distinctly better tone, and, until the coal strike, orders booked were much more satisfactory. Orders were still coming in well for their patent auto-synchronous motor, and they were about to put on the market a series of motors designed to fulfil the same purpose for smaller outputs, and for those machines there was also quite a good demand. Satisfactory orders had been received for rotary converters. They still did a large export business, but prices ruled low. The report was adopted.

New Companies.

BEKO LAMP CO., LTD.—Cap., £100. Manufacturers of, agents for and dealers in incandescent electric lamps, etc. Solicitors : Jenkinson, Heyler and Co., 5, Frederick's Place, London, E.C.

CABLE, TELEPHONE AND GENERAL TRUST, LTD.—Cap., £202 000. Investment and trust company, etc. Solicitors : Linklaters and Paines, 2, Pond Court, Walbrook, London, E.C.4. (Public company.)

CEAG, LTD.—Cap., £1 000. To acquire business carried on by the Ceag Miners' Supply Co., Ltd., Barnsley, to acquire trade mark "Ceag," No. 346 135, and carry on business of manufacturers, importers and exporters of and dealers in electrical and other safety lamps for use in mines, etc. Reg. office : Queens Road, Barnsley.

CORNWALL POWER CO., LTD.—Cap., £210 000. To carry on business of electric light and power company and to adopt agreement with the Urban Electric Supply Co., Ltd., for the sale to the company of all shares held by the Urban Co. in the Cornwall Electric Power Co. Reg. office : Broad Sanctuary Chambers, Westminster, S.W.1. (Public company.)

EDISON SWAN CABLES, LTD.—Cap., £150 000. To adopt agreements between Lydbrook Cables, Ltd. (in. vol. liquidation), F. V. Hasemore and this company and with the Edison Swan Electric Co., Ltd., to develop and turn to account the business of manufacturers of and dealers in cables and wires, insulating material, electrical, wireless and vulcanising equipment. Reg. office : Lydbrook, Gloucestershire. (Public company.)

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.]

BOND, SON AND POULTON, 6, Lorenzo Street, Pentonville Road, N., electrical engineers. £15 2s. 2d., May 20th; and £12 1s. 3d. May 11th.

BONE, Welby, Garden Suburb, Burry Port, electrical contractor. £91 16s. 10d. May 18th.

INGHAM BROTHERS, 56, Manchester Road, Bradford, electrical factors. £13 10s. 10d. June 3rd.

ORMSBY, L., AND CO., 28, Page Street, Westminster, wireless manufacturers. £14 3s. 4d. May 19th.

SPEED, Mr. J. A. (trading as J. A. JACKSON), 6, Queen Street, Liverpool, commission agent and electrical engineer. £32 9s. 6d. June 7th.

Private Meetings, etc.

[Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.]

RAPINET, LTD., manufacturers of wireless instruments and accessories, 39–47, Grosvenor Road, Earlsfield, London, S.W. The statutory meeting of creditors in the voluntary winding-up of this company (THE ELECTRICIAN, 25/6/26, p. 689) was held on July 1st, at the Institute of Chartered Accountants, Moorgate Place, E.C. The chair was occupied by the liquidator, Mr. S. Sharpe, C.A., of Balfour House, Finsbury Pavement, E.C., who submitted a statement of affairs which disclosed ranking liabilities of £1 652. The indebtedness to the trade was £499, and Mr. D. J. Phillips was shown as a cash creditor for £1 153. According to the books the assets totalled £1 585, but they were estimated to realise only £382. There were debentures in existence for £1 000 and interest accrued of £45. The assets were therefore insufficient by £663 to allow the debenture holders to be paid in full, and there was nothing available for the unsecured creditors. The assets consisted of cash at bank, 9s.; book debts, £341, estimated to realise £114; stock and work in progress, £336, estimated to produce £148; and plant and machinery, £308, valued at £120. The patent rights stood in the books at £600, but no value was placed upon them at the moment. The liquidator stated that accounts of the company were prepared as at December 31st last, and they showed a turnover of £1 840, a gross loss on the trading of £52, and a net loss of £948. During the present year the net loss on the trading had been £1 119. The turnover during the period of practically six months was only £313. With regard to the book debts, a number were bad and other customers refused to pay, alleging that the goods were faulty. The stock consisted very largely of components, and would be difficult to dispose of. He was afraid the patent rights were not of very great value. Latterly the company had done practically no trade at all. Mr. Phillips had been advancing money to keep the company going, but when a writ was issued he refused to find anything further and voluntary liquidation took place. In answer to questions, the liquidator said that Peerless Productions, Ltd., were creditors for £50, money advanced to the company. Both the concerns carried on business at the same address. The premises were owned by Mr. D. J. Phillips, who let a portion to Rapinet, Ltd., at £100 per annum, and no rent had been paid to him. Rapinet, Ltd., had manufactured various articles, including small portable wireless sets and a fault finder. The latter seemed to have been one of the most important articles. It was marketed at 2s., but apparently cost the company 2s. 6d. to produce. No resolution was passed, and therefore the voluntary liquidation will be continued, with Mr. Sharpe as liquidator.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Companies Winding-up Voluntarily.

KNOWSLEY ELECTRICAL CO., LTD. T. Robson, chartered accountant, 43, Castle Street, Liverpool, appointed liquidator, June 25th. Meeting of creditors at the Common Hall, Hackins Hey, Liverpool, on Thursday, July 15th, at 3 p.m.

MIDLAND WIRELESS MANUFACTURING AND SUPPLY CO., LTD. R. E. Clark, 17, Albion Street, Hanley, chartered accountant, appointed liquidator, June 24th.

Bankruptcy Information.

McMULLINS, Charles, 9, Tanygroes Street, Port Talbot, Glamorgan, electrician, etc. First meeting, July 10th, 11 a.m., Official Receiver's offices, Government Buildings, St. Mary's Street, Swansea. Public examination, July 13th, 10.45 a.m., Town Hall, Neath.

MUNDAY, Edison Douglas Stuart, 272, Lake Road, Portsmouth, Hants, electrical engineer. Receiving order, July 1st. Debtor's petition.

RENNIE, John George Fowler, electrical engineer, 19, Bridge Street, Andover, Southampton. Receiving order, July 1st. Debtor's petition.

WARNER, Rupert Charles John, and PEARCY, Stanley Reginald, 28, Hill Street, Poole, Dorset, electrical and radio engineers, trading as WARNER AND CO. First meeting, July 15th, 12 noon, Law Courts, Stafford Road, Bournemouth. Public examination, August 6th, 2.30 p.m., Law Courts, Stafford Road, Bournemouth.

WARREN, Walter John (trading as COLEMAN AND WARREN) 66, Victoria Street, Westminster, S.W.1. wholesale electrical supplies. Receiving order, July 2nd. Debtor's petition.

WILSON, Alfred Charles Ward, of Wepre, Higher West Cross Lane, Swansea, electrical engineer. First meeting, July 14th, 11 a.m., Official Receiver's offices, Government Buildings, St. Mary's Street, Swansea. Public examination, July 23rd, 11 a.m., Town Hall, Swansea.

Partnerships Dissolved.

DENNIS AND JAMES (Russell WEAVER and Richard Alexander James BRETT), electrical engineers, Triumph House, 189, Regent Street, London, W.1, by mutual consent as from May 31st, 1926, so far as concerns R. A. J. Brett, who retires from the firm by reason of ill-health. Debts received and paid by R. Weaver, who will continue the business.

H. W. HAMBLIN (Henry Thomas HAMBLIN and Herbert Wilson HAMBLIN) 93, East Street, Chichester, radio engineers, by mutual consent, June 3rd, 1926. The business will be carried on by H. T. Hamblin (as sole proprietor), under the style of Hamblin.

LEWIS AND MAYER (Herbert Ernest Basil LEWIS and Edwin Thomas MAYER), Subway Road, Barry Dock, Glamorganshire, electrical engineers and contractors, from April 30th, 1926. Debts received and paid by E. T. Mayer.

Bankruptcy Proceedings.

RADIO PHONOPORE ELECTRICALS, LTD., 58, Coleman Street, London, E.C.—Under a winding-up order made against this company on June 15th the statutory meetings of the creditors and of the shareholders were held on June 30th at the Board of Trade offices, 33, Carey Street, W.C. The Official Receiver said that no statement of the company's affairs had yet been lodged. The liabilities were said to amount to about £12 000, all of which were unsecured, but some of them were guaranteed by the directors and others including the bank overdraft of £3 515, and also the liability of £1 300 due to the petitioning creditors. The assets, apart from book debts, £100, consisted of stock, office furniture, plant, etc., which were stated to be worth £2 500 if taken as a going concern, but if realised by a forced sale not more than £750. The directors were negotiating with various persons with a view to the business being taken over as a going concern.

Metal and Chemical Prices.

TUESDAY, July 6th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£62 5 0	5s. 0d.	—
Electro Wirebars	,,	£65 0 0	—	—
H.C. Wire, basis	per lb.	9 7/16d.	—	—
Sheet	,,	9 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 1 7/16d.	—	—
Brass 60/40—				
Rod, basis	per lb.	7½d.	—	—
Sheet, basis	,,	9½d.	—	—
Wire, basis	,,	9 7/8d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£4 6 6	2s. 6d.	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£13 10 0	—	—
Lead Pig—				
English	,,	£31 10 0	5s. 0d.	—
Foreign or Colonial	,,	£30 2 6	5s. 0d.	—
Tin—				
Ingot	,,	£275 17 6	£3 12s. 6d.	—
Wire, basis	per lb.	3s. 6d.	¼d.	—
Aluminium Ingots	per ton	£120 0 0	—	—
Spelter	,,	£33 15 6	12s. 6d.	—
Mercury	per bottle	£15 10 0	—	—

Sodium Chlorate—Per lb. 3d.
Sulphur (Flowers)—Ton £11 10 0 *Sulphuric Acid* (Pyrites, 68°)
,, (Roll-Brimstone)—,, £10 5 0 per ton, £6 15 0
Copper Sulphate— ,, £25 to £25 10 0
Sodium Bichromate—Per lb. 3½d.
Boric Acid (Crystals) ,, £37
Rubber—Para fine, 1s. 7¼d.; plantation 1st latex, 1s. 8¼d.

The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

238 433 J. W. KIRKLAND (ALLGEMEINE ELEKTRICITATS GES.) Starting and short-circuiting devices for induction motors. (1/12/24.)
238 439 A. M. M. POOLE and H. C. POOLE. Tuning-coils for wireless apparatus. (11/12/24.)
238 441 J. B. M. KNUTSEN. Electric lift machines and the like. (15/12/24.)
238 442 WESTERN ELECTRIC CO., LTD. (WESTERN ELECTRIC CO., INC.). Methods of sheathing electrical conductors and like cores. (17/12/24.)
238 443 A. SHAW and F. FAIRER. Intermittent electric-light fitting. (20/12/24.)
238 453 BRITISH THOMSON-HOUSTON CO., LTD., and J. SUGDEN. Overload electric relays. (10/1/25.)
238 459 E. DIXON and C. J. E. DIXON. Combined wireless valve-holder and rheostat. (21/1/25.)
238 462 P. C. RUSHEN (PACENT ELECTRIC CO.). Variable resistance device. (31/1/25.)
229 297 INTERNATIONAL GENERAL ELECTRIC CO. INC. Electric switches. (11/2/24.)
238 468 H. J. FITZPATRICK. Electrical relays. (13/2/25.)
230 446 PORCELAINFABRIKEN NORDEN AKTIESELSKABET. Electric insulators. (5/3/24.)
238 477 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and J. E. OSTLINE. Automatic or semi-automatic telephone systems. (16/5/24.) (Divided Application on 12 136/24.
238 480 LODGE-COTTRELL, LTD. (formerly LODGE FUME CO., LTD.) (METALBANK UND METALLURGISCHE GES.-AKT.-GES.). Process for electrical gas purification. (23/3/25.) (Addition to 177 117.)
231 505 INTERNATIONAL GENERAL ELECTRIC CO., INC. Relays for the protection of alternating electric current systems. (25/3/24.)
221 180 E. L. WIEGAND. Electrical heating elements. (31/8/23.)
216 854 BRITISH THOMSON-HOUSTON CO., LTD. Systems of electric ship propulsion. (28/5/23.) (Addition to 147 029.)
238 594 W. J. BROWN, E. Y. ROBINSON, B. A. G. CHURCHER, and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Apparatus for obtaining substantially steady heating effects from alternating current. (15/5/24.)
238 603 A. H. BRACKENSEY and FRANCO-BRITISH ELECTRICAL CO., LTD. Coloured electric incandescent lamps for advertising signs and the like. (20/5/24.)
238 604 E. GARVANI. Current limiters for alternating or direct currents. (20/5/24.)
238 610 A. COMPARE. Crystal rectifiers for wireless reception. (21/5/24.)
238 611 BRITISH THOMSON-HOUSTON CO., LTD., and L. GRIFFITHS. Electric ignition systems for twin-cylinder internal combustion engines. (21/5/24.)
238 617 R. D. PHILLIPS. Construction of aerial for wireless telegraphy. (22/5/24.)
238 627 BRITISH THOMSON-HOUSTON CO., LTD. (COMPAGNIE FRANCAISE POUR L'EXPLOITATION DES PROCEDES THOMSON-HOUSTON). Electric relays for disconnecting polyphase apparatus. (24/5/24.) (Addition to 202 744.)
238 632 A. E. L. SCANES and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Receivers for high frequency signals. (28/5/24.)
238 638 F. B. HOLT. Means for maintaining harmony between the speeds of electric motors. (31/5/24.)
238 640 W. ESCHBACH. Electric time fuses for blasting. (2/6/24.) (Addition to 210 518.)
238 641 A. H. RAILING, W. WIDDOWSON and A. E. ANGOLD. Clamping device for electric transformer windings. (4/6/24.)
238 644 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and W. SAVILLE (AUTOMATIC CO., in part). Telephone systems. (5/6/24.)
238 647 IGRANIC ELECTRIC CO., LTD. (CUTLER-HAMMER MANUFACTURING CO.). Rheostats and operating means therefor. (10/6/24.)
238 648 T. H. MCQUINN. Electric water heater. (10/6/24.)
238 655 A. H. HUNT. Wander plugs for use with high tension batteries and the like. (21/6/24.)
238 660 BRITISH LIGHTING AND IGNITION CO., LTD., and J. C. HUTTON. Variable speed dynamo electric machines. (23/6/24.)
238 669 FULLER'S UNITED ELECTRIC WORKS, LTD., and A. P. WELCH. Tuning coil holders for use in connection with wireless telegraphy and the like. (10/7/24.)
238 670 L. J. SIMON. Terminal for electric and wireless connections. (11/7/24.) (Cognate Applications 23 470/24 and 25 237/24.)
238 680 T. L. R. COOPER. Dynamo-electric machines. (24/7/24.)
238 716 SIEMENS BROS. AND CO., LTD., and L. DE M. G. FERREIRA. Electrically-driven apparatus for operating railway signals, train stops, and the like. (16/9/24.)
238 726 LUCAS, LTD., O. LUCAS and W. H. EGGINTON. Electric lamps for motor vehicles. (27/9/24.)
223 570 G. P. DENEEF and M. J. A. BOISSON. Electrically-controlled direction indicator for motor cars or automobiles and other vehicles. (15/10/23.)
238 734 L. H. PADDLE and J. A. CRISP. Inductance coil mountings. (15/10/24.)
238 735 L. A. LEVY. Dry batteries. (15/10/24.)
238 757 W. D. MCGOWAN. Crystal detector for wireless reception. (8/12/24.)
238 744 J. WANGLER GES. Manufacture of vessels adapted to be electrically heated. (20/1/25.) (Addition to 213 897.)
238 775 R. F. WINDER and A. HARRISON. Carriers for electric storage batteries or accumulators. (21/1/25.)
238 793 IGRANIC ELECTRIC CO., LTD., and A. H. CURTIS. Filament rheostats and the like. (2/3/25.)
238 799 J. H. HOLMES and A. T. ROBERTSON. Dynamo-electric machinery. (6/3/25.)
238 810 GENERAL ELECTRIC CO., LTD. Metal filaments for electric incandescent lamps. (25/9/24.)
231 478 A. B. DIBNER. Electrical tee connectors. (31/3/24.)
233 360 C. LOTT. Device for indicating the correct adjustment of speed of electro-motors. (21/3/23.) (Divided application 213 275.)
238 824 A. MCMURRAY. Electric truncheon torch. (5/11/24.)
238 691 W. J. BROWN, E. Y. ROBINSON, B. A. G. CHURCHER, and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Apparatus for obtaining substantially steady heating effects from alternating current for heating the cathodes of thermionic valves or for other purposes. (15/5/24.) (Divided application on 12 030/24.)
238 911 BRITISH THOMSON-HOUSTON CO., LTD., and A. S. FITZGERALD. Protective arrangement for a polyphase alternating electric current circuit and the like. (25/2/24.)
216 114 WESTERN ELECTRIC CO., LTD. Circuits for electron discharge tubes. (16/5/23.)
238 922 F. MCKAY. Automatic telegraph devices. (28/4/24.)
238 934 C. SEYMOUR, H. G. HUGHES and H. R. CANTELO. Thermionic tubes or valves. (26/5/24.)
238 951 A. REYROLLE AND CO., LTD., F. COATES and H. W. CLOTHIER. Metal-clad electric switchgear. (28/5/24.)
238 952 A. REYROLLE AND CO., LTD., H. W. CLOTHIER and A. ALLAN. Metal-clad electric switchgear. (28/5/24.)
238 956 G. B. ELLIS (ROESSLER AND HASSLACHER CHEMICAL CO.). Electrolytic process and apparatus. (28/5/24.)
238 962 H. S. MACKAY. Electrochemical treatment of copper ores. (29/5/24.)
238 963 REYROLLE AND CO., LTD., and H. W. CLOTHIER. Electric fuse boxes. (30/5/24.)
238 964 REYROLLE AND CO., LTD., H. W. CLOTHIER and H. F. SECRETAN. Electric wall plugs and like fittings. (30/5/24.)
238 965 J. E. FAIRLIE. Leading-in means for wireless telegraphy and telephony. (30/5/24.)
238 995 L. GROSSMAN. Crystal detectors for wireless receiving sets. (24/6/24.)
238 997 H. MARRYAT and R. G. WILLIAMS. Holders for electric lamps. (25/6/24.)

Applications for Patents.

June 19th.

15 489 G. J. BLAKE and G. MCNEILL. Electric accumulators.
15 490 G. J. BLAKE, A. W. COATES, and RADIONS, LTD. Tools for manufacturing thermionic valves.
15 522 EASTERN TELEGRAPH CO., LTD., and K. L. WOOD. Telegraphic signal amplification.
15 512 GENERAL ELECTRIC CO., LTD. Electric luminous discharge tubes. (4/11/25, Germany.)
15 513 GENERAL ELECTRIC CO., LTD. Tungsten arc lamp. (3/2/26, Germany.)
15 511 J. GRIGAS. Thermal circuit controller. (8/7/25, U.S.)
15 485 J. K. HELE. Wireless apparatus, etc.
15 462 F. PALMER. Electric lamp holders.
15 459 G. D. PARK. Variable resistances.

June 21st.

15 638 AKT.-GES. BROWN, BOVERI ET CIE. Electric net-works. (26/6/25, Germany.)
15 591 ALLMANNA SVENSKA ELEKTRISKA AKTIEBOLAGET. Liquid-insulated transformers. (4/7/25, Sweden.)
15 624 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., W. O. PASSMORE, and L. M. SIMPSON. Telephone systems.
15 595 BRITISH THOMSON-HOUSTON CO., LTD. Thermoelectric generators. (22/6/25, U.S.)
15 646 DUBILIER CONDENSER CO. (1925), LTD., and W. H. GOODMAN. Electrica condensers.
15 561 FIBERLOID CO., LTD., J. E. SNOW, and O. SNOW. Coil holders for wireless.
15 548 J. H. HEWITT and WILKINS AND WRIGHT, LTD. Variable electric condensers, etc.
15 589 G. A. JUHLIN, METROPOLITAN-VICKERS ELECTRICAL CO., LTD., and R. TOWNEND. Electric rotary converters.
15 597 C. H. F. MULLER (Firm of). Electron tubes. (18/9/25, Germany.)
15 603 A. SCHLEICHER. Electric safety alarm.
15 574 SIEMENS UND HALSKE AKT.-GES. Telephone, etc., systems. (27/6/25, Germany.)
15 552 A. TULLETT. Means for attachment of electric-lamp holders.

June 22nd.

15 700 J. BETHENOD. High-frequency signalling. (25/6/25, France.)
15 689 and 15 690 BRITISH THOMSON-HOUSTON CO., LTD., W. P. HAMLYN, and H. TRENCHAM. Electric switchgear.
15 691 BRITISH THOMSON-HOUSTON CO., LTD., and R. D. PARRY. Electric regulating devices.
15 692 BRITISH THOMSON-HOUSTON CO., LTD., and A. A. POLLOCK. Electric motors.
15 656 J. A. DAVIES and G. A. LITTLE. Signal lamp for electric cookers, etc.
15 651 T. MCCLELLAND. Terminal connections for flexible wire.
15 722 METROPOLITAN-VICKERS ELECTRICAL CO., LTD., T. W. ROSS and C. RYDER. Electrical control apparatus.
15 687 A. L. MOND. Method for preventing evaporation, etc., of electrolytes, etc.
15 699 SIEMENS-SCHUCKERTWERKE GES. Hollow electric cables. (23/6/25, Germany.)
15 720 H. F. SIMON. Electric lighting appliance.

June 23rd.

15 823 J. L. BAIRD and TELEVISION, LTD. Television.
15 801 BRITISH THOMSON-HOUSTON CO., LTD., R. D. GIVEN and W. J. POOL. Electric motor control.
15 743 S. C. COULSON. Wireless receiving sets.
15 800 INTERNATIONAL GENERAL ELECTRIC CO., INC. Method of winding electric transformer, etc., coils. (27/6/25, Germany.)
15 829 P. RICHARDSON. Aerials for wireless installations.
15 810 SIEMENS-SCHUCKERTWERKE GES. Electric driving of machinery. (25/6/25, Germany.)
15 830 SIEMENS-SCHUCKERTWERKE GES. Asynchronous electric motors. (25/6/25, Germany.)
15 838 SIEMENS UND HALSKE AKT.-GES. Electromagnetic devices. (24/8/25, Germany.)
15 747 R. G. WELCH. High-tension supply for wireless sets.
15 744 L. J. W. WOOD. Radio coil-holder.

June 24th.

15 938 F. AIGNER. Radio receiving apparatus. (24/6/25, Austria.)
15 934 C. P. ALLINSON. Wireless signalling.
15 897 S. F. BALLS and F. E. KEWLEY. Apparatus for production and application of ultra violet rays.
15 879 and 15 901 R. H. BARBOUR and J. R. WALTON. Electric motor controllers. (25/8/25).
15 882, 15 900 and 15 912 R. H. BARBOUR and J. R. WALTON. Electric motor controllers.
15 943 and 15 944 W. GROSS, F. NEOTHER and G. STEIN. Electro-magnetic separating apparatus, etc.
15 841 L. LANZETTER. Radio signalling apparatus.
15 911 E. W. SMITH. Electric generators, etc.
15 865 SOC. GENERALE METALLURGIQUE DE HOBOKEN. Electrical contacting devices, etc. (19/4/26, France.)
15 866 SOC. GENERALE METALLURGIQUE DE HOBOKEN. Apparatus for electrical precipitation of dust, etc. (19/4/26, France.)

June 25th.

16 000 and 16 001 J. H. E. BAKER, A. H. CAMERON, and STANDARD TELEPHONES AND CABLES, LTD. Telephone systems.
16 030 B. BARRY. Electrical water heaters. (31/8/25, New Zealand.)
16 089 BUSER AND SOHN. Incandescent electric lamps. (26/6/25, Switzerland.)
15 992 F. GAYTON. Telephonic loud speakers.
16 058 R. E. GORE and J. A. KENDALL. Electric generators, etc.
15 985 E. E. GUMPERT. Wireless apparatus.
15 955 J. K. HELE. Apparatus for reducing interference during radio reception.
16 035 W. A. MAAS and G. ZAMBRA. Electro-magnetic drive for gramophones, etc.
15 999 M-O VALVE CO., LTD., and C. W. STOPFORD. Thermionic discharge tubes.
16 079 NAAMLOOZE VENNOOTSCHAP VEREENIGDE, ETC. Electrically driven rotor for driving spinning cans, etc. (2/3/26, Holland.)
16 071 J. RIDDLE and TELEGRAPH CONSTRUCTION AND MAINTENANCE CO., LTD. Telegraph transmitters.
15 968 E. WALSTER. Earth tubes for wireless, etc., instruments.

June 26th.

16 123 C. P. ALLINSON. Wireless signalling.
16 161 A. H. BARKER and A. J. NEILL. Wireless receivers.
16 098 O. VON BRONK. Electrical transmission of pictures.
16 158 COMPAGNIE POUR LA FABRICATION DES COMPTEURS ET MATERIEL D'USINES A GAZ. Variable self-inductances. (29/6/25, France.)
16 174 J. H. COX and H. TINSLEY. Protection of electrical apparatus from overloads.
16 168 FERRANTI, LTD. and A. HALL. Measurement of voltage and current in connection with thermionic valves.
16 106 G. W. HUMPHRY and H. TUCKER. Electric switches.
16 150 L. LESCHANOVSKY, F. REIBER, and J. ROTHMULLER. Device for connecting weak-current apparatus to power lines.
16 126 E. E. ROUSE. Telephone transmitters.
16 110 A. M. TAYLOR. Electric power transmission.

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THE ELECTRICIAN

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OUR ECONOMIC PLIGHT.

IT is the custom of men and women of our nationality to visit the United States of America and to come back and tell us what they have seen. Almost always, if not invariably, they next proceed to inform us how much better we should conduct our sport, our business and our religion if we did things in the American way. We do not contend that we can learn nothing from other countries. But the danger lies in the application of the lessons. Conditions, it will not be denied, differ in Great Britain and America, and in following too closely what is being done elsewhere we may do harm rather than good. For a long time there has been a tendency to laud America and American methods, and the inevitable result has been that the idea has got abroad that we are "done" in the economic sense. This idea is highly injurious and to counteract it Mr. J. L. GARVIN made the wise suggestion that one of the many able American writers in London should emulate Columbus and undertake the discovery of industrial England. The suggestion has been taken up and the harvest is gathered together in a most interesting book entitled "Britain's Economic Plight," by Mr. FRANK PLACHY, which has just been published by Ernest Benn. It will be seen that here we have a reversal of the usual method. Instead of an Englishman going over to America and attempting on his return to apply his experience, which must naturally be limited, to the solution of our industrial difficulties, we have an American examining our problems on the spot and giving us his views on how to overcome them. There is a great deal of difference between these two methods of procedure. That is why Mr. PLACHY's book is so valuable.

"Britain's resources are," he says, "tremendous and incalculable. It has . . . apparently everything that goes to make a trading and manufacturing nation pre-eminent in its sphere. But . . . it isn't using the kind of economic intelligence to turn these national resources to the best account. It is the human element that is at fault . . . there must be the genuine spirit of co-operation between workers and employers . . . and there must be greater loyalty on the part of the people of the British Isles . . . in demanding and getting British made goods." Those are the author's short impressions of his trip through the industrial centres of the country. His book is a detailed support of this indictment which everyone interested in the present and future of British industry from whatever point of view should read and cannot fail to profit by reading.

The position as Mr. PLACHY sees it, and no one will say that he is not right, is that on the one hand we have an economically ignorant personnel (for the employers are as much at fault as the workers), and on the other almost limitless resources. We have, for instance, a monopoly of the whisky trade which Mr. PLACHY, perhaps wickedly, regards as only second in importance to the wheat and cotton industries, and hold an important position both in shipping and cotton. Potentially, therefore, there is no reason why Great Britain should not become one of the most prosperous nations of the world, if only we will allow it to do so. The great question is: Where is the friction in the machine?

For one thing Mr. PLACHY finds our theory of unemployment all wrong. We seem to regard it as a necessary evil, and instead, therefore, of the owner of one of the three richest domains on the globe stirring about and finding jobs for its people, we are putting finishing and most expensive touches on enlarged systems of unemployment relief, state insurance, etc. Could our inherent weakness have been more skilfully exposed? The solution of this state of affairs, the author contends, is to cut off the dole and to encourage emigration, though in putting forward the latter solution he does not disregard the difficulties that in the Dominions agricultural workers are required and we have mainly town dwellers to supply, nor that prohibition experiments, using the term in the widest sense, in Canada and the United States have made those countries even less attractive to our own people than they were before.

After a short and well-balanced account of the coal situation and the general strike, Mr. PLACHY goes on to discuss Empire markets and trade depression. We recommend a close study of this short chapter to all our readers. The subject, as he rightly says, is involved. The Empire is intensely British in spirit, but, paradoxically, it draws the line at giving preference to British goods. For this Mr. PLACHY blames the bureaucrats. Whatever be the reason, however, Empire markets are not expanding and the British share of those markets is in some commodities

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decreasing. His remedy is substantial preferential trade advantages between the Mother Country and the Dominions. On the other hand, he rightly condemns outright the policy which has been followed in the textile industry of selling at a loss to retain business. Our products have always been renowned for their quality, and in due course the demand for such goods will again increase. We have the skill both to operate and to make textile machinery, and it need not be feared that our national characteristics will fail to pull us through. At the same time there is need for a drastic financial and industrial organisation, combined above all with the exercise of imagination.

Conservatives will grieve, and those of other political persuasions will rejoice, at Mr. PLACHY'S indictment of the present Government. It cannot be denied, however, it is in substance true. Politically, however, the real difficulty, as Mr. PLACHY clearly sees, is to find an alternative Government that would not be worse. But whatever the solution, there must be a real *entente* between the Government and industry so that all those obstacles which, we know so well, are preventing the revival of trade, may be removed. Unless, he adds, mutual confidence is engendered there can be no real expansion of British industry. These are weighty words to which due attention should be given.

Electrical engineers will find the most interesting chapter in Mr. PLACHY'S book that in which he argues that industrial salvation for England will come through the low temperature distillation of coal. If this method of treating coal is more generally adopted the result, in his view, will be cheaper power, more widespread employment, and profitable by-products. He has a word to say about the attempts that are being made to reorganise the electricity supply industry and the way in which these attempts are "being fought tooth and nail by the vested interests involved."

Here we must conclude our analysis of this instructive and suggestive book. Mr. PLACHY leaves few of our faults unchastened and few of our idiosyncracies unexposed. He even deals with our cooking. And in a recapitulation he avers that what we require is a different mental outlook if our individuality and self-reliance are not to be sapped. In addition, non-productive social expenditure must be checked, our penal taxing policy altered, and protection introduced so that Empire development may be effected on proper lines. Mr. PLACHY leaves us in no doubt as to our faults. But he seems to have no less doubt as to our future. His criticisms are the criticisms of a friend. He sees much that is wrong, but much also that is good; and having given his diagnosis he leaves us to find the cure. We thank him for this, for we realise that to discover what is wrong is the first step towards putting it right. This book is one of the wisest contributions towards a solution of our industrial problems that we have read.

Current Topics.

Industrial Electric Heating.

ON another page of this issue we publish an article by Mr. S. E. MONKHOUSE. This forms an interesting addendum to the Paper by Messrs. A. P. M. FLEMING and J. H. CROSSLEY which was read at the recent convention of the Incorporated Municipal Electrical Association and to our leading article on the subject of "Industrial Heating" which appeared in THE ELECTRICIAN of June 25th. The object of all these essays is to indicate how large is the potential field for electricity as a heating agent and how little has been done, at least in this country, to take advantage of what is from all points of view an excellent load. It has been suggested, and we heartily support the idea, that one of the first steps is to interchange information. Our columns are at the disposal of the industry for this very important form of internal publicity. As the discussion at Glasgow showed, electricity is being applied in many new and strange ways and the more, therefore, that the industry knows about them the better. In addition, as Mr. MONKHOUSE points out, manufacturers should publish descriptions of electric heating equipment that they have installed. We need hardly say that we shall be pleased to help them to do this and that the more novel the application the better. Supply engineers can also help in this way as very useful work is being done in the adaptation of existing equipment to the newer methods of working. To assist progress in all these directions Mr. MONKHOUSE suggests the calling of a conference at which power engineers could meet manufacturers and discuss the problems involved. We hope that steps will be taken to do this without undue delay.

An "All-Electric Town."

IF any electrical engineer were suddenly asked whether there is a town in Great Britain every house in which is wired for the electric light he would assuredly say No. He would, however, be wrong for, as Sir THEODORE CHAMBERS pointed out at the Annual General Meeting of the Welwyn Garden City Co., Welwyn Garden City can claim to be an "all-electric" town. As our readers probably know, this enterprise was started in Hertfordshire in 1921 and since that time about 1 350 houses have been built, all of which are wired for electricity. Of these 50 are "all-electric" and 50 more of the same kind with 300 ordinary houses are under construction. Electricity is employed for cooking and other uses by an increasing number of consumers. This progressiveness is encouraged by the attractiveness of the tariff, especially to small consumers, and by the enterprise of Mr. WALTER ELLIS, the electrical engineer of the Welwyn Garden City Electricity Supply Co., which obtains its electricity in bulk from the North Metropolitan Electric Power Co. We may add that electricity is largely used for baking and that electric power is employed in a number of usual and unusual ways. All concerned are to be congratulated on having done so much in pushing the electrical idea in this new town.

Broadcasting.

A VERY interesting speech was made by Lord GAINFORD last week at what may prove to be the last meeting of the British Broadcasting Co. In the course of the meeting a resolution, proposed by the manufacturing interests, was carried urging the directors to get in touch with the Government with a view to obtaining a definite decision on the future of the broadcasting service. We support the argument that no time should be lost, no less than we do the view that the B.B.C. has set up a higher standard of broadcasting than exists in any other country in the world. It would be a thousand pities if this service and the potentialities for good that it can exercise were swathed in red tape. As it is Lord GAINFORD was called upon to protest that during the past year the activities of the company had been restricted by the withholding of revenue to which they legitimately considered themselves entitled. Nevertheless the report shows that the new authority will take over the company under extraordinarily favourable circumstances. We hope that in future the Post Office will show a greater generosity in the matter of revenue than they have done in the past. They are justly entitled to act as controllers, but they are not justly entitled to retain a large sum of money which has been subscribed by licence holders —a sum which can be used in no better way than in improving an already excellent service. On the technical side great efforts are being made to establish regional high power stations. This will make alternative programmes possible and prevent wave length chaos. Money spent on such objects will, it is admitted, be well spent.

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"Or" or "Er"?

We have spent the week-end in studying two books the connection between which may not at first sight seem very clear. These are "A Dictionary of Modern English Usage," by Mr. H. W. Fowler, and the "British Standard Glossary of Terms Used in Electrical Engineering," which, as we have already noted, has been issued by the British Engineering Standards Association. Mr. Fowler sets out not so much to standardise the English language (we hope it will always be too flexible for that), but to pillory certain grammatical, etymological and phraseological usages which have neither the sanction of tradition, nor the mark of elegance. To any one who is engaged in literary work it is a terrifying book to read, for its immediate effect is to cause the envisagement of Mr. Fowler behind us, as we write, with his hands uplifted in horror at the mistakes that we are making. From the objective to the subjective is a short step and having learnt from the B.E.S.A. glossary that it is proposed to use "startor" instead of "starter," we naturally tried to discover what Mr. Fowler says about it. He is, it seems, indifferent. Both terminations are in use and both are correct, though there are a few odd differences to which "startor" may now be added. We note that the termination "or" is intended by the B.E.S.A. to connote an apparatus accomplishing a certain purpose, while the ending "er" is to signify the person who carries out the operation. As in the case of all good rules, there are certain exceptions to this. Feeder will, for instance, continue to mean a cable carrying current and not a harassed mains superintendent snatching a hasty meal. The point is, however, a small one, or rather it is small in comparison with the necessity that the terms should be universally adopted. It will mean a few difficulties at first but these are worth surmounting for the sake of uniformity. We shall, in The Electrician, by our example assist to bring that change about.

Electro-Farming.

It is more than a little unfortunate that the display of electrical exhibits which we have come to consider as part of the Royal Agricultural Society's annual show was at Reading this year hampered by the inability of the local supply undertaking to provide connections to the various stands. This naturally reduced the show's attractiveness for electrical exhibitors, and we fear that many visitors must have gone away without realising what can be done by electricity on the farm. Unfortunately, too, some error was made in announcing the holding of the electrical conference, with the result, as we note elsewhere, that the attendance was small. This is the more to be deplored as Mr. R. Borlase Matthews's paper on "The Economic Use of Electric Light on the Farm" gave some useful information, while Mr. C. T. Allan was no less informative in dealing with the power side of the problem. A very important point is that though lighting is the thin end of the wedge it is not long before the wedge is driven in. That is, there is but little delay, after electric light has been installed, before the farmer turns to electricity's other uses. He does this because it pays him to do so. Power also is not confined to the farmyard, but finds its way into the house, and heating, too, is being more and more used. Both Mr. Allan and Mr. Borlase Matthews argue that lighting and small power must be taken up first. Mr. C. D. McDowell, on the other hand, contended that the larger applications, such as ploughing, must be considered before there could be a full development of the smaller uses. A reliable electric plough was required and he felt sure that electric ploughing was practical and economic if tackled on the right lines. In this connection it appears certain that the greater consumption of electricity for agricultural purposes depends on the success of the Government scheme. As Mr. H. T. Young pointed out, the independent plant for purposes other than lighting is ruled out on the score of cost. The moral of this is clear.

Politicians and Businesses.

The attack on Mr. Neville Chamberlain for his family connection with Hoskins and Sons raises a subject of far wider importance than the honour of a particular Minister or the affairs of a particular firm. The purity of public life depends upon the separation of business and political interests, and its high standard in this country is in no small measure due to the self-sacrifice of those who have divested themselves of active business connections upon assuming office. Mr. Chamberlain has followed the best tradition in this matter, but it may be necessary to revise our views on the subject. If directors of industrial companies are to be forbidden from participating in the Government, what about officers of Labour organisations who have, in many cases, as much or more responsibility for the prosperity of industry and are at present free to use the machinery of Government for their own industrial ends. That, however, does not exhaust the matter. The traditional limitations have the effect of restricting the choice of Ministers. They make it easy for lawyers and professional men to take leading positions in politics, and impossible for those with heavy business responsibilities to enter Parliament at all, That was all very well when politics had nothing to do with business, but now that the House of Commons is occupied with little else, the whole question requires to be studied afresh.

The Electricity Bill.

Clause 40 in the Electricity (Supply) Bill was reached and passed on Tuesday, and there now only remain to be considered the new clauses that have been suggested, and the schedules. A number of new clauses have been withdrawn as a result of an important statement made by the Attorney-General. The Bill, he said, was intended to set up a scheme for improving and cheapening electricity supply throughout the country and not to amend the general electrical law. If that was considered necessary, he added, suggestions should be made to the Ministry of Transport who would consider them, and a Bill might then be introduced to render the position more satisfactory. It does not therefore look, as some have fondly hoped, that this Bill will be the Bill that will end electrical legislation. A certain measure of progress may now, however, be recorded and it is probable that the Bill will weather the Committee stage by the end of next week. We shall then have ample time to consider the alterations that have been made.

"Moscow" in the Building Trade.

The case of Bovis, Ltd. *v.* The London Master Builders' Association, which was concluded on Tuesday in the King's Bench Division, deserves the attention of every member of a trade association. As is the way with the Courts, the judgment against Bovis, Ltd., was concerned with legal side-issues, though there were great questions of policy underlying the case, to which no reference was made in the judgment. It was, however, shown in the evidence, that Bovis, Ltd., had paid wages higher than the trade union rate. It was further shown that they had arranged overtime with some of their workers without the consent of the employers' federation or the committee of the trade unions. A complaint was also made that in connection with a strike some of the workers of Bovis, Ltd., went back before the strike was officially concluded. These are only samples selected from evidence which should be read *in extenso* by every student of industrial development. They disclose a position which would cause no surprise if it had applied to the Moscow and not the London building trade. For we fail to see the difference in principle between a committee of commissars, who exercise despotic sway over workers and consumers alike, and a central authority composed of federation directors and trade union officials without whose consent it is an offence to work.

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INDUSTRIAL ELECTRIC HEATING.

Need for Prominence Being Given to the Subject—Co-operation between All Parties Essential to Develop an Excellent Load—An Assurance of Success.

By S. F. MONKHOUSE, M.I.E.E., Power Engineer, Newcastle-upon-Tyne Electric Supply Co., Ltd., and Associated Companies.

THE paper read by Messrs. A. P. M. Fleming and J. H. Crossley at the annual convention of the Incorporated Municipal Electrical Association, and the leading article in THE ELECTRICIAN of June 25th, are published at an opportune time, for they both give prominence to a subject which is of considerable importance, not only to the electricity supply industry, but also to the majority of the manufacturing industries in this country.

The development of the industrial heating business throughout the United States, and in some parts of the Continent, has been very marked in recent years, due, no doubt, to the combined measures adopted by the supply authorities and the appliance manufacturers to demonstrate to the owners of works the advantages which electric heating for industrial purposes has to offer over heating by other means.

A Striking Example

A striking example of the development and possibilities of industrial electric heating has just been reported in a publication by the National Electric Light Association. In this the Edison Electric Illuminating Company of Boston report on a special survey which they recently conducted of 134 industrial consumers' installations, in which the connected power and lighting load amounted to 17 500 kW and the connected heating load to 1 500 kW. The survey revealed that the additional heating load to be obtained from those consumers in respect of processes for which electric heating could be economically adopted immediately was 12 500 kW, whilst in addition there was a further possible heating load of about 33 000 kW from processes which it was not then practicable to electrify, either on the grounds of economy or because suitable electric heating apparatus had not then been developed.

A further example of the possible development that is likely to take place in industrial heating is to be found in the report to the shareholders of the Detroit Edison Company for the year 1925, in which Mr. Alex Dow, the President of the company, stated :—

> It is likewise the case in small foundries, where electric furnaces are displacing oil fuel or gas in the melting of brass, and in large metal working factories, where electric heat is operating heat treating, case hardening, and welding processes on a scale which suggests that these processes may within a few years use more electric current than is now used to run factory machinery.

Up to the present there has been no concentrated effort made to inform the public in this country that industrial heating by electrical means has long since passed the experimental stage and that it is, in fact, an established practice abroad, that it is reliable, and that it is a complete success. The time has arrived for these facts to be published, and for the owners of works in this country to be informed that electricity is at their service for heating purposes just in the same way as it is available for meeting their mechanical needs.

More Publicity

I would suggest that the manufacturers of electrical apparatus should publish descriptions of the heating equipments they have already installed in this country, and I would advocate also that they should advertise the types of heating apparatus they are prepared to supply.

It is asking a good deal of the general manufacturing public to expect them to be pioneers and to install a heating system which they possibly regard as novel, and which they have had no opportunity of seeing in operation, but I am confident they will not be slow to adopt electric heating for any specific purpose when they have seen it successfully applied.

The creation and development of an industrial heating load calls for the closest co-operation between manufacturers and power engineers, and in my opinion the onus for this development must largely rest with the latter, especially in the early stages. It is essential, therefore, that power engineers should have at their disposal all the information which manufacturers can provide of apparatus which they have installed or are prepared to supply. In this connection it would be of great assistance if manufacturers of appliances would follow American practice, by publishing a small brochure on each new heating equipment they develop.

Isolated cases come to notice from time to time of interesting heating applications which have been adopted in works owing to the initiative of the works manager, and any descriptions of such cases would be of great benefit in helping forward this development.

In dealing with this problem power engineers will, I am sure, frequently be asked to submit proposals for the conversion of existing gas or solid fuel furnaces and heating appliances, in preference to the installation of a complete new equipment, and manufacturers should be prepared to undertake work of this comparatively unattractive nature, otherwise the power engineer must step into the breach and accept the responsibility for the conversion.

I feel that if industrial heating is to progress satisfactorily in this country, with prosperity alike to supply authorities and manufacturers, a complete interchange of information is imperative, and I suggest that this could most readily take place at a conference at which power engineers could meet manufacturers and discuss these problems to their mutual advantage. It is not improbable that a conference of this nature would prove to be so useful that it might become a permanent Electric Heating Association.

The electrical industry in this country has a new field to enter in the industrial electric heating business, and, with a spirit of co-operation within the industry, success in that field is assured.

Political Simplicity.

How Not to Remove Suspicion in the Mining Industry.

The politician has a very superficial sense of humour. He is at present engaged in devising an Act of Parliament that is to remove suspicion from the mining industry. The new Mining Industry Bill is especially designed to make all parties feel happy, and here is a sample of the way that it is done :

A total amalgamation scheme—(*a*) may provide either for the constitution and incorporation of a new company, or companies, under the Companies Act, 1908 to 1917, with or without the dissolution of all or any of the constituent companies, and the transfer to the new company of the undertakings of the constituent companies or the distribution thereof amongst the new companies and such of the constituent companies as are not dissolved, or for the continuance (with or without change of name) of one or more of the constituent companies, and the dissolution of the other constituent companies, and the transfer of their undertakings to the continued company or the distribution thereof amongst the continued companies ; (*b*) may provide for vesting in the new or continued company or any of the new or continued companies any or all of the property, rights, powers, duties, and liabilities of the constituent companies ; (*c*) may provide generally as to the terms and conditions of amalgamation, and for the winding up of the constituent companies or such of them as are to be dissolved, including the allocation to holders of securities of the constituent companies, in substitution therefor and in satisfaction of all claims arising thereunder, of such securities of the new or continued company or any of the new or continued companies and of such amounts as may be specified in the scheme ; (*d*) may make such provision as may be necessary with regard to the share and loan capital of the new or continued company or companies, including provision for increasing all or any of the existing classes of loan or share capital of any such company, or creating new classes of loan or share capital of any such company, with such rights, priorities and conditions as may be specified in the scheme.

Of course, mining companies and mining managers have for long had to puzzle their brains to understand the meaning of this sort of parliamentary wisdom, but if miners are now to give their attention to the same sort of thing, the rest of us had better lay in good supplies of oil.

An error, which we much regret, occurs in our account of Sir Oliver Lodge's recent lecture on "Telephony." See THE ELECTRICIAN for July 2nd, p. 8. On p. 9, 20 lines from the end should read "Heaviside had shown that the right condition was to apportion the four characteristics—resistance, inductance, capacity and leakance—in such a way that the ratio R : L was equal to the ratio G : K, G being the leakance.

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MECHANICAL AND ELECTRICAL VIBRATIONS.

Their Maintenance by a Neon Lamp—An Improvement Over Tuning Fork and Other Methods—Facilitating the Detection of Higher Harmonics.

By W. H. ECCLES, F.R.S., and WINIFRED A. LEYSHON, Ph.D.

IN May 1919 the now well-known method of using a triode valve for sustaining the natural vibration of a tuning fork was described* to the Physical Society of London by one of the authors of the present Paper. The method then demonstrated was protected in a patent granted to W. H. Eccles and F. W. Jordan, No. 155 854, April 17th, 1918. The claims of this patent cover the use of a triode for sustaining the vibration of bars capable of torsional, longitudinal or lateral vibration, and indeed of any other vibrating body, for example, a piezo electric crystal, in which a vibrational motion can produce, without the use of conducting contacts, an alternating electromotive force. Put briefly, the underlying idea of the invention is to apply to the grid of a triode the electromotive force generated by the mechanical motion and then use the resulting magnified alternations of anode voltage or current to encourage the motion, by the exercise of either electromagnetic or electrostatic forces. The patent specification calls attention to the fact that the alternating current contains harmonic frequencies

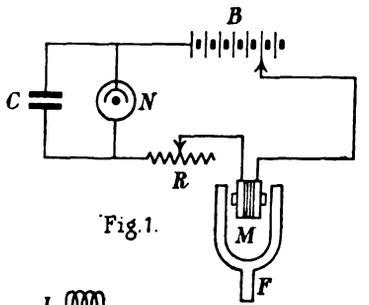

Fig. 1.

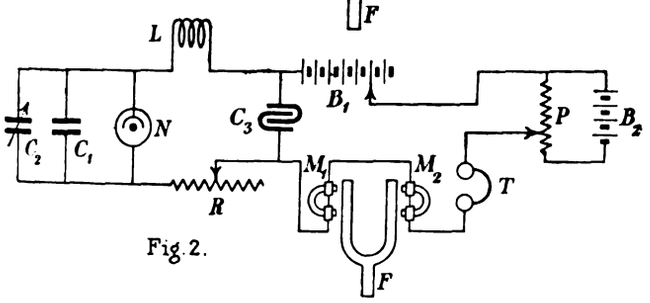

Fig. 2.

which, in some of the types of apparatus constructed at Finsbury Technical College in 1918, were relatively powerful and numerous.

The theory and the design of apparatus for maintaining a tuning fork in vibration by means of the above described principle has been discussed by S. Butterworth,† D. Dye,‡ and G. T. Hodgkinson.§ Other workers, notably, W. G. Cady‖ and G. W. Pierce,¶ have studied the use of piezo-electric crystals, such as quartz, instead of a tuning fork, and thus obtained linked mechanical and electrical vibrations of very high frequency. A. G. Lee,** again, has described the use of a tuning fork and triode for supplying current of 43 000 cycles per sec. to the antenna of the Post Office wireless station at Northolt, this being the twenty-two-fold harmonic of the tuning fork; and a similar fork apparatus utilising the eight-fold harmonic is in operation at the Rugby station. These references to a portion of the literature on the subject suffice to show that the study of linked mechanical and electrical oscillations is becoming of importance.

Various experimenters during the past few years have sought to produce harmonics of higher order or of greater power than those given directly by the triode maintained fork, and for this purpose Dye, for example, has passed the alternating current from a triode maintained fork through the circuits of a multivibrator or of a neon lamp. It was found that the fork-controlled currents steadied the fundamental and harmonic frequencies of the more erratic oscillators and thus converted them into instruments of precision. Following the same aim the present authors have investigated some direct methods of linking a tuning fork, piezo-electric crystal, or other mechanical vibrator, with harmonic producing circuits such as the neon lamp flashing circuit, the multivibrator, or, generally, with conductors possessing so-called "negative resistance."

The new method will be described as it is carried out in co-operation with a modified form of the well-known flashing circuit of the neon lamp described by Pearson and Anson.* The method consists in adding an electromagnet to the neon lamp circuit and adjusting the rate of flashing until it is approximately equal to the frequency of the given tuning fork; the fork can then be driven by means of the electromagnet. When this is done, the motion of the fork induces an electromotive force in the windings of the magnet which is sufficient to compel the rate of flashing to synchronise exactly with the frequency of the fork. Fig. 1 is a diagram of the simplest circuit. Here B is a battery, N is a neon lamp, C a condenser, R a resistance, M an electromagnet and F a fork.

For convenience in manipulation, the apparatus is best arranged as indicated in Fig. 2, where B_1, B_2 are batteries, P a potential divider, C_1, a fixed condenser, C_2 a variable condenser, M_1, M_2, telephone magnets, T a pair of head telephones, L a coupling coil for delivering power to another circuit, and C_3 is a blocking condenser. In a particular piece of apparatus which has been in use recently, the telephones and electromagnets had a total resistance of 12 000 O, and the resistance R ranged up to about 100 000 O. The frequency of the fork being 2 000 cycles, the condenser C_1 was about 0·001, and C_2 had a maximum of rather smaller value. The battery B_1 had a voltage of about 200, and the battery B_2 was a 12 V accumulator. The apparatus needed very slight modifications to adapt it to operate forks of frequency 384, 512, or 540, in place of the fork of frequency 2 000. In all cases it is advantageous to have inductance such as that of the telephones T in circuit, over and above the inductance of the electromagnets. Neon lamps of the beehive type or of the I type, with or without their series resistances, have been used successfully. As a rule, the neon tubes on the market operate at voltages between 150 and 170 V and pass a current between one-third and one-half of a milliampere when the resistance in series is between 60 000 and 100 000 O.

Procedure in Starting.

The following procedure should be followed in starting the apparatus into action. Begin with a very large value of R and increase the voltage until the lamp starts flashing and a musical note is heard in the telephones. Then reduce R and the applied voltage in steps until the note is almost equal to the natural frequency of F. It is well to have at hand a spare fork of the same frequency as the working fork, so as to aid the ear in this tuning operation. On improving the adjustment of R slightly the working fork will start into feeble vibration and the musical note emitted from the telephones will start beating. The adjustment can now be gently altered until the beats disappear; the working fork will then be found to be in vigorous oscillation. The amplitude of vibration can be somewhat improved by slight readjustments of P, R and C_2. When the fork has been sounding for a minute or two it is possible to alter P, R or C_2 considerably without stopping the vibrations.

Experience with the neon lamp and fork combination shows that it is always easy to detect, in the current through the lamp, harmonics ranging up to 200 times the frequency of the fundamental, and delicate means of detection enable one to trace much higher harmonics. Therefore, if strong harmonics of relatively short wavelength are desired, it is well to replace the fork by a steel bar vibrating longitudinally. In one experiment a cobalt steel bar 4 cm. long was supported at its middle so as to be held in an axial position between the "poles" of a U-shaped yoke of soft iron. Fine wire windings were placed on the poles and connected into the neon lamp flashing circuit in the position of the electromagnets used with

(*Concluded on page* 72.)

* Eccles, "Proc. Phy. Soc.," vol. 31, p. 269, 1919.
† Butterworth, "Proc. Phy. Soc.," vol. 32, p. 345, 1920.
‡ Dye, "Proc. Roy. Soc.," 103, p. 24, 1923; and Phil. Trans., 224, p. 259, 1924.
§ Hodgkinson, "Proc. Phy. Soc.," vol. 38, p. 24, 1925.
‖ Cady, "Phy. Rev.," 18, p. 142, August 1921, etc.
¶ Pierce, "Proc. Am. Acad. Soc.," vol. 59, p. 82, 1923.
** Lee, THE ELECTRICIAN, 94, p. 510, May 1, 1925.

* Pearson and Anson, "Proc. Phy. Soc.," p. 204, 1922.

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ELECTRIC TRACTION IN BRITISH COLUMBIA.

The Most Electric Country in the World—Details of Interesting Hydro-electric Scheme.

By R. E. TURNBULL.

CANADA is the most "electric" country in the world to-day and, judged on the basis of power developed per capita of population, British Columbia is the most "electric" province of Canada. This proud position is largely due to the enterprise of the British Columbia Electric Railway Co.

In reading this article it should be borne in mind that the company has now grown to be a very large undertaking. It supplies light, heat, power and traction to Victoria and district on Vancouver Island and to Vancouver and district on the lower mainland: a total of 1 500 sq. miles. It serves a population of 375 000 people, has 3 240 employees on its pay roll, and last year paid out £1 000 000 in salaries and wages. As a tribute to its efficiency and its desire to serve the public faithfully and well, it may be mentioned that whereas the company was at one time treated with suspicion and opposition by the various municipalities which it serves, it has now come to be regarded in its true light—a great asset to the province.

Generating Plant.

The company came into existence in 1887. At first its growth was slow. After ten years of more or less chequered career, the total capacity of the plant in Vancouver and Victoria was only about 2 000 H.P., derived from steam. In 1903 a start was made to develop 6 000 H.P. hydraulically by building a power station at Lake Buntzen. In view of the rapid growth of Vancouver at that time, the plans were changed to make this 30 000 H.P., and then changed to again increase it. As storage facilities in Lake Buntzen were too small, a tunnel was driven through the mountains to connect it to Lake Coquitlam. Eventually a dam was built at Lake Coquitlam and two power stations close together were built below Lake Buntzen. British Columbia is generally mountainous and high heads are the rule in water power, and for that reason the Pelton type of runner is preferred to the reaction type as installed in some other parts of Canada where low heads prevail. The Lake Buntzen plants operate under a head of 400 ft. No. 1 plant now generates 28 200 H.P. and No. 2 plant 35 800 H.P.

On the mainland there is also the Stave Lake plant, originally built by the Western Canada Power Co., and taken over by the B.C.E. Railway Co. in 1920. It has since been greatly enlarged and now, with five units, has a capacity of 87 500 H.P. The company has commenced further development on the Alouette Lake near the Stave Lake plant, where a single unit of 13 500 H.P. is being installed. These may seem big units, but it should be mentioned they are as nothing compared with some in Eastern Canada, which run to over 50 000 kVA.

As a further offshoot of the Stave Lake plant, the company owns the Ruskin site, a few miles below the present Stave Falls plant, where the water can be used over again to develop another 60 000 H.P. The water from Alouette Lake would then pass first through the Alouette plant, then the Stave Falls plant and finally through the Ruskin plant, developing a total of 160 900 H.P.

Still looking ahead, the company anticipate the present developments will be fully utilised by 1930 or 1931 and they have chosen the Bridge River for a further supply of power. The site is 135 miles from Vancouver, and there is available 700 000 H.P., which ought to be sufficient to serve even such a growing community as Vancouver for another generation. The company plan to develop 60 000 H.P. and to add another unit in 1933, which would bring the Bridge River output up to 90 000 H.P. As a stand-by there is a large steam plant in Vancouver, though this is very seldom used and to-day could well be dispensed with.

So much for power on the mainland. Vancouver Island, although it includes Victoria, which is the capital of the province, is a much smaller proposition. It is supplied with power from two hydro-electric and one stand-by steam generating station. One of the hydro-electric plants is at Jordan River, 37 miles from Victoria, along the Straits of Juan de Fuca. It has an installed capacity of 24 400 H.P. The other is at Goldstream River, 15 miles from Victoria, with a capacity of 3 100 H.P. The auxiliary steam plant is at Brentwood, 11 miles from Victoria, with a capacity of 6 000 H.P.

Transmission is all on the three-phase alternating system at 60 cycles. The voltage varies. From Stave Falls to Vancouver it is 60 000 V, and from Lake Buntzen it is 36 000 V. The lines are supported either on lattice steel or on wooden poles. Insulators are either of the pin or suspension type. The pin type are good up to 66 000 V, and the suspension type up to 220 000 V.

The company owns 17 sub-stations, but this figure includes those used for transforming the three-phase power into 600 V direct current, which is used for traction purposes.

The interconnection of transmission lines and the varied sources of supply has reduced the chance of total interruption to a minimum. Last year was entirely devoid of any such interruption.

A Large Traction Load.

For traction purposes the power is converted to 600 V direct current, and fed from the sub-stations to the overhead trolley wires by direct current feeders carried on poles. The company owns 186·6 miles of city car lines and 158·72 miles of inter-urban lines, a total of 345·32 miles. The longest inter-urban line is from Vancouver to Chilliwack along the Fraser Valley, a distance of 70 miles, or about as far as from London to Brighton. In addition to passenger cars the company own 495 freight cars, and to draw these latter there are 17 electric locomotives. They also have a motor-bus service at the end of some of the car lines, and the same thing between Vancouver and New Westminster to relieve congestion on the inter-urban line. In 1925 the entire traction system carried a total of 71 796 794 passengers.

The cars in the city are of the single-deck double-truck type, fitted with two 35 H.P. motors and carrying 40 to 50 passengers. They are provided with safety gates operated by the conductor. The "pay as you enter" system is universal for the city cars. The fare, which used to be five cents before the war, has had to be raised to six cents, but it is still below the average for American cities. It covers the whole of the city lines, and if one has to change cars the conductor gives a "transfer," stamped with the time and date. On some of the outer districts where traffic is not dense, "one-man cars" are used.

The inter-urban cars are of a larger type. They are provided with four 75 H.P. motors and are divided into smoking and non-smoking compartments. They are generally run in pairs or in trains of three or four cars and coupled up on the multiple unit system.

It is the policy of the company to promote courtesy from its employees to the public. A pamphlet called "The Buzzer" is published every month and is on free distribution in all the cars. In it the company takes the public into its confidence, explains difficulties and asks for votes to be given by passengers who receive special courtesy from any conductor. Each month the name and number of the conductor getting the greatest number of votes is published.

Private Lighting.

The standard voltage for lighting of private houses is 110 V. The distribution wires are carried on street poles, and transformers are also on poles. The 2 200 V three-phase lines are carried on the upper cross-arms of the poles and at intervals transformed down to the lower voltage. The service wires cross overhead from pole to house. In Canada practically every house within reach of an electric distribution system uses electric light. The company carries out an extensive educational campaign to induce people to use more light, heat and power in their homes, which has resulted in the sale of thousands of washing machines, vacuum cleaners, irons and ranges.

The price charged for lighting has been steadily reduced and to-day it is 4½ cents per kWh for the first 3 kWh per 100 sq. ft. of area, and 2 cents for all additional current. Thus for a house of one thousand sq. ft. and a monthly consumption of 40 kWh the cost for electricity would be $1.55 (about 6s.) a month.

The street lighting was formerly carried out by placing series arc lamps at each street intersection and by ornamental cluster standards on the main business streets. The arc-lamps have now been replaced by gasfilled lamps of 400 c.p., run in series circuits of about 4 000 V. On the business

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Electric Traction in British Columbia.

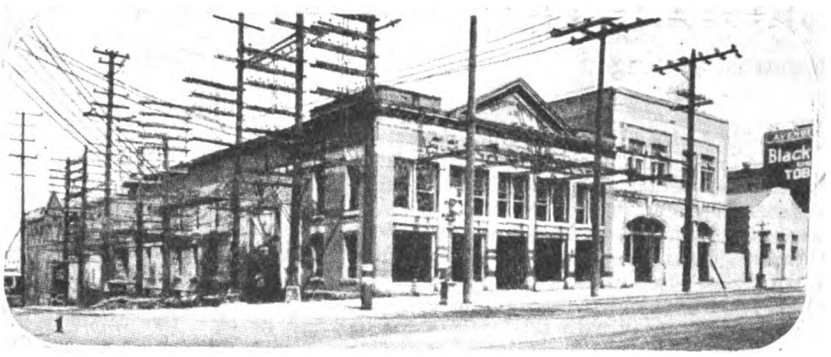
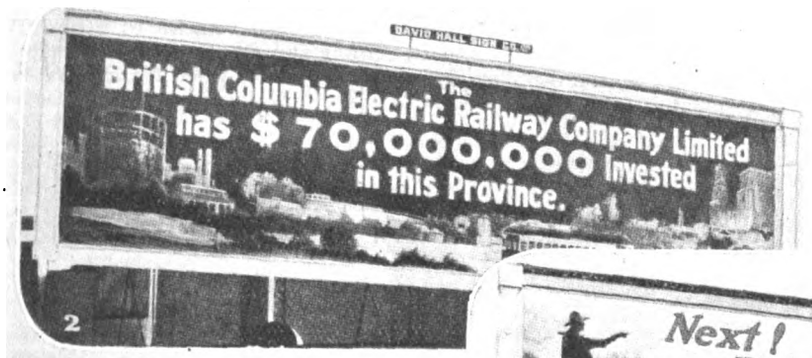


Fig. 1.—View of the Main Street sub-station.

Figs. 2 & 3.—Telling the public—examples of the illuminated posters used.



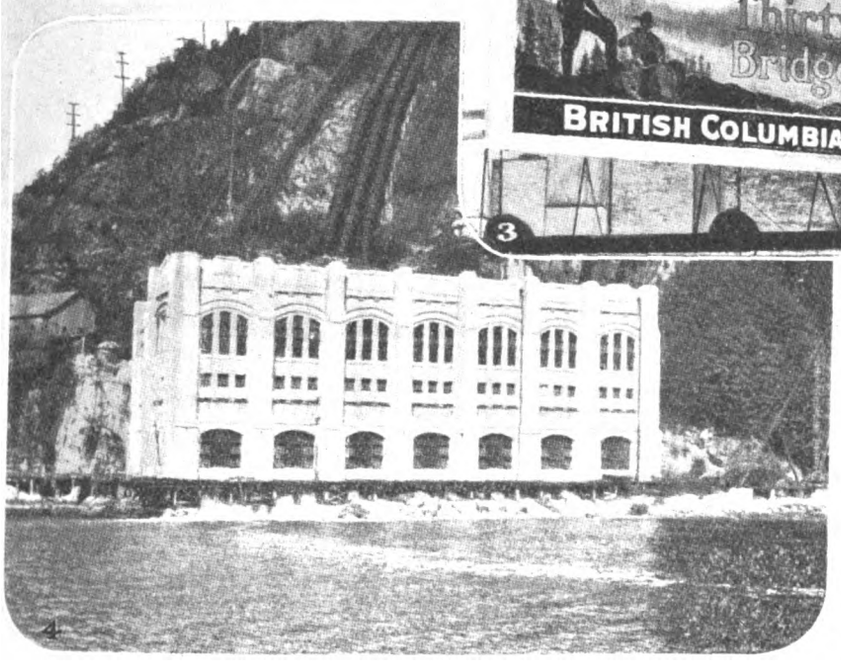
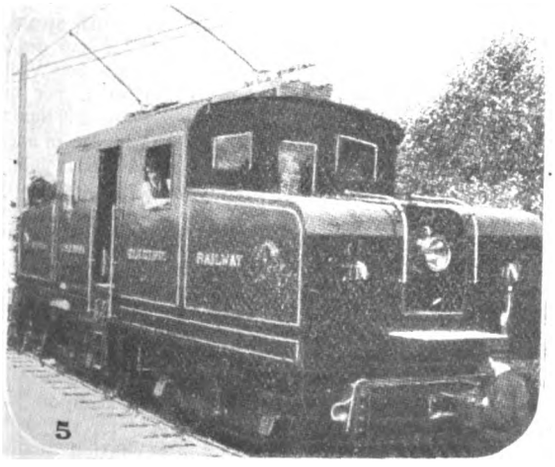
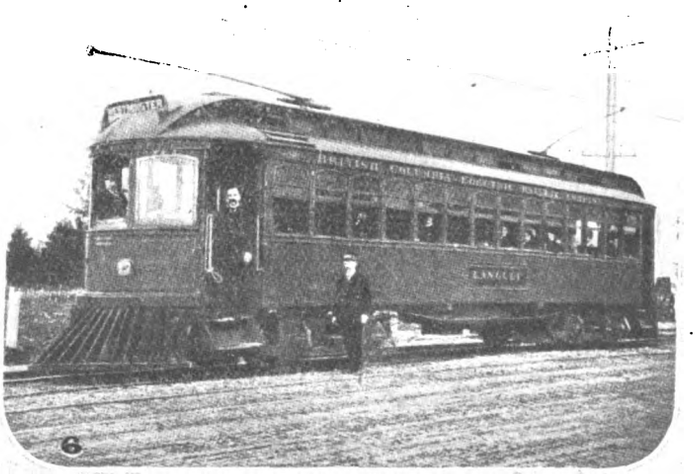


Fig. 4.—View showing the Lake Buntzen power plant No. 2—35 800 h.p.

Figs. 5 & 6.—Examples of goods locomotive and inter-urban passenger car used by the British Columbia Electric Railway Co.





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ELECTRICITY SUPPLY IN WOLVERHAMPTON.

Reconstructing a Generating Station—A Record of Continuous Expansions—Good Domestic Load.

MR. S. T. ALLEN'S forthcoming departure to a sphere of greater responsibility was fittingly marked a few days ago by the completion and formal opening of the extensions to the generating station at Wolverhampton.

These extensions consist of two 7 500 turbo-alternators together with the appropriate steam raising and other auxiliary plant. To effect these extensions it was not only necessary to extend the original engine room to about double its original length, but to do away with the low wooden roof. A heavy ferro-concrete gantry was built into the walls on each side of the old structure, the uprights protruding through the roof. This gantry will be used to carry a new and much heavier crane. The walls were then extended above the old roof and a new roof constructed, the old roof being eventually taken away. At the ground level thousands of tons of concrete were broken up and excavated, and the reciprocating plant with all the pipe work appertaining thereto was removed gradually, and replaced by modern alternator units. The result is that very little now remains of the generating station as it existed before 1913.

A supply of electricity was originally given in the borough over 32 years ago, and coupled with the developments which we have just noted there has been a great expansion on the distribution and installation side of the Electricity Department's activities. Not the least important item in this expansion has been the large increase in the area of supply and the giving of bulk supplies to a number of authorities in the surrounding districts. The area directly under the Corporation's control now amounts to 47 sq. miles, while electricity supply is exclusively given by them in another 27 sq. miles. There are 59 sub-stations of various sorts. The consumers now amount to 8 150, and this number is being increased at the rate of 1 370 consumers per annum.

The amount of electricity sold per annum is over 44 000 000 kWh, and the total connections to the mains are 34 000 kW, including over 26 000 H.P. in motors and several thousand H.P. in heaters and cookers.

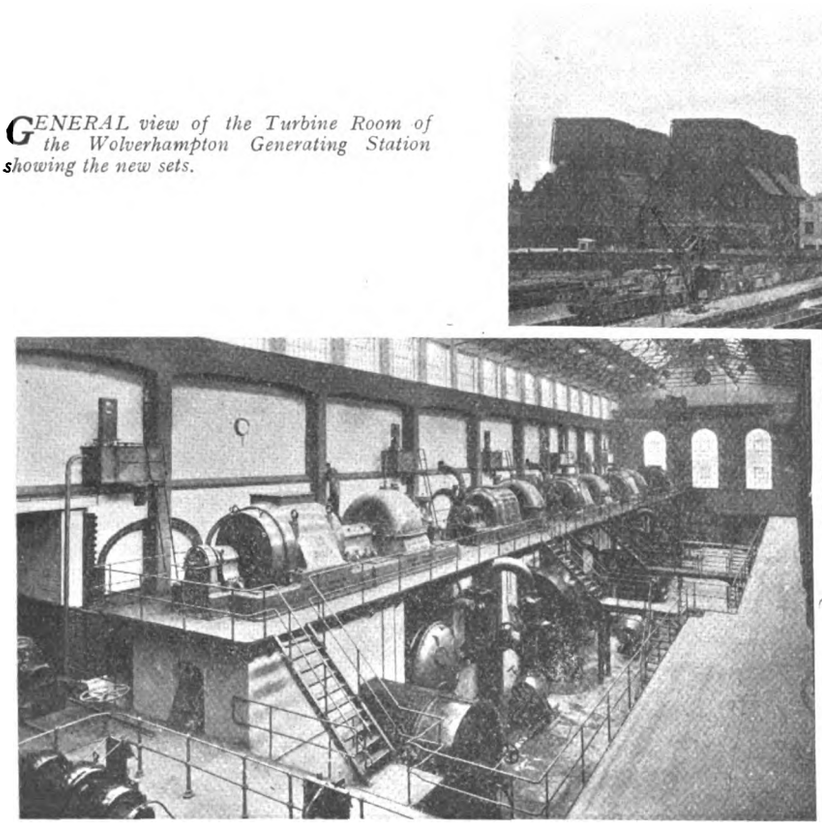
Returning to the boiler house, fuel is brought in by barges, which are towed by an electric tug, all of which are owned by the Corporation. It is unloaded by means of grabs and is taken by the telpher system to a weigh-house and thence by another and larger telpher to bunkers over the boiler houses. From these bunkers it falls through the shutes direct to the furnaces.

The boilers are fitted with electrically driven Underfeed stokers, and consist of 12 Stirling boilers with a total evaporative capacity per day of 9 000 000 lb. of water. Both forced and induced draught is used and the ashes are discharged into hoppers, and in the case of one boiler house, into water troughs whence they are taken to bunkers and conveyed away by the Department's electric vehicles to a tip. The boilers are fitted with Stirling superheaters and are equipped with a complete series of electric and other instruments.

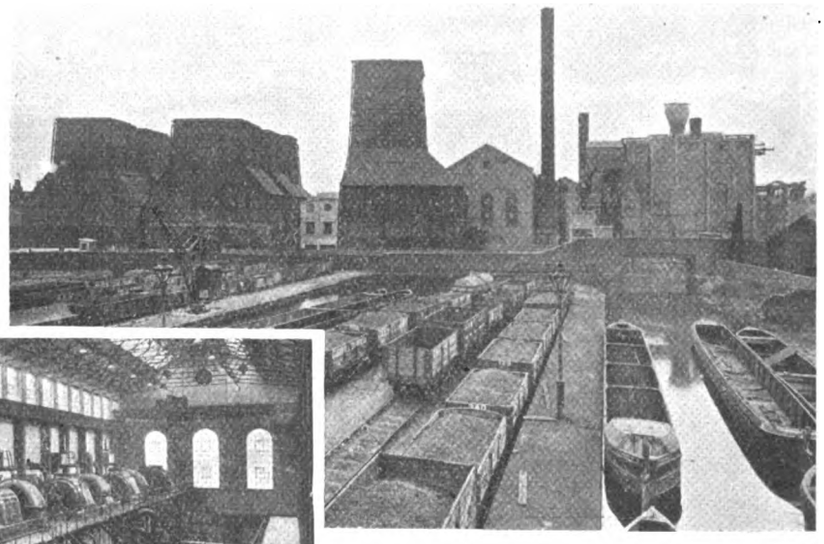
The turbo-alternator plant now consists of two 5 000 kW English Electric sets, one 5 000 kW B.T.H. set, and two 7 500 kW B.T.H. sets. The turbines are supplied with steam at 180 lb. per sq. in. and a total temperature of 550 deg. F. The alternators deliver three-phase current at 6 600 V, and a frequency of 50, the speed being 3 000 revs. per min. Allen condensers are used, and the condensed steam is pumped through Lea recorder meters so that the amount of steam consumed can be registered. The circulating water is pumped out of the condensers by pumps with a capacity of 57 000 000 galls. per day, which lift the water to nine large cooling towers. This circulating water system is also connected to the canal, careful arrangements being made for screening out the detritus.

The alternators are cooled by B.T.H. air cooler plant which has a circulation of 20 000 cub. ft. per min.

The switchgear is situated on three floors, on the uppermost one of which are the oil switches for controlling the generators, main inter-connection and trunk feeders. In addition, there are other main switchboards which are used for the general distribution of the e.h.t. current for the station auxiliary plant, and the 57 odd public sub-stations in the district and bulk supply consumers.



GENERAL view of the Turbine Room of the Wolverhampton Generating Station showing the new sets.



THE exterior of the Wolverhampton Station. This gives a good idea of the changes resulting from the reconstruction of the building.

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ELECTRO FARMING.

Conference at the Royal Agricultural Show—The Farmer's Wife—The Need for Saving Hundreds of Pounds.

AN interesting conference on "Electro Farming," over which Mr. Ll. B. Atkinson presided, was held in connection with the Royal Agricultural Society's Show at Reading last week. Two papers, one on "Electric Power on the Farm" and the other on "The Economic Use of Electric Lighting on the Farm," were read by Mr. C. T. Allan and Mr. R. Borlase Matthews respectively. We published an abstract of Mr. Matthews's paper on p. 52 of our last issue. An account of Mr. Allan's paper and the joint discussion is given below :—

Progress in South Wales.

Mr. C. T. Allan said that the first Royal Agricultural Society's Show after the war, at Cardiff in 1919, was also the first at which there was an electrical exhibit, and there was such a large attendance that the police had to be put on to guide the people. As a result there had been a great desire on the part of farmers to have an electricity supply in South Wales, and he could only hope that when the Government Electricity Bill came into operation it would be possible to have transmission lines all over the country. In this connection he urged farmers to look favourably upon applications for wayleaves, because if they resisted them it would only mean an increase in the cost of electricity. The general experience in South Wales was that as soon as a farmer got electricity on for lighting he immediately installed a motor for chaff cutting, pulping, etc. It was, in fact, remarkable what a small 2-3 H.P. motor, costing £25, would do. In one case a farmer installed a small motor for chaff cutting which had previously cost him £65 a year in labourers' wages. He was now able to do three times the amount of work he used to, because he also did work for his neighbours and made money in that way, and yet his total bill for current, at 2½d. per kWh, was only 36s. There was also considerable development possible in electro-culture and, of course, in the house for washing machines, vacuum cleaners, irons, cooking, heating, etc. Small power could be provided by means of a portable motor on a trestle, and undoubtedly this led to more extended uses for which individual motors were required. The farmer's wife particularly appreciated the labour saving which the various household uses of electricity made possible. As regards the vacuum cleaner, it was not generally known that this was also the finest fly-catcher available. If a rubber pipe was attached to the suction end and run round the windows and walls, flies were sucked in at once. Radiators used in conjunction with fans had a wonderful effect in increasing the temperature of a room by circulating warm air quickly. The Sunray radiator was very useful for heating conservatories and greenhouses.

After Mr. Matthews' paper had been read Mr. C. D. McDowell expressed the view that it would be necessary to deal with the larger applications of electricity on the farm before there could be a full development of the smaller uses. He was within two miles of a supply of electricity and would at once adopt electric ploughing if a successful machine was available at a suitable price. Until such apparatus was developed on economic lines, however, he could not imagine much progress being made with rural electrification, for the simple reason that it would not be economic to take electricity into the rural areas merely for the lighting and small power load.

Mr. W. A. Turnbull (Borough Electrical Engineer, Aylesbury) said he was doing all he could to make electricity on the farm a practical proposition for the farmer in the Aylesbury area. A scheme was being developed there covering practically 250 square miles of agricultural land. It was no use trying to rush the farmer, however; this development would have to be done gradually. The great aim at the moment must be to get some examples in their districts of the applications of electricity on the farm. He was concentrating on the small uses, but hoped to be ready in about 18 months' time to study the larger uses, such as ploughing.

Mr. H. T. Young said he had found that, owing to the capital cost of the battery, people with isolated plant never went beyond lighting and the use of very small apparatus. Such was the psychology of the farmer, however, that as soon as one went in for a new thing all others would want to follow, and that gave some point to the suggestion of Mr. Turnbull that every effort, at this stage, should be made to get examples in the various districts.

The Chairman, proposing a hearty vote of thanks to Mr. Allan and Mr. Matthews, said it was a little astonishing that so few people at a Show like this—farmers as well as manufacturers—should have felt sufficiently interested to attend this meeting. At the Show was a lot of very valuable machinery for arable farming on which most people lost money. In electricity, however, they had a means of turning the scale, but there was yet a lot of pioneer work to be done. Himself and others interested in farming and electricity believed that the next great move by the electrical industry would be in the farms and rural areas.

REVIEWS.

Modern Telpherage and Ropeways. By HERBERT BLYTH, M.I.C.E. (London: Ernest Benn, Ltd.) Pp. 156. 27s. 6d. net.

An unmistakable sign of the rapid progress made in the adoption of mechanical handling methods is the fact that the subject as a whole is becoming too extensive for the scope of one text-book. Mr. Blyth's monograph is the first really serviceable publication which deals with that section of handling engineering which concerns telpher and ropeway transport.

The work in question is equally as helpful to the industrialist who employs overhead transport as to the engineer who builds it; both will find in it useful data to go upon. The very instructive information concerning steel structural work for telphers is of more particular interest to the latter.

Many of the advantages pointed out as belonging to the telpher are as yet practically unknown in this country, and Mr. Blyth having carefully enumerated them may, it is hoped, be instrumental in promoting their adoption, by overcoming the conservative attitude of those who control the purse-strings in industry.

In the ropeway section are given details of a number of interesting features, never before published in any text-book. They refer to angle stations, automatic shunt rails, and suspended railways both electrically and rope operated.

The chapter on grabs includes all the latest types which by the elimination of "spin" lend themselves as integral parts of the telpher plant for storing and reclaiming. The distinctive feature of each type has been lucidly given.

Noteworthy features of the book are the allusions to prime cost of both telpher and ropeway installations, working and maintenance expenses, and the actual saving over manual performances. Such information is most acceptable, since it is always difficult to obtain.

The statement that "the ratio of the cost of the working parts of a telpher to that of its supporting structure is very low as compared with a similar ratio for the conveyor class, and that consequently the maintenance and depreciation charges are lower for the telpher than for other types of conveyor," will be considered by some handling engineers as rather sweeping. A telpher installation involves, as is obvious from the illustrations, a good deal of steel work, and the ratio between this and the working parts may be low, but the weight of telpher machine, plus man, plus grab, is very great when compared with the net load conveyed, whereas with the conveyor, which the author seems to despise, more favourable conditions may obtain.

The book will fill a gap, in which hitherto there has been nothing to put, on the bookshelves of the power house and gas works engineers and also on those of the handling engineers.

The book is well printed on very good paper and profusely illustrated, all half-tone blocks being on art paper and printed on one side only, which ensures every detail being clearly visible.

Mr. Blyth has written his book from a cosmopolitan point of view and has omitted nothing of interest and allied to his subject, from whatever source it might emanate.

"Modern Telpherage and Ropeways" is not only a good book by a good man, but, moreover, as the reader is constantly reminded while perusing it, by one who has been in close touch with the telpher throughout the period of its modern evolution.

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ELECTRIC MINING APPARATUS.*

Twelve Years' Developments as the Result of 1913 Act—Details of Signalling and Telephone Equipment.

By G. D. KENNEDY.

PREVIOUS to the passing of the "Coal Mines Act" in 1913, signalling in mines was usually considered a simple proposition, of little importance. It often consisted of a rope which, when pulled, raised a piece of iron and allowed it to fall on to a piece of iron plate, thus giving an audible signal. In the original paper the author gives a summary of the Clauses of this Act which caused a considerable amount of discussion. Quite a number of manufacturers proceeded to design apparatus capable of furnishing visual signals, and most of the early forms of apparatus arranged for the cancelling of signals by the winding engine-man, thus introducing the human element. But it was soon realised that in order to carry out the spirit of the Act completely, the cancelling, as well as the registration of signals, should be automatic.

Ingenious Dial Indicators.

The simplest way of complying with the Act was the provision of a dial indicator, the pointer of which automatically registered the nature of the signal, and a cancelling device operated by the engine to cancel the signal when the engine is moved to comply with the order. The drawback was the progressive movement of the pointer, one step round the dial for every signal. Other difficulties arose in conveying repeat signals. One method of avoiding the accumulative effect is to fit a delay action device to the indicator, based either on the use of a dashpot or a vane or governor type mechanism. But the problem can be met by various ingenious electrical devices, for instance, special forms of sending switches. One such switch has to be moved through 90 deg. before it can be pressed to give the signal. Immediately the handle is released it returns, and this return movement closes the releasing circuit and cancels any previous signal. Another requirement that is now met is the indication of the place from which the signal proceeds; also signals can be given simultaneously by one dial for the banksman and others for the various onsetters. The work of mechanically operated signalling gear is very hard, and involves wear and tear, also some loss of time in signalling; though the initial cost of the electrical system is higher, the saving in maintenance cost and time is an important item.

The author also discussed in some detail the design of release-switches, remarking that while it is necessary to cancel all action signals at the commencement of a wind, it does not follow that "cautionary signals" need be cancelled. Many releasing switches are operated on the governor principle, others utilise a small magneto or generator, and there is one form of apparatus based on the use of mercury contacts that is particularly interesting. Apparatus in use at the present time falls into two main groups:—(1) apparatus of a step-by-step motion which can be used in conjunction with mechanically or electrically operated signals, and (2) apparatus of a more elaborate type, generally giving luminous indications which are invariably electrical. Colliery officials often desire that all signals, even action signals, should be allowed to remain indicated until the wind is completed, believing that such an indication would prove valuable in determining the correctness of a signal should an accident occur. In practice action signals must be cancelled immediately the engine starts so that the "stop" signal can be given. The only way to enable signals to be checked in the event of an accident would be to provide a separate recording apparatus.

Code Ringing.

In the final section of the paper the author discussed telephones, which may be either of the magneto or battery call type. The former provide a relatively high voltage (about 75 V) and enable reliable signals to be obtained over a comparatively poorly insulated system. They are capable of giving good results over long periods without requiring adjustment. Battery call telephones are now only used in small numbers. Design presents special features, including cases solidly constructed of cast iron with covers to comply with Home Office regulations. The simplest and cheapest mode of connection is the well-known "bridging system." Only one conversation can proceed at a time, and some form of code-ringing must be employed. A switchboard is naturally more expensive, but its advantages are obvious, and considerable interest has recently been taken in systems of linking up both underground and pit-head stations in a comprehensive scheme.

In the discussion, Mr. J. W. Gibbon (Branch President) referred to troubles in shafts and emphasised the importance of using the very best quality cable. He also inquired whether the winding signal system advocated worked on permanent current, as the latter method has given rise to trouble in early days. Mr. R. Pickett inquired whether batteries or secondary cells were best for working these signals. Mr. Robertson referring to multi-core cables in shafts 200 to 400 yd. deep, had found it better to use E.V.I.R. cables in porcelain insulators, as the cable could then be so easily replaced. Mr. F. C. Knowles thought that the step-by-step system of signalling had limitations. A system on the ohmmeter or ratiometer principle, similar to that used on ships, gave a definite signal every time, whatever the operator might do. He imagined a pressure of 24 V would be used to comply with the regulations. He referred to a system of recording the last ten signals; a similar device had been suggested for motor cars, the speed of over half-hour periods at intervals of five minutes being recorded. Mr. Kennedy, in reply, said that the use of lamps involved a pressure of, say, 20 V, and the use of accumulators. The systems described used a permanent current, but had no double pole switches. At the present time, cables were much better than in the days referred to by the President, and no troubles had arisen. The choice of batteries or secondary cells depended on the nature of the colliery, especially the facil ties for charging. Either method worked well under good conditions. The idea of running single lengths of cable down a shaft was not bad if the distance was not too great, but a multicore cable was preferable if the depth was great; such cables had lasted very well. He described in some detail a recording device similar to that mentioned by Mr. Knowles. This worked very well, but might possibly be expensive to make. The pressure for signalling was 25 V. He had not heard of the ohmmeter or ratiometer principle being adopted in mines. Signalling in mines could hardly be compared with fire control gear on board ship; he had, however, heard of the step-by-step system being applied on battleships. In a colliery there was little probability of the system breaking down in the middle of a signal. There were, however, some ingenious modifications that had recently been suggested.

*Abstract of a paper read before the London Branch of the Association of Mining Electrical Engineers.

STANDARD BRASS BARS AND SECTIONS.

THE British Engineering Standards Association has issued specifications for brass bars (high-speed screwing and turning) and high tensile brass bars and sections (Nos. 249–1926 and 250–1926 respectively).

The copper content in the high-speed screwing material is specified to be between 56 and 60 per cent. and the minimum tensile strength 20 tons per square inch. with an elongation of not less than 20 per cent. In the high tensile brass, two grades of which are specified, the copper content is required to be between 54 and 62 per cent. The minimum tensile strength of the first grade is 30 tons per square inch, with a proof stress of 15 tons per square inch and a minimum elongation of 25 per cent. In the lower grade the minimum tensile strength is 35 tons per square inch, with a proof of stress of 18 tons per square inch and a minimum elongation of 20 per cent. Tables giving the margins of manufacture for round, square and hexagon bars, whether extruded, rolled or drawn (after extrusion or rolling), are included as appendices to both specifications. Specifications covering naval brass bars and sections are in preparation.

Copies of these new publications can be obtained from the B.E.S.A., Publications Dept., 28, Victoria Street, London, S.W.1, price 1s. 2d. each, post free.

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LABOUR SAVING IN THE WORKSHOP.

The Use of Specially Designed Fractional Horse-Power Electric Motors for Industrial and Domestic Purposes.

NOT only are electric motors in various sizes from one-half horse-power up to the largest—one of 20 000 H.P. driving a Yorkshire steel mill—in very extensive use for numerous industrial purposes, but there is a big demand for small motors developing one-half, one-quarter, one-sixth or even only one-eighth horse-power. There are innumerable applications of these fractional horse-power motors in the retail shop and in the home as well as in the factory, their adoption taking place in ever-increasing quantity as their possibilities became more and more appreciated. It is interesting to note that these small motors are made by the British Thomson-Houston Co., the same firm who manufactured the 20 000 H.P. motor just mentioned.

An important point with regard to the marketing of fractional horse-power motors is that users often require prompt delivery of their orders. To meet this requirement, the British Thomson-Houston Co. has arranged to maintain a large stock of completed machines for use both on alternating current and on direct current circuits. The range of sizes is from one-eighth horse-power up to one-quarter horse-power for the alternating current motors, and up to one-half horse-power for the direct current motors. Starting and stopping is a very simple matter, and, for all motors up to and including the one-quarter horse-power size, may be effected through the medium of an ordinary tumbler switch ; in many instances the motors may be connected to the lighting circuits.

The direct current motors are compound wound and are made for operation on circuits of any standard pressure between 50 and 250 V. The mean speed is 1 725 revs. per min., but a speed of 1 140 revs. per min. is available for motors of the one-sixth horse-power size. These motors can be supplied for rotation in either direction or in both directions, as well as for variable speeds, if desired.

The alternating current motors are of the split-phase type, a centrifugal switch being incorporated in the design so that the starting winding is automatically cut-out as soon as the running speed is reached. The circuits for which

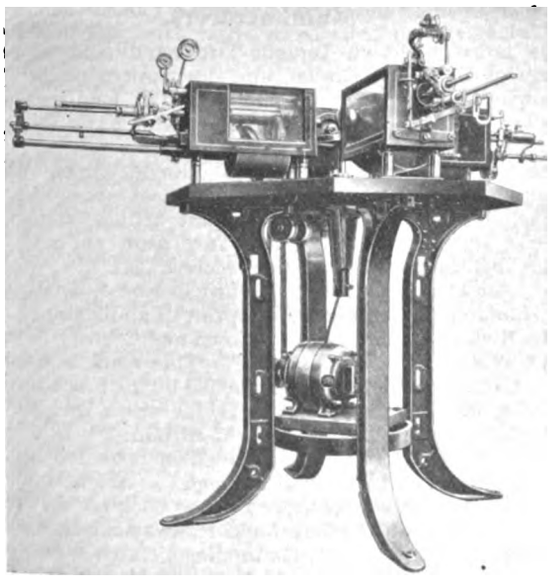

Fig. 1.—View of automatic silk winding spindles driven by a fractional horse-power motor.

these motors are supplied are those of standard pressures between 100 and 250 V, 25 to 100 cycles, the 25 and 50 cycle motors being designed to run at 1 425 revs. per min. and those for operation on circuits of other frequencies at the nearest possible speed to this.

As motors of the kind under consideration are being used extensively for driving domestic and industrial machines of standardised dimensions, it is important to the manufacturers of such plant that motors of the same horse-power for direct and alternating current circuits be interchangeable. B.T.-H. fractional horse-power motors of equal output for direct and alternating current circuits are interchangeable, although in the case of alternating current motors for other than 50 cycles the dimensions are a fraction of an inch wider than for the corresponding direct current motors. By this method of standardisation every motor is of minimum size for its output, whatever the frequency of the circuit.

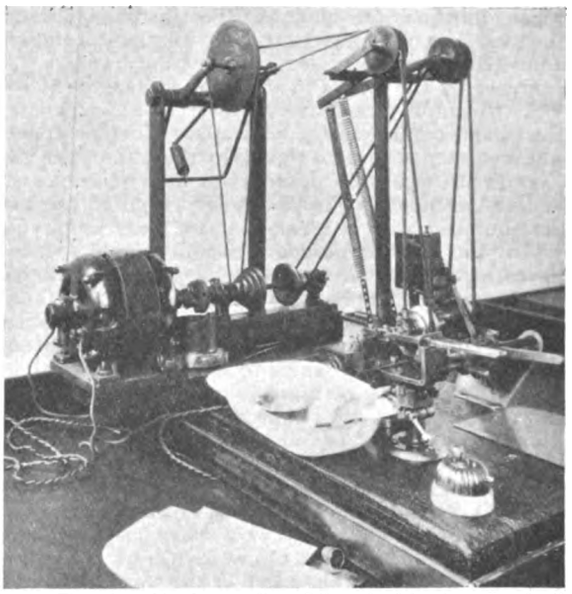

Fig. 2.—View of machine for rounding off the ends of bearing rollers for the "Megger," "Meg," etc, at Evershed and Vignoles works.

Among the other notable features of B.T.-H. fractional horse-power motors may be mentioned their high starting torque and overload capacity, low temperature rise, robust construction and high-class finish, this being in black stove enamel with nickel fittings.

WATER ENGINEERING.

A Great Irrigation Scheme in India—Important Contract for British Firm.

THE subject of water engineering is naturally of the greatest interest to the electrical industry, if only because the production of electrical power by utilising the energy in falling water is advancing in leaps and bounds. Important also is the subject of barrages in rivers and other sources of supply in order to increase the reserve of cooling water for steam-driven electricity stations. It will be remembered that we gave, in our issue of June 11th last, a description of the work on these lines of Glenfield and Kennedy, of Kilmarnock, and we have now been able to obtain some information with regard to the contract they have secured for sluice gate equipment for the new Nizam-Sagar irrigation barrage that is to be erected at Hyderabad, India.

The general principle of a barrage for power station cooling water, although generally on a smaller scale, is, the same as irrigation barrage work, now making enormous strides. Thus for example over 30 000 000 acres of soil is now being irrigated in British India alone on these lines, not including native states, such as Hyderabad, involving about 70 000 miles of main and feeder canals and producing crops every year worth about £120 000 000.

Glenfield and Kennedy have long specialised on this work, and they have supplied over 200 large steel sluice gates alone, largely in South Africa, India, and Siam. For the Nizam-Sagar barrage, which is on the Manjira River, about 50 miles from the junction with the Godaveri River, the contract includes 28 sets of gates 40 ft. span by 15 ft. 6 in. deep, of the free-roller type on the latest principles, hand operated, with cast iron projecting grooves, cast iron sills having renewable teak wood faces, steel counterbalance weights, and geared headstocks, all carried on a steel overhead structure erected on heavy masonry foundations.

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Mechanical and Electrical Vibrations.

(*Concluded from page* 65.)

the tuning fork. The bar was then sustained in longitudinal vibration at a frequency of about 6 250 cycles. If desired a soft iron bar may replace the cobalt steel magnet, and the yoke be then magnetised by a direct current. The 200-fold harmonic of the bar is an oscillation corresponding to a wavelength of about 240 m. Experiments are being continued with much shorter bars.

Applications of this method of linking mechanical and electrical vibrations are obvious. For instance, the method may be used for generating electrical oscillations of exceedingly constant frequency for wireless transmitting stations. As has been proved by the Post Office station at Rugby, it is quite practical to amplify oscillatory power of a few microwatts until it becomes hundreds of kilowatts. Another application is to the reception of wireless signals by the heterodyne method. This would be especially appropriate at a receiving station which was intended to receive solely from a transmitting station equipped with a fork generator; the unvarying frequency of the heterodyne sound would enable refined note tuning to be adopted at the receiving station. But perhaps the most frequent application of the neon lamp and fork combination will be to calibrating wavemeters. To perform this operation the coil marked *L* in Fig. 2 is brought near to the coil of the wavemeter so as to induce electromotive force in it and the capacity of the condenser in the wavemeter is slowly varied while the indicating apparatus—usually a rectifying device with a galvanometer—is watched. It will be found that as the condenser vanes rotate, the galvanometer deflection rises and falls, for the reason that the wavemeter resonates to the successive harmonics of the fork. The rises of the deflection are in the nature of sharp peaks; the reading of the condenser scale at the top of each peak is easily determined; and the calibration curve of the wavemeter can then be constructed by taking condenser readings as abscissæ and consecutive whole multiples of the fork's frequency as ordinates.

As compared with the triode and fork combination, the neon lamp and fork combination is more difficult to adjust and to keep in adjustment. This is partly due to the variation of the gas content of the neon lamp as time goes on. Thus the triode arrangement is generally the more reliable, but the neon arrangement is the more fertile in harmonics.

Electrical Traction in British Columbia.

(*Concluded from page* 66.)

streets the cluster standards have been replaced by single units of higher intensity.

Industrial Power.

With but few exceptions every industry within reach of the transmission lines uses B.C. Electric power. The exceptions are the large lumber mills which must use their waste fuel, and one or two institutions which require steam for heating and laundry purposes. For the rest, rates are so low that no private installation can produce power so cheaply. One large industry using B.C. Electric power is the Britannia Mines on Howe Sound, 28 miles from Vancouver. A 14 000 V transmission line was constructed in 1923 to serve the great copper mine at that place.

In Victoria the shipbuilding and repairing industry as represented by such local firms as Yarrows, Ltd., and the Victoria Machinery Depot, form a considerable and constantly increasing item in the company's output of commercial power. The Dominion Government dry dock at Esquimalt is also nearing completion. It is the second largest in the world and will give a considerable impetus to the shipbuilding industry in Victoria. There is already a total connected commercial load in that city of 28 000 H.P.

In Vancouver itself the development of the harbour during the last few years has meant a large increase in the company's connected load. The new piers, grain elevators and the industries arising from them, all use electric power in large quantities.

Gas.

This article cannot be allowed to close without mention being made that a subsidiary company of the B.C. Electric Railway Co. undertakes to supply the community with gas (not merely the hot-air variety) and owns two modern gas plants—one in Vancouver and the other in Victoria. At one time water gas was manufactured, but owing to the proximity of suitable coal on Vancouver Island, the plant has been changed and coal gas is now supplied. The new plant is of the vertical retort type, the first of its kind on the Pacific Coast and one of the first in Canada. The one in Vancouver has a capacity of 2 000 000 cub. ft. per day and that in Victoria a capacity of 700 000 cub. ft. per day.

There are now 256 miles of gas mains and 30 000 gas consumers. The gas is used entirely for heating and cooking purposes.

Thus it is seen there need be no inherent antagonism between electricity and gas. They can be supplied by the same company and pushed with equal vigour. Most people out there take advantage of both, if the gas and electric light mains are within reach of their homes.

Correspondence.

BURIED CABLES REPORT.

[To the Editor.]

Sir,—May I be allowed to thank Mr. Melsom for his letter published in your issue of 9th inst., which I have only just seen, owing to having been away.

I ought not to have forgotten the published list of corrections (which include *all* mine), especially as I believe I pointed out some of them to Mr. Fawssett when the paper was read at Newcastle. With regard to the errors in my corrections, in the first case the rest of the expression is raised to the *n*th power as printed, and my correction was intended to be as stated by Mr. Melsom, but possibly his way of putting it is clearer. The 0·577 for 0·477 is a slip on my part; I have the correct figure on my own copy, but put the wrong value in my letter.

Apologising for having written unnecessarily, but trusting it may have had the good effect of reminding others of the existence of a list of errata.—I am, etc.,

W. T. Maccall.

Sunderland.
July 13th.

Trade Publications.

Details of Catalogues and Dealer-Helps Issued by Manufacturers.

The latest "Brown Budget" to hand contains a brief history of Mr. S. G. Brown, and descriptions of the famous "Brown" gyro compass, the new "P.Q." loud speaker, the "Brown" cabinet loud speakers and the S. G. B. Athletic Association.

The Eagle Engineering Co., Ltd., Eagle Works, Warwick, has issued an abridged list of electrical accessories. The list includes prices of cables, conduit fittings, domestic appliances, insulators, switch and fuse gear, cut-outs, lampholders, bell fittings, cells, valve receivers, etc.

De Leeuw and Co., Ltd., Sentinel House, Southampton Row, London, W.C., send us a reprint of an illustrated article by Mr. Sydney Lakehurst, in "Town and Country News," on "High-Water Mark in Wireless." This mark is considered by Mr. Lakehurst to have been reached by the Freed-Eisemann five-valve neutrodyne wireless sets, for which De Leeuw and Co. are sole concessionaires in Great Britain.

Morris pulley blocks are described in book 108 issued by Herbert Morris, Ltd., Loughborough. Amongst the uses of these pulley blocks illustrated in the book are the lifting of electric grinders and Underground Railway carriages. Prices are given of pulley blocks, chain slings, clutches, etc. Other publications are a leaflet on Morris vertical cross-tube boilers and a folder dealing with Morris battery trucks.

We have received a folder descriptive of the soot blowers manufactured by the Bayer Co., of St. Louis, Mo. U.S.A. The company builds a distinct soot-blowing system for every type of boiler, and it is mentioned that the Carnegie Steel Corporation alone ordered 224 Bayer balanced valve-in-head soot blowers in less than a year. The Lovick Johnson Co. 5, Montana Road, London, S.W.17, are the sole concessionaires for the Bayer blowers in Great Britain and Ireland.

We are asked to call attention to the fact that the batteries on the electric storage battery mining locomotive which won the £1 000 prize offered by the late Mr. Charles Markham were supplied by the D.P. Battery Co., Ltd.

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NEWS IN BRIEF.

Electrocution of Bacteria in Drinking Water—Electrical Traders and Merchandise Marks—Admiralty Electrical Engineers' Pay Rates.

ELECTRICAL students at Blackburn Technical College number 37.

On January 1st, 17 672 towns and cities in the U.S.A. had a supply of electricity.

Blackpool connected 317 new electricity consumers in May compared with 296 a year ago.

Sheffield Corporation has invited tenders for the erection of a transformer substation in Herries Road.

The Oxford Electric Co., Ltd. have subscribed £19 to the local fund for the British Association meetings.

Lady Salvidge will be asked to set in motion the new 25 000 kW set at the Lister Drive (Liverpool) power station.

Bolton Chamber of Commerce complains that the Electricity Bill will substitute for industrial control the "dead hand of the State."

The staff of Albert E. Sudlow and Co., registered electrical installation contractors, of Manchester, held their annua picnic at Chester.

Electrocution of injurious bacteria in drinking water and sewage is being tried in New Jersey instead of chlorine and similar treatments.

The borough electrical engineer is undertaking the installation work for the electric lighting of the Darlington covered market, at a cost of £10c.

The decoration and furnishing of the saloon of the new .s. "Dominia" are from designs by the Hon. Elsie Mackay, he daughter of Lord Inchcape.

Perfect weather favoured the annual sports of Johnson and Phillips, Ltd., at Kidbrook. Lady Dawson, wife of Sir Philip Dawson, one of the directors, presented the prizes.

Sir Hugo Hirst, Mr. G. W. Spencer Hawes, managing director of the Reading Electric Supply Co., and Mr. R. J. Wilder, of Wilder and Co., electrical engineers, were members of the local committee for the Reading Royal Show.

A joint committee of the London Chamber of Commerce, representing many traders, including electrical importers and traders, has passed a resolution protesting against the unnecessary interference with trade threatened by the Merchandise Marks Bill.

The British Association's annual meeting will be held at Oxford from August 4th to 11th. The Prince of Wales will deliver the presidential address, and Sir John Snell's presidential address in the Engineering Section will be on the subject of "Electricity Supply."

The laying of the first section of the new "permalloy" cable for the Western Union Telegraph Co., between Bay Roberts, Newfoundland, and Penzance, has been successfully completed by c.s. "Colonia." The ship is now proceeding to London, where she will load the cable for the Bay Roberts and New York section.

A telephone which is being installed in a cabinet in the Press gallery of the House of Commons is notable owing to the fact that it completes a total of half a million telephones installed by the London Telephone Service. It is proposed to attach a commemorative tablet to the cabinet and to have an opening ceremony.

A "Financial Times" correspondent states that the Norwegian Cabinet has submitted to the Storthing a proposal to grant the Aluminium Corporation a 56-years' concession to use 36 000 kW of the power developed at the Glamfjord hydro-electric works, with the right to take over a further 36 000 kW, if desired, at a later stage.

The annual outing of the employees of Page and Miles, Ltd., electrical engineers, of Brighton, was held last week, when a party numbering 73 journeyed by road to Horsham and Guildford. Mr. E. J. Page presided at dinner, and the guests included Mr. L. C. Penwill, secretary of the E.C.A., and Mr. W. Bowthorpe, of the General Electric Co., Ltd.

"The Times" reports that a convention was signed on Monday between the Greek Government and the Eastern Telegraph Co., whereby the company is granted the privilege of maintaining cable and wireless telegraphic communication between Greece and foreign countries for a period of 50 years. This is the first occasion on which a concession has been granted to a company for a joint cable and wireless service.

An additional automatic telephone exchange has been opened at Hull.

A German fitter working on the Shannon scheme wsa accidentally electrocuted last week.

Electrically-operated light signals are a feature of the new 'bus station at Victoria (London).

Slight damage was caused by fire at the battery charging station of the Oxford Wireless Telephony Co.

Aldershot Chamber of Commerce is organising a shopping week and window-dressing competition from October 28th to November 6th.

Mr. A. E. Jepson, manager of the Sheffield branch of the G.E.C., lectured to Rotherham Rotary Club on "An All-Electric Home."

Bolton Electricity Committee has placed a contract for the erection of a sub station at the junction of Deane Church Lane and Doris Street.

During the year ended April 30th, 1926, the number of telephones installed by the Post Office was 225 352, compared with 216 980 during the preceding year.

Eagleston and Son, Ltd., Hill, Upton and Co., the Oxford Electric Co., Ltd., and the Austin Lighting Co., Ltd., are among those on the King's Roll for Oxford and District.

Last year Quebec Public Service Commissioners granted permits for the erection of 440 miles of transmission lines, but this year it is estimated that permits will be granted for 2 000 miles.

Mr. A. E. Jepson told the Sheffield Rotary Club that in America there are 4 000 000 electric washers in use, compared with 50 000 in 1914. In the next three years it is estimated that another 4 000 000 will be sold.

A telephone system has been installed in a Ramsgate Congregational Church to enable deaf members of the congregation to take part in the services. Microphones are placed on the pulpit, reading desk, or lectern, and each deaf worshipper is provided with an earpiece.

In the last year 269 U.S.A. cities closed down or sold their municipal electricity works to private companies, according to a survey just completed by the N.E.L.A. This brings the total of abandoned municipal plants up to 1 129 during a period of a little over five years.

Admiralty electrical station engineers and senior electrical station engineers who had been for two years and less than four years prior to April 9th on the old maximum rate of salary, and those who had been for four years or upwards prior to April 9th on the old maximum rate of salary, may be granted an mmediate increment of £10 or £20 respectively.

Awards to Inventors.

Settlement of the Metropolitan-Vickers Co.'s Claim Against the Admiralty.

MR. Justice Tomlin and Sir G. Chadwyk Heeley (sitting as members of the Royal Commission on Awards to Inventors), last week heard an application for approval of an agreement between the Metropolitan-Vickers Electrical Co., Ltd., and the Admiralty in respect of wireless patents.

Mr. Whitehead, K.C., for the applicants, said there were eight patents involved, but he would discuss only one, which would expire in 1929. It stood in the name of Lee and Hogan and the present owners were the applicants. Lee and Hogan's discovery led to a remarkable invention which made continuous wave reception a practical art, and it was one that was still in use. The agreement provided for the payment for past and future use of £4 000 down and £2 000 per year for each of the next three years, a total of £10 000.

Dr. W. H. Eccles said there was nothing comparable in efficiency to this invention, which he ranked as one of the most important of the three or four important discoveries made in wireless telegraphy.

Mr. Moritz (for the Admiralty) said they thought the lump sum arrived at was reasonable.

The Commissioners, with certain modifications, approved the agreement.

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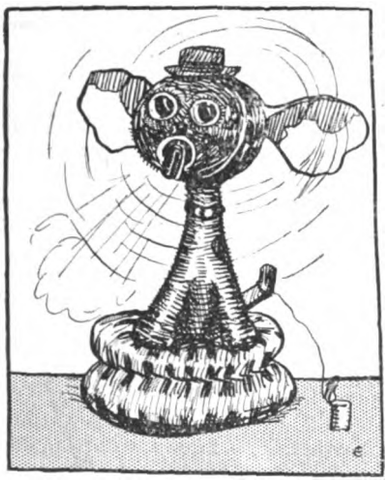
IN LIGHTER VEIN.

Random Comments and Reflections on Electrical Topics of the Week.

RECENT hot weather reminds us of our domestic pet Fanzo, who makes his breezy début below. He leads a dog's life; one day the favourite, petted and patted; the next, put away without a thing to eat, and forgotten. When his day is in, however, Fanzo proudly sits on high, turning his head first this way and then that way, receiving cool glances from those below, and getting the breeze up generally.



Fanzo, a popular summer-time domestic pet.

Securely muzzled, he can harm no one, but persons removing his muzzle may have their fingers rapped in an unguarded moment. Very energetic at his exhausting work, he will do his turn until he assumes the colour of a Blackman. Unlike his friend Bonzo, he does not wag his tail when happy, but wags his ears! Although his tail controls his movements—a single touch will double his speed—he has no control over it; a case of the tail wagging the dog.

* * *

When kept on his lead Fanzo is perfectly happy and content, but once he is taken off his lead and set free, he no longer runs and wags his ears, but sits quite still with mournful eyes, dormant and desolate.

* * *

Very clean in his habits, Fanzo keeps two brush-holders and brushes in his mouth ready to clean his teeth, and a supply of grease in a screwed tube to oil his tonsils. Usually free from troubles, he is subject to discount and distemper, although the latter can be avoided by keeping him under cover when decorators are about.

* * *

Full of mischief, Fanzo delights in hair-raising stunts, cheerfully chases flies, plays steam with windows, and unsettles bills with a blow. Some of Fanzo's stable companions have been trained to perform tricks, and put up a good performance on the stage as "The Cosmopolitan Flickers." It is said that they do this to raise the wind.

* * *

The Muse—not Fanzo—has bitten our poet to some purpose:—

Blow, blow, Fanzo,
Set the breezes blowing.
From the ground whizz them round,
Round and round and rolling.

When you reverse (in the next verse)
Direct your breeze, and put at ease
The heated lady, Sadie.
Just to please her, Freezor.

Oscillate and commutate
Round Orbits in this Cosmos.
Sun and stars, including Mars,
Are betting on your setting.

* * *

Our Parliamentary correspondent states that the tree loppers have had to go the whole Hogg.

* * *

Discussing the possibilities of the Electricity Bill, a religious journal says that "the prospect is pleasing from every point of view." And only man is vile.

* * *

Did the gentleman who, at the Electrical Conference at the Royal Agricultural Show, announced that he had not come to talk about electricity, but only to look at pigs, really mean what he said?

THE NATIONAL REGISTER.

Executive Accepts Nineteen Further Applications from Electrical Contractors.

AT the July meeting of the Executive Committee of the National Register of Electrical Installation Contractors, thirty-three applications from electrical contractors for inclusion on the Register were considered, and of these nineteen were accepted and fourteen were declined, thus bringing the total enrolment, exclusive of duplicated entries, up to 930.

The rate of progress as indicated by the latest figures can hardly be regarded as satisfactory, even when contrasted with the June total of thirty new registered contractors, but it is to be hoped that the prominence given to the subject of registration at the E.C.A. Conference at Brighton (fully reported in THE ELECTRICIAN of July 2nd) will result in a greatly increased number of applications and acceptances being notified after the August meeting of the Executive. As Mr. F. W. Purse pointed out in his recent Paper on "The National Register," it is really inconceivable that any electrical contractor of repute should continue to be unregistered, when the only essentials are the maintenance of a proper standard of work and an annual fee of £1. If only the registered contractors would adopt Mr. Purse's exhortation to "undertake the rôle of missionary" there would soon be a great addition to the number of registered contractors, and also a corresponding improvement in the status and influence of the registration movement as a whole.

The high percentage of unsuitable applications in July—nearly 50 per cent.—indicates that there are still many contractors who do not properly understand the qualifications required, and the necessity for supplying the precise information asked for. Any contractor who is in doubt as to what is required of him can obtain the fullest information from Mr. T. Trimnell, the Secretary, National Register of Electrical Installation Contractors, 1, Lincoln's Inn Fields, London, W.C.2.

The list of contractors whose applications for registration were accepted at the July meeting is given below, the names being in alphabetical order:—

Bailey, Charles W., Tenby Road, Chadwell Heath; Bailey, Thomas J., 16b, Dyke Road, Seven Dials, Brighton; Brown, Cranmer R., Ltd., 9, Wellington Street, Hull; Brunswick Engineering Co., Ltd., 9, Brunswick Place, City Road, London, N.1; Crowborough District Gas and Electricity Co., Station Road, Jarvis Brook, Sussex; Cuthbertson and Co., 29, Scarborough Street, West Hartlepool; Drabble, H. E., 1 and 25, Market Street, Staveley, near Chesterfield; Hallam, J. E., and Sons, 30, Great Portwood Street, Stockport; Jackson, F. S., 28, George Street, Halifax; Laidler, J., and Sons, 83, New Street, Durham; Laing, J. C., 4, Regent Quay, Aberdeen; Levine, B., 24, Seymour Place, Marble Arch, London, W.; Mauger, Clifford H., 8, Leazes Park Road, Newcastle-on-Tyne; Moran, W. J., 153, Victoria Road, Swindon; Needham, B., and Sons, London Works, Bakewell; Phillips and Dart, 3, Rivoli Buildings, Chapel Road, Worthing; Rigby, Thos., Ltd., 136, Woodhouse Lane, Leeds; Skewes, W., and Co., Ltd., South Parade, Doncaster; Stillingfleet and Harper, 100, Commercial Street, Brighouse.

Floor Polishing.

A Light Weight Electrical Appliance for Domestic Use.

In most households the operation of wax polishing a floor involves a good deal of kneeling and soiling of hands, in addition to a considerable amount of labour. With the introduction of the "Johnson's Wax" electric floor polisher, waxed floors can be obtained quickly and without effort.

The appliance, which weighs only 9 lb., is of strong but simple construction, being provided with a tough Tampico bristle brush making 2 100 revs. per min. The universal motor for driving the brush takes 0·4 A at 210 V, and can be run off any lamp socket. About 10 hours' working can be obtained from 1 kWh.

A novel feature of the polisher is that it practically propels itself and has only to be guided by means of its long handle. Taking up but little space, the polishing brush can operate under low furniture without moving it.

The selling price of the equipment, including 25 ft. of connecting cord and a finger tip control switch, is £9 18s. 6d. The sole European distributors are L. G. Hawkins and Co., Ltd., 30-35, Drury Lane, London, W.C.2.

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"THE ELECTRICIAN'S" NEW HOME.

Reception to Mark Inauguration of the New Offices—Congratulatory Messages—Introduction of a New Service for Readers.

TO mark the removal of THE ELECTRICIAN to its new premises in Bouverie House, Fleet Street, London, our friends in the electrical industry were invited to tea at Bouverie House last Thursday, when a large number of electrical people attended, and were received by Sir Ernest and Lady Benn. Many congratulatory messages were received from those who came, and also from those who were unable to attend, and though a certain modesty prevents us from quoting them, it was very gratifying to receive so many expressions of goodwill. We may mention, however, that one Manchester gentleman was constrained to write, in what seems to be the *vers libre* style, the following lines :—

" Here's wishin'
Th' Lectrician
All Good Luck—
To the *n*th Edition !

Another reader in the same area seems to expect a great development of our service to the industry—and he will not be disappointed, as we shall show later—and writes to say that he sincerely trusts " that the ample space in your new premises will allow your mental outlook to expand to such an extent that you might even be able properly to amend the Electricity Bill, or fully to understand the new menu of the Engineers' Club."

Among the guests who were present were Messrs. W. Aitken, C. T. Allan, H. Allcock, F. G. Arnott, A. L. M. Ayers ; A. Brammer, A. H. Bridge, H. H. Berry, H. H. Broughton, Provost Neil M. Brown, E. S. Byng ; E. Calvert, R. A. Chattock, Col. R. E. B. Crompton, F. Creedy, J. S. Dow ; C. F. Elwell, Lt.-Col. C. H. S. Evans, H. J. Galliers, F. Goddard, H. E. Goody, Ald. Mrs. Hammer, Miss C. Haslett, F. W. Hewitt, P. V. Hunter, R. Hughman, R. W. Kennedy, Miss B. J. Lanfear, R. F. Looser, D. C. McLagan, H. J. Miles, Prof. W. H. Merrett, E. Myhre, A. Rashleigh Phipps, H. A. Price-Hughes, L. C. Penwill, F. W. Purse, Major T. Rich, C. C. Roe, Dr. A. Russell, F. Selley, E. Kilburn Scott, E. H. Shaughnessy, C. W. Sully, Mrs. Stanton Swire, W. C. P. Tapper, C. H. R. Thorn, F. H. Whysall, K. L. Wood, W. Wyld, and many others.

This reception marks the beginning of a new era of service to the electrical industry, of which brief details may here be given. While THE ELECTRICIAN gives all the service to the trade that can be rendered within the limitations of the printed page, Bouverie House enables us to supplement that service by one which is quite new in the realm of trade and technical publishing ; a service which we believe will be welcomed and accepted as a proper part of our function in promoting the interests of the industry that we serve.

A Club for Our Readers.

It is our intention that Bouverie House should partake of the nature of a club, membership of which is freely open to all readers of THE ELECTRICIAN. Our spacious reception room, which, as some of our guests last week were good enough to say, rivals in artistic and decorative interest the best of the reception rooms of the best of the London clubs, will not be used as *our* offices. Its purpose is to provide a meeting place where readers from the provinces and inquirers after information on electrical matters can find all the comfort and help and assistance that they require.

Subscribers to THE ELECTRICIAN are invited to make their appointments at Bouverie House, where every convenience will be found for conversing with their friends in comfort, and where telephone and correspondence facilities are entirely at their disposal. Letters may be addressed to subscribers in our care, to await their arrival, and will be handed to them upon calling at Bouverie House. Telephone messages may be sent through, and will be preserved in the same way until our subscriber visits us. Subscribers to THE ELECTRICIAN have always made full use of our organisation for the supply of information. A good proportion of our daily post consists of requests for such assistance. There may be a name or an address, or a figure, some information about markets, or the customs and requirements of foreign centres—this sort of service is still, and always will be, rendered by post. Bouverie House will give, to those who care to take advantage of it, the opportunity of obtaining this sort of help, and securing this class of information personally at interviews with our experts. Our Inquiry Department, with its research staff, can now be interviewed personally, as well as through the post.

Perhaps the most original feature about the new ELECTRICIAN office is the mode in which it receives its callers. London is not distinguished for the hearty welcome which its offices accord to the caller. The usual practice is to place at the entrance inexperienced youths, or maidens, whose chances of promotion depend upon their success in getting rid of people who want something. We propose to go to the other extreme : to take an exactly opposite course, and to do what we can to make the caller feel that he is welcome.

Another Innovation.

We admit that in this connection we have borrowed an American idea. On entering the new offices of the ELECTRICIAN the caller finds, right inside the door, a senior member of the staff, who is waiting to make sure that the caller's business is properly understood, and that his desires and wishes are complied with, so far as that is humanly possible. We are going to be thoroughly American in this little matter ; on the reception desk the caller finds a card displayed giving him the name of the reception official on duty, and thus the interview starts right.

These, in the rough, are our ideas of the new service that we can place at the disposal of the electrical industry. The popular Press depends for its existence upon " stunts " ; the trade and technical paper of the future will depend for its existence upon service. The scheme is, of course, quite new to us, and will develop as we have more experience of it, but there is this one other thing that can be said about it, and which should be thoroughly understood to make our service all that we desire it to be to the trade. Callers at our offices will not be placed under any obligation to us on account of information given, courtesy shown, or help rendered.

We live by the publication of THE ELECTRICIAN, and our revenues are of two kinds, and two kinds only. First, the charges which we make to subscribers and readers for the supply of the journal ; and second, the charges which we make to advertisers for the use of our advertising space. It cannot be too widely understood that we have no other sources of revenue, nor do we desire any ; and that those who, being subscribers or advertisers, make use of us in the many new ways in which we hope to serve them, do not thereby place themselves under any sort or kind of new obligation to us.

Electric Cloth Cutters.

Novel Motor-driven Machines for Cutting Thick Layers.

THE old method of cutting up large quantities of cloth and other material by hand is superseded by the " Maimin " portable electric cloth cutters, which have recently been placed on the English market.

Two types of machine are manufactured, the larger having a vertical reciprocating knife and the smaller pattern a rotary knife of either 4 in. or 5 in. diameter. The first-mentioned type of machine, which is driven by a motor rated at ¼ H.P., and taking approximately 250 W, is designed to cut high or low lays of heavy or medium weight materials such as shirts, overalls, canvas, overcoats, and rubberised materials. The machine is designed for rapid cutting, and when in use affords the operator an unobstructed view of the chalk line guide from a natural position. A lay of cloth six inches in thickness can be cut with this machine.

The rotary knife cutters, which are driven by ¼ H.P. motors, are intended for use on low lays of material, and are adapted for cutting to straight lines and moderate curves. A grinder attachment is fitted, and the starting switch and grinder control are conveniently located at the handle.

All the wearing parts of these new appliances are of special alloy steel, hardened, treated and ground, and various other parts are of drop forged steel. A bracket lamp is fitted to the front of each cutter so that a convenient source of light is at hand for illuminating the chalk guiding line on the cloth when necessary. Both types of cutters can be supplied for working on either a.c. or d.c.

The sole distributors are B.E.N. Patents, Ltd., 100, Victoria Street, London, S.W.1.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

SIR Edward Manville has been elected a director of the Metropolitan Railway Co., in the place of the late Mr. J. W. Wheeler-Bennett.

Barry U.D.C., on Monday, adopted a recommendation of the Gas and Water Committee to appoint Mr. T. E. Franklyn (the gas and water engineer) as engineer and manager of the electricity department at a salary of £150.

We are glad to learn that Sir Hugo Hirst, who has been suffering from synovitis, is now convalescent. He is not yet, however, allowed by his doctors to attend to business affairs, and was thus prevented from attending the annual meeting of the General Electric Co. on Monday, this being the first occasion on which he has been absent from the meeting since the company's inception in 1889.

Maidstone T.C. has decided that Mr. E. E. Pope, mains superintendent, shall be regarded as in charge of the electricity undertaking at such times as the engineer may be absent, and that his salary be increased from £520 per annum to £550. Mr. C. H. Tritton (charge engineer), has been appointed station superintendent, and his salary has been increased from £326 to £520; Mr. A. G. Finch has been appointed charge engineer, and Mr. G. Gilham relief charge engineer.

Mr. W. R. Spaven, the retiring general manager of the Portsmouth Corporation Tramways, has been presented with a silver coffee set and tray by the employees' club, a chiming clock by the uniform officials, a leather travelling case by the administrative staff, a set of fish knives and forks by the members of the Tramway Brotherhood, and a silver cigarette box by the Tramways Band. Mrs. Spaven received a handbag from the clerical and engineering staff.

Sir George Sutton, chairman and managing director of W. T. Henley's Telegraph Works Co., Ltd., who is a member of the Council and a vice-president of the Royal Society of Arts, is commemorating the jubilee of his first connection with the Society by bearing the whole cost of the decoration of the rear wall of the Society's house in John Street, Adelphi. Plans have been prepared by Sir Aston Webb and Son, and it is proposed to carry out the work during the summer recess.

Many friends of the late Mr. Frederick S. Spiers are desirous of establishing a memorial commemorating his services to science and the humanities, and it has been suggested that this should take the form of a memorial lecture to be paid for out of the interest on the fund, and to be given at intervals, under the auspices of the Faraday Society. Contributions should be sent to Miss M. Parsons, the assistant hon. secretary, at the offices of the Faraday Society and the Institute of Physics, 90, Great Russell Street, London, W.C.1. Cheques should be made payable to Prof. A. W. Porter, and crossed "F. S. Spiers Memorial Fund A/c."

Obituary.

The following deaths have been announced :—

MR. W. H. STEELE, for many years a member of the Whitehaven Electricity Works staff.

MR. L. COLBERT, aged 61 years. He was in business as an electrical contractor in Bacup Road and Fernlea Street, Waterfoot, Ramsbottom.

MR. FREDERICK HARRISON GLEW, radiographer-electrician, aged 68 years. Throughout the war Mr. Glew was radium expert to the Ministry of Munitions and did valuable research work on luminous compounds.

MR. F. A. NIXON, chief London engineer of the Victoria Falls and Transvaal Power Co., on July 3rd, aged 60 years. Mr. Nixon in 1889 became a pupil in the works of the Brush Electrical Engineering Co. He was subsequently on the staff of the company, and engaged on mains and station work. In 1892 he was appointed third engineer at the Eccleston Place Station of the Westminster Electric Supply Corporation, and afterwards promoted to second engineer and superintendent of mains and underground work. In 1897 he was appointed resident engineer for Kincaid Waller and Manville, in connection with the South London Electric Supply Co.'s undertaking, and in 1899 became chief engineer to that company. In 1905 he was appointed chief engineer of the Handsworth supply undertaking, and in 1911 he became chief engineer in London to the Victoria Falls and Transvaal Power Co., and held that appointment until the time of his death.

OVERSEAS TRADE.

Increase in Electrical Exports in June—Half-year's Figures Show Decrease.

EXPORTS of electrical goods from this country in June were valued at £1 173 787, a decrease of £111 386 compared with the corresponding month last year, but an increase of £440 734 compared with May of this year, in which month the general strike occurred. The electrical exports for the six months from January 1st, amounting to £7 952 272, also are less than those of the first half of last year by £1 221 096. The imports of the same classes of goods, however, are much less in volume than the exports, the total for the six months being valued at £2 225 838 and the decrease for the half-year is £347 704. Certain classes of electrical exports, however, showed considerable rises for the past month, notably railway and traction motors, increase £7 639; telegraph and telephone instruments and apparatus, £68 845; glow lamps, £9 307; switchboards, other than telegraph or telephone, £3 276; and electrical goods and apparatus, unenumerated, £7 325.

Electrical imports for the month show a diminution in most cases, but considerable rises are recorded in a few instances.

Import Figures.

	Month of June.		Six Months.	
	1925.	1926.	1925.	1926.
	£	£	£	£
Electrical Machinery	80 273	126 731	541 437	572 518
Electric Wires and Cables, Insulated—				
Rubber Insulated (not being telegraph or telephone wires or cables)	20 752	14 485	99 622	105 630
Insulation other than Rubber (not being telegraph or telephone wires or cables)	45 069	32 443	193 388	165 975
Telegraph and Telephone Wires and Cables (not being submarine cables)	15 910	4 674	95 225	82 200
Submarine Telegraph and Telephone Cables	—	—	—	—
Telegraph and Telephone Instruments and Apparatus (except wireless valves)	39 297	27 082	483 448	219 570
Carbons, Electric	6 527	3 563	44 735	39 980
Electric Lamps and parts thereof—				
Electric Glow Lamps	49 392	23 971	212 368	136 222
Arc Lamp and Electric Searchlights	432	119	2 820	1 841
Parts thereof (except carbon rods)	380	190	3 153	2 328
Batteries and accumulators (including parts)	22 688	47 432	217 453	198 956
Electrical Instruments (other than telegraphic and telephonic): Commercial (including ammeters, voltmeters, etc.), House Service Meters and Scientific	10 879	20 747	125 202	112 003
Switchboards, other than Telegraph and Telephone	61	113	640	464
Electrical Goods and Apparatus, all other sorts	79 347	107 214	554 051	588 151
Total of Electrical Goods and Apparatus	371 007	403 794	2 573 542	2 225 838

Particulars of Exports.

	Month of June.		Six months.	
	1925.	1926.	1925.	1926.
	£	£	£	£
Electrical Machinery—				
Railway and Traction Motors	17 867	25 506	285 477	238 366
Other Motors and Generators	157 196	97 316	1 101 388	979 952
All other sorts	264 888	230 357	1 644 194	1 521 937
Electric Wires and Cables, Insulated—				
Rubber Insulated (not being telegraph or telephone wires or cables)	125 792	106 558	693 570	747 993
Insulation other than Rubber (not being telegraphic or telephone wires or cables)	111 574	106 287	661 567	749 169
Telegraph and Telephone Wires and Cables (not being submarine cables)	55 946	37 492	403 094	372 060
Submarine Telegraph and Telephone Cables	15 922	3 406	1 015 339	83 782
Telegraph and Telephone Instruments and apparatus (except wireless valves)	221 065	289 910	1 478 027	1 428 651
Carbons, Electric	1 941	781	14 535	8 588
Electric Lamps and Parts—				
Electric Glow Lamps	25 452	34 759	235 202	229 109
Arc Lamps and Electric Searchlights	170	410	8 445	2 674
Parts thereof (except carbon rods)	132	51	2 441	2 877
Batteries and Accumulators (including parts)	107 840	53 816	509 217	430 094
Electrical Instruments (other than telegraphic and telephonic): Commercial (including ammeters, voltmeters, etc.), House Service Meters and Scientific	29 626	26 775	175 304	183 425
Switchboards, other than Telegraph and Telephone	6 977	10 253	45 131	35 818
Electrical Goods and Apparatus, all other sorts	142 785	150 110	900 437	937 777
Total of Electrical Goods and Apparatus	1 285 173	1 173 787	9 173 368	7 952 272

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A TELEPHONE DISPUTE.

Claim Against Siemens Brothers over a £55 000 Exchange Contract.

ON Wednesday, in the Chancery Division, Mr. Justice Russell had before him an action by Mr. Henry Rose, of Blackheath, against Siemens Bros. and Co., Ltd., claiming commission alleged to be due to him under an agreement.

Defendants admitted the agreement, but alleged that it was obtained by reason of a statement by the plaintiff that he was in a position to render material assistance to the defendants in the development of their telephone business in Egypt. Defendants alleged that the alleged representations of the plaintiff were false and that he was not in a position to render the assistance alleged, and that as soon as they discovered the facts they repudiated the agreement. Defendants admitted that they obtained orders for the telephone exchange from the Egyptian Government, but said that it was not by the assistance of the plaintiff.

Plaintiff in his reply asserted that he was always in a position to render the assistance to the defendants he represented he could give them.

Mr. A. R. Kennedy, K.C., and Mr. L. Fior appeared for the plaintiff, and Mr. J. G. Hurst, K.C., and Mr. Du Parcq, K.C., represented the defendants.

The Plaintiff's Case.

Mr. Kennedy in opening the plaintiff's case said that in 1922 his client went to Egypt, and there became acquainted with leading official Egyptians, and became well known to Zaghlul Pasha. Plaintiff, however, was deported by the Egyptian Government. He returned later to Egypt and got into close touch with Zaghlul Pasha and Col. Gray, general manager of the Associated British Enterprises in Egypt, who also represented the defendants. In 1924 plaintiff was in London and he accompanied the sons of the Egyptian Ambassador over the defendants' works at Woolwich. On that visit he suggested to the defendants' manager that he should represent them in Egypt, and he agreed. There were further interviews, and in February, 1924, the plaintiff was given a commission note by the defendants which stated " as we (defendants) understand, you can render us assistance in telephone business in Egypt, we are willing to pay you a commission in respect of such service amounting to 2 per cent. on the invoice value of telephone exchange equipment supplied by us to Egypt. As we informed you, we are represented in Egypt, and we understand that you are acquainted with Col. Gray there."

After receiving this commission note the plaintiff (counsel continued) used his influence and endeavours on behalf of the defendants, which resulted in the defendants obtaining a contract for an exchange with 2 000 lines for the Egyptian Government, worth £55 000. In January, 1925, plaintiff's solicitors wrote defendants for the commission due to him, and received a reply from defendants' solicitors that defendants could not admit any liability to pay plaintiff anything.

His lordship observed that the question of fraud was immaterial. The question appeared to be one of fact; whether or not the plaintiff did render the assistance to the defendants he undertook to render, and if he did so he was entitled to his commission, and if he did not, then he would not be entitled to his commission.

Plaintiff gave evidence, and said he had been in this country 20 years and had been known all that time as Henry Rose.

Mr. Hurst said his clients would have considered the claim if they thought the plaintiff had rendered them any service, but his instructions were that the plaintiff never rendered the defendants any material service.

Cross-examined, plaintiff said he was not aware that in 1923 Col. Gray had communicated with the defendants regarding a telephone station in Egypt. He had been told by Egyptian officials that when the contract was placed the defendants should have it.

For the defence Mr. Horace Mayne was called. He was Inspector-General of Telegraphs and Telephones to the Egyptian Government, and had been in supreme charge since 1923. The practice was to put all contracts out to tender. The Government consented to the scheme some time before the end of April, 1924. Witness said he had discussed the question of telephones with high officials, and ultimately a Minister consented to the matter going to contract.

The hearing was adjourned.

REFRIGERATION.

Enormous Field for Electrical Methods in Great Britain's Homes.

IT cannot be denied that there is a large field in this country for the sale of electrical refrigerating apparatus. With its obvious superiority over the ice-box method, the need for it has long been apparent, but its advantages have not been sufficiently disseminated. Now the Ministry of Health is about to bring into force restrictions on the use of preservatives in foods, and the effect of these regulations will be that refrigerators will be not only desirable but essential domestic equipments if many of our foodstuffs are to be kept fresh and free from harmful bacteria.

In the U.S.A. electrical refrigerators have made phenomenal

A corner of the Delco Light Co.'s new London showrooms.

progress despite the fact that ice-boxes were to be found in almost every home, and although there were only about 5 000 electrical refrigerators in use there in 1921, the number had grown to 150 000 by 1924, and is expected to reach 750 000 by the end of 1926.

In this country, where electrical refrigeration is a comparatively new thing, the makers of the " Frigidaire " apparatus have increased their sales in four years from 100 to over 5 000 refrigerators, while this year it is expected that 10 000 of these units will be sold here.

It is, therefore, of interest to note that the Delco-Light Co., are undertaking a big selling campaign of their " Frigidaire " units, and have this week opened fine new showroom premises at Imperial House, Kingsway, London.

The " Frigidaire " plant operates on the flooded principle of refrigeration, the flooding taking place in a cooling coil which is entirely filled with sulphur-dioxide, the liquid refrigerant. The amount of liquid refrigerant in this cooling coil is controlled by the use of a float valve, and as the refrigerant evaporates the float valve lowers, permitting further liquid to enter the cooling coil. The condensing unit consists of a compressor, condensing coils, fly-wheel, fan, motor, control, receiver and endless type " V " belt. The compressor is driven by a small fractional H.P. motor, which is mounted at the side of the condenser, and is connected by a " V " belt which operates without idlers.

The automatic control on the " Frigidaire " is accomplished without the use of a thermostat. For a given temperature in the cooling coil there is also a definite pressure. It is therefore a very simple matter to make this change of pressure react on the control mechanism, which in turn controls the operation of the motor. From the suction side of the machine a small tube leads to a bellows which collapses and expands as the pressure changes. This action of the bellows in turn reacts on the switch starting and stopping the motor. The result is that heat is removed at short intervals of approximately 1½ to 2 hours, maintaining an even temperature in the refrigerator in which it is installed.

On the reverse side of a new calendar issued by Mavor and Coulson, Ltd., 47, Broad Street, Mile End, Glasgow, there is an illustration of the M. and C. "G." type 12-in. chain coal-cutter, which can be worked by air or by a.c. or d.c., and has a high cutting capacity and low maintenance cost.

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IN PARLIAMENT.

Further Consideration of Electricity Bill by House of Commons Committee.

LAST Friday the Attorney-General moved an amendment to clause 28 of the Electricity (Supply) Bill to the effect that the Minister of Transport, in revising the maximum prices chargeable by a power company which takes a supply from the Board, shall have regard to any change in the cost of electricity attributable to the Act. The amendment was agreed to. A motion by Mr. G. Balfour to omit subsection 2, which permits the Electricity Commissioners to repeal or limit the authorisation in special Acts to power companies to make good deficiencies in previous dividends, was withdrawn, after the Attorney-General had stated that the Government only proposed to repeal the authority of power companies to pay back dividends to the extent of the benefits derived from the scheme under the Bill.

Clause 28 having been agreed to, the Attorney-General moved to add a proviso to clause 29 to ensure that any Order made by the Electricity Commissioners as to the relation between charges for electricity and dividends to be paid by companies should, in the case of a company carrying on two or more separate undertakings, regulate the charges for each undertaking in relation to the dividable profits on the capital employed in that undertaking. The motion was agreed to.

Clause 29 was agreed to, and clause 30, referring to the lopping of trees was withdrawn, with a view to substituting a new clause dealing with the same subject.

Clause 31, dealing with the constitution of electricity districts, was agreed to.

Clause 32 was also agreed to, after it had been decided to delete subsection 3.

Clause 33 was passed, and clause 34 also agreed to, after Col. Moore Brabazon had promised that "a large area of supply" should be clearly defined before the report stage.

On Monday, clause 35, on the terms of purchase of a company taking a bulk supply, was discussed. Col. Ashley opposed an amendment which proposed that a final decision should rest with a barrister acting as arbitrator. He felt that the matter was one for the Electricity Commissioners. The amendment was withdrawn.

Clause 36, on methods of charging, and clause 37, referring to minor amendments to various Acts, were passed.

It was also agreed that clause 38 stand part of the Bill.

On Tuesday the Attorney-General moved an amendment to Clause 39 that the expression "generating station" has the meaning given in sec. 36 of the Electricity (Supply) Act, 1919. The amendment was accepted. A further amendment, moved by the Attorney-General and passed, specified that "capital charges" means in the case of a local authority the interest and sinking fund charges in respect of the capital, and in the case of a company, interest on the capital at a rate equal to the average rate of dividends and interest paid by the company during the preceding year, but not under 5 nor over 6½ per cent., plus a charge for depreciation on a scale fixed by the Commissioners.

Defining "Load Factor."

Sir Joseph Nall moved an amendment to the provisions in the Bill in regard to fixing the price for electricity according to the cost of production and the load factor. The Minister of Transport said he was stumped by this amendment. Mr. George Balfour then read a definition of load factor in popular language, and was cheered. Sir Douglas Newton having asked for a memorandum of the figures, without which he said he could not follow Mr. Balfour, the chairman said he never imagined anyone was following him. Ultimately, Sir Joseph moved the amendment and it was accepted. Clause 39 was passed.

Clause 40, referring to the short title, construction and extent of the Bill, was also agreed to.

The new clause in reference to tree-lopping (to take the place of Clause 30) was also allowed to stand part of the Bill.

The Attorney-General said they had now been engaged on this Bill for over three months. A series of clauses had been put down, which cover 15 pages in the Order Paper, which were designed to improve the general law and had nothing to do with the scheme. Having spent three months on the Bill they might easily spend more time in discussing new clauses. Members with suggestions to make regarding the general law should offer them to the Ministry of Transport.

LEGAL INTELLIGENCE.

Action Against Shipowners for Damage to Electric Cables.

ON July 8th, the Court of Appeal, consisting of Lords Justices Bankes, Atkin and Sargant (sitting with nautical assessors) concluded the hearing of an appeal by the Great Western Railway Co. from the judgment of the President of the Admiralty Division dismissing the action which the Railway Co., as the owners of the Swansea Docks, brought against the owners of the steamship "Mostyn" to recover the cost of repairing three electric cables laid on the floor of the passage-way between the King's and Prince of Wales' Dock, which on the night of October 26th, 1923, were damaged by the anchor of the "Mostyn," whilst that vessel was entering the Prince of Wales' Dock.

The defendants denied negligence and liability, and pleaded that the accident was inevitable, and, further, that the Railway Co., as the dock authority, had been guilty of contributory negligence as there had been no warning given to the pilot of the "Mostyn" as to the presence of the cables, which were unmarked in the entrance to the channel.

The President held that the defendants had not been guilty of negligence, and that so far as they were concerned the accident was unavoidable. He dismissed the action, with costs, and from this result the Railway Co. now appealed.

At the conclusion of the arguments their lordships dismissed the appeal, with costs, holding that there was no negligence on the part of the defendants, and having regard to a decision of the House of Lords in a previous case, the defendants could not be made liable under the provisions of the Harbours, Docks and Piers Clauses Act, 1847.

Delayed Deliveries of Wireless Parts.

In the Shoreditch County Court, on July 8th, before Judge Cluer, the Bowfa Engineering Co., of 13–15, Three Colt Lane, Limehouse, E., radio manufacturers, sued the P. and C. Manufacturing Co., of 6, Bath Street, City Road, E.C., tool makers and wireless accessories manufacturers, to recover £50, money lent, or, alternatively, for the return of the £50, paid as a deposit on November 11th, 1925, against goods to be delivered.

Mr. Alfred Gould, of the plaintiff firm, said that on November 6th he offered to buy £500 worth of condenser vanes from defendants, paying cash, the order to be completed in two months. On November 10th, Mr. Posner, of the defendant firm, accepted the order, but witness told him he was too late.

Eventually Posner offered to make some at a reduced price. An order was given for 100 gross, stipulating part delivery in seven days, and the balance in fourteen, without fail. They could have done with these goods as they were very busy up to December, but after Christmas trade always fell off. Besides this, a late delivery in the wireless trade was useless, as many accessories were changed and improved every three months. On November 11th Posner called and asked for £50 with which to buy some aluminium plates, and he let him have it. As no delivery had been made up to November 27th, he insisted on immediate delivery, but when told it could not be done, witness cancelled the order, except as for £50 worth which defendants had got the money for. They had never received any of the goods.

For the defence, Mr. William Posner said Mr. Gould made an offer to pay £500 down if it carried a special discount of 5 per cent. He did not think it advisable to accept on that day, but a few days afterwards he accepted the offer. When he asked for the £500, Mr. Gould said he had been buying heavily, but to show his good faith he would give him £50 on account, and did so. End plates were then discussed, and he offered to make them at plaintiff's price, if a fair quantity were ordered, this being necessary, he explained to Gould, because he would have to have tools specially made. He decided to put the £50 he had received against this order for plates to cover him against any possible loss in connection with the tools. A second £50 cheque was in part payment of the contract, and was not a loan. They were counterclaiming for £107, less £50 received, the balance being the cost of the plates, £23, for aluminium sheeting, £37 16s. 3d.; and for cutting labour and loss of profit.

Judge Cluer said the plaintiffs were entitled to cancel their contract because of the late delivery. The plaintiffs would have judgment for their £50, and there would also be judgment for the Bowfa Engineering Co. on the counterclaim, both judgments being with costs.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given. Unless otherwise stated, particulars are to be had from the Department of Overseas Trade, 35, Old Queen Street, Westminster, London, S.W.1.

DUNDEE CORPORATION.—Tramway rails, tiebars and bolts and nuts. Specification, etc., from the City Engineer, 91, Commercial Street, Dundee.

ROCHDALE GUARDIANS.—Fire bells, electric cables, etc. Particulars from Mr. I. Clegg, Union Offices, Townhead, Rochdale.

BRISTOL CORPORATION, July 16th.—Supply, delivery and erection of two wooden natural-draught cooling towers, each of 450 000 gallons per hour capacity, at the Feeder Road power station. Specification, etc., from Mr. H. Faraday Proctor, Electricity Offices, Colston Avenue, Bristol; deposit £1 1s.

DUNDEE CORPORATION, July 16th.—Four-core, three-core and two-core, paper insulated, lead covered and double steel tape armoured cable. Specifications, etc., from Mr. D. H. Bishop, Electricity Supply Department, Dudhope Crescent Road, Dundee.

FORT WILLIAM TOWN COUNCIL, July 16th.—Electric light installation work in 32 houses on a site between Alma Road and Victoria Road. Schedules, etc., from Mr. Geo. MacRitchie, architect, Fort William.

ST. HELENS CORPORATION, July 17th.—Three electrically driven pumps, with starting gear, switchboard, etc., for Sutton Road pumping station. Further information from Mr. A. W. Bradley, borough and water engineer, Town Hall, St. Helens.

DOVER CORPORATION, July 19th.—Transformers and Brookhirst switchgear, for voltage regulation on 6 600 V, three-phase, 50 period supply. Specification from the Borough Electrical Engineer; deposit £1 1s.

GRIMSBY CORPORATION, July 19th.—Electric light installation at Victoria Street new Council Schools. Specification, etc., from Lt.-Col. W. A. Vignoles, borough electrical engineer.

MANCHESTER CORPORATION, July 20th.—Street lanterns, for the Electricity Department. Specification, etc., from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester.

NEWCASTLE-UNDER-LYME CORPORATION, July 20th.—Supply and laying of 1 000 yards single, l.t., paper, lead feeder main, and 1 000 yards single, l.t., paper, lead, steel tape armoured distribution main. Specifications from Mr. A. J. C. de Renzi, borough electrical engineer; deposit £1 1s.

WARRINGTON CORPORATION, July 20th.—Twelve months' supply of e.h.t. and l.t. paper-insulated lead-covered cables. Specifications, etc., from Mr. F. V. L. Mathias, borough electrical and tramways engineer; deposit £1 1s.

CARDIFF RURAL DISTRICT COUNCIL, July 22nd.—Supply, erection and connecting up of sub-station equipment, overhead lines, etc., at Dinas Powis, near Cardiff. Specification can be seen at the office of Mr. R. Howard Fletcher, 3, Park Place, Cardiff.

CORK BOROUGH COMMISSIONER, July 23rd.—Repair by electric welding of turntable undercarriage at Parnell Bridge. Specification from Town Clerk; deposit £1.

SAFFRON WALDEN CORPORATION, July 24th.—Engine and dynamo, switchgear, booster, balancer, batteries and mains. Specification from Mr. R. A. Smith, 14, Victoria Street, Westminster, S.W.1; deposit £1 1s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, July 24th.—Supply and erection at Birchills power station of three steam boilers, pulverised fuel plant, ash and coal handling plant, and boiler house auxiliaries. Specifications, etc., from Mr. E. M. Lacey, 12, Victoria Street, Westminster, S.W.1; deposit £5 5s.

CARLISLE CORPORATION, July 26th.—Lighting installation at the new electricity works at Willow Holme. Specifications from Mr. C. W. Salt, city electrical engineer.

MANCHESTER CORPORATION, July 26th.—One 500 kVA static transformer, for sub-station on the premises of Beyer, Peacock and Co. Specification (No. 167) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

PORT OF BRISTOL AUTHORITY, July 26th.—Electric light installation at premises in The Grove. Particulars from Mr. T. A. Peace, engineer, Avonmouth Docks.

BEDWELTY URBAN DISTRICT COUNCIL, July 27th.—Cables, overhead lines, etc. Forms of tender, etc., from Mr. R. H. Fletcher, 3, Park Place, Cardiff.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., July 28th.—Electric light wire and cable. Forms of tender, etc., from the Controller of Supplies, King Charles Street, Westminster, S.W.1.

BETHNAL GREEN (LONDON) GUARDIANS, July 29th.—Installation of internal telephone system at Children's Homes, High Road, Leytonstone, E.11. Specification, etc., from Mr. C. Faulkner Jones, Clerk to the Guardians, Bishop's Road, London, E.2; deposit £2 2s.

SPALDING URBAN DISTRICT COUNCIL, July 29th.—Electricity mains and kiosks. Specifications from Mr. R. W. Hastings, clerk of the Council, or from A. H. Seabrook and Partners, 146, Bishopsgate, London, E.C.2; deposit £3 3s.

How the Dominions are co-operating in the "Buy Empire Goods" campaign. Our photo shows a large sign on a Johannesburg building. The representation of the Siemens lamp is 18 ft. high.

WATERFORD CORPORATION, July 29th.—About 5 miles of 10 000 V three-phase overhead line, with three-phase four-wire medium pressure lines on same supports; medium pressure four-wire overhead distribution network; and street lighting system. Specifications, etc., from McEntee and O'Kelly, 22, Nassau Street, Dublin; deposit £2 2s.

BELFAST CORPORATION, July 31st.—One 15 625 kW turbo-alternator, with condensing plant and auxiliaries, and, alternatively, one 18 750 kW turbo-alternator, with condensing plant and auxiliaries. Specifications (Nos. W48 and W48a) from Mr. Johnstone Wright, city electrical engineer and manager, East Bridge Street, Belfast; deposit £3 5s.

KILKEEL RURAL DISTRICT COUNCIL, August 5th.—(*a*) Cold-starting crude oil engine; (*b*) generator booster and switchboard; (*c*) storage battery; (*d*) pole erection work; (*e*) line erection work; and (*f*) erection of power house for electric lighting of Rostrevor. Specifications for each section (deposit £1 1s.) from Mr. P. T. White, 50, Queen Street, Newry.

BRIDLINGTON CORPORATION, August 6th.—(1) Surface condenser, with extraction plant and circulating pump, pipework and valves, to work in conjunction with 600 kw turbine; and (2) one wooden cooling tower, with tank and foundations, to work in conjunction with 600 kW condensing plant. Specifications, on and after July 19th, from Kennedy and Donkin, 8, Broadway, Westminster, S.W.1; deposit £2 2s. for each specification.

Overseas.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

INDIA STORE DEPARTMENT, July 16th.—Rotary converters, 500 V, 200 V, with step-down transformers. Tender forms from the Director-General, Branch No. 1, Belvedere Road, Lambeth, London, S.E.1.

INDIA STORE DEPARTMENT, July 16th, July 30th, August 6th.—(1) Coal and ash handling plant for power station; (2) steel frame buildings and electric travelling crane; and (3)

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boiler house equipment, piping, etc., or, alternatively, complete boiler house installation, including pulverised fuel equipment, piping, etc., in connection with Great Indian Peninsular Railway electrification. Specifications from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1. Fees (not returnable) 5s. each for Nos. 1 and 2, and £2 for No. 3. Tenders by July 16th for No. 1, July 30th for No. 2, and August 6th for No. 3.

EGYPTIAN MINISTRY OF THE INTERIOR, July 20th.—Centrifugal pumps and electric motors, in connection with water supply works at Minieh. (Reference A.X. 3 230.*)

INDIA STORE DEPARTMENT, July 20th.—Four 10 000 kW turbo-alternators, condensing plants, and auxiliary apparatus for Great Indian Peninsula Railway electrification. Specification (£2) from the Director-General, Belvedere Road, Lambeth, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, July 20th.—Phase transformer, for Mangahao electric power scheme, section 184. (Reference B.X. 2 502).

CAPE TOWN MUNICIPALITY, July 21st.—Electrically driven gravity bucket type coal conveyor, with driving mechanism. etc., for Electricity Department. (Reference A.X. 3 149.*)

CAPE TOWN MUNICIPALITY, July 21st.—Two water-tube boilers, with stokers, mechanical draught plant and motors.

INDIA STORE DEPARTMENT, August 9th.—Electrical generating plant for the Peshawar power station of the North-Western Railway. (Reference B.X. 2 644.)

STATE ELECTRICITY WORKS, MONTEVIDEO, July 22nd.—Supply of 35 000 electric lamps. (Reference B.X. 2 575.)

VICTORIAN ELECTRICITY COMMISSION, July 26th.—Supply of 22 000 V porcelain bushing insulators, in connection with Yallourn power scheme. Specification (No. 56/23) from the Agent-General for Victoria, Australia House, Melbourne Place, Strand, London, W.C.2.

INDIA STORE DEPARTMENT, July 27th.—Electrically driven centrifugal pumping sets, mounted on pontoons. Tender forms from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1.

JOHANNESBURG MUNICIPALITY, July 29th.—Supply of transformers (contract 647). (Reference B.X. 2 636.)

JOHANNESBURG MUNICIPALITY, July 29th.—Supply of 10 miles of copper trolley wire and 50 miles of underwriters' wire.

JOHANNESBURG MUNICIPAL COUNCIL, July 31st.—Supply and erection of electrically driven triplex plunger sewage pump.

EGYPTIAN MINISTRY OF THE INTERIOR, August 1st.—Installation of electric power station equipment at Keneh and Luxor for production of three-phase current, 3 300 V, 50 cycles. (Reference B.X. 2 627.)

DEPUTY POSTMASTER-GENERAL, MELBOURNE, August 3rd.—Supply of telephones and dials. (Reference B.X. 2 564.)

STATE ELECTRICITY WORKS, MONTEVIDEO, August 5th.—Porcelain insulators, etc. (Reference B.X. 2 618.)

INDIA STORE DEPARTMENT, August 6th.—Boiler-house equipment with other plant and piping for power house, or, alternatively, complete boiler house installation, including pulverised fuel equipment, etc. Specification (£2) from the Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1.

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, August 10th.—Dry cells. (Reference B.X. 2 649.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 10th.—Supply of telephone exchange indicators (schedule C. 99). (Reference B.X. 2 597.)

MELBOURNE CITY COUNCIL, August 11th.—Supply of high and low tension three-phase sub-station switchgear (specification No. 810). (Reference B.X. 2 565.)

SOUTH AFRICAN RAILWAYS AND HARBOURS ADMINISTRATION, August 12th.—Supply of cables and wires and bare copper wire during 1927 (tender No. 834). (Reference B.X. 2 630.)

INDIA STORE DEPARTMENT, August 17th.—Transformers for power station in connection with G.I.P. Railway electrification. Specifications (10s.) from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1.

JOHANNESBURG MUNICIPALITY, August 19th.—Overhead tramway equipment, comprising double pull-offs, straight line hangers and insulator pins. (Reference B.X. 2 702.)

CHILIAN STATE RAILWAYS, August 20th.—Signals, telegraphs, telephones, etc. (group 36); electric materials for sub-stations, aerial lines and lighting, 1st-zone (group 37). (Reference C. 1 935.) Booklets (in Spanish) numbered to correspond with the group numbers, and giving further particulars, will be loaned to British firms in the order of application.

VICTORIAN ELECTRICITY COMMISSIONERS, August 23rd.—Supply of 10 in. diameter disc suspension insulators, with cotton split pin or similar coupling device. (Reference B.X 2 614.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 24th.—Synchronous condensers (section 18, Waikaremoana). (Reference B.X. 2 608.)

SOUTH AFRICAN RAILWAYS AND HARBOURS ADMINISTRATION, August 26th.—Material for distribution system in connection with the Capetown suburban electrification. Reference B.X. 2 680.)

CITY ELECTRIC LIGHT CO., LTD., BRISBANE, August 27th.—Supply, delivery and erection of one 12 500 kW turbo-alternator. (Reference A.X. 3 085.)

NEW ZEALAND RAILWAYS DEPARTMENT, August 30th.—Supply of slip-ring induction 400 V 50 cycle three-phase motors and starters. (Reference B.X. 2 561.)

DEPUTY-DIRECTOR OF POSTS AND TELEGRAPHS, MELBOURNE, August 31st.—Telegraph equipment (schedule C. 109). (Reference B.X. 2 653.)

PERNIK STATE COAL MINES, BULGARIA, September 1st.—Electricity generating plant, consisting of two 4 000 kW steam turbo-generator sets, buildings, etc.

VICTORIAN RAILWAY COMMISSIONERS, September 1st.—Equipment for automatic control of two rotary converters at Seaford sub-station.

VICTORIAN RAILWAY COMMISSIONERS, September 1st.—Automatic sub-station equipment (contract No. 39 287), for Elwood sub-station. (Reference B.X. 2 598.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 2nd.—Electro-pneumatic working of points and day colour light signalling, with alternative current track circuits, in connection with the electrification of the Cape Town suburban railways. Specifications, etc., from the Office of the High Commissioner for the Union of South Africa, Trafalgar Square, London, W.C.2, or from the Chief Railway Storekeeper, Park Station Chambers, Johannesburg; deposit £5 5s.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 7th.—Synchronous condenser for Arapuni power scheme, section 165. (Reference B.X. 2 654.)

DUNEDIN (N.Z.) CORPORATION, September 8th.—(i) Reaction water wheel for direct connection to a.c. generator; (ii) one 3 000 kW, 6 600 V, 50 cycle generator; (iii) four 1 000 kW 6 600/20 000 V, 50 cycle transformers; (iv) switchboards, oil-break switches, disconnecting switches, voltmeters, ammeters and wattmeters, current and potential transformers, etc. (Reference B.X. 2 676.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 28th.—Three motor-driven low lift pumps with control apparatus, for Taieri drainage scheme. (Reference A.X. 3 274.)

CHRISTCHURCH (N.Z.) DRAINAGE BOARD, October 19th.—Supply and erection of three sets of electric centrifugal pumping plants (contract 26/329.) (Reference A.X. 3 215.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT. November 2nd.—Indoor control gear and switchgear for Waikaremoana electric power development (section 14). (Reference B.X. 2 675.)

Tenders Accepted.

SUNDERLAND CORPORATION.—Ed. Bennis and Co., Ltd., replacements to mechanical stokers.

BARNSLEY CORPORATION.—Mather and Platt, Ltd., electrically driven turbine boiler feed pump, £295.

LONDON COUNTY COUNCIL.—Metro-Vick Supplies, Ltd., Cosmos opal bulb gasfilled tramcar lamps.

HIGH CARLEY (ULVERSTON) FEVER HOSPITAL.—E. A. Blackburn, electric light installation, £191 1s. 6d.

ROYAL MAIL STEAM PACKET CO.—British Thomson-Houston Co., Ltd., twelve months' supply of Mazda lamps.

HALIFAX CORPORATION.—A. Higginbotham and Sons, electric wiring of 40 houses in Nursery Lane, £200.

SOUTHEND-ON-SEA CORPORATION.—Chamberlain and Hookham, Ltd., supply of 1 450 current limiters, £1 159 15s.

AIR MINISTRY.—Metro-Vick Supplies, Ltd., three months' supply of Cosmos carbon filament flashlamp and gasfilled lamps.

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ELLON VICTORIA HALL.—T. C. Smith, electric light wiring and fitting in connection with the construction of an emergency exit.

BACUP EDUCATION COMMITTEE.—R. Wood and Son (Bacup), Ltd., electric light installation at St. Saviour's School, £80 10s. 6d.

KIDDERMINSTER GENERAL HOSPITAL.—G. L. Harvey, installation of an automatic telephone system throughout the hospital.

WEST HAM CORPORATION.—New Switchgear Construction Co., Ltd., e.h.t. switchboard for High Street sub-station, £819 (recommended).

LONDON COUNTY COUNCIL.—Siemens and English Electric Lamp Co., Ltd., twelve months' requirements of electric incandescent lamps.

HAZELGROVE AND BRAMHALL URBAN DISTRICT COUNCIL.—W. T. Glover and Co., Ltd., mains and services for Woodford fringe area, £2 222.

LYTHAM CORPORATION.—W. H. Allen, Sons and Co., Ltd., one 18 in. direct coupled electrically driven centrifugal pump, for the sewage works.

SALFORD CORPORATION.—Etchells, Congdon and Muir, Ltd., supply and erection of 5 cwt. electric passenger lift at Bloom Street gas offices.

ECCLES CORPORATION.—British Electric Transformer Co., Ltd., two 100 kVA air-cooled single phase transformers, ratio 2 000/200 V, periodicity 50 cycles.

LONDON MIDLAND AND SCOTTISH RAILWAY (CARRIAGE DEPT. STORES, WOLVERTON).—Metro-Vick Supplies, Ltd., Cosmos vacuum train lighting lamps.

MANSFIELD GUARDIANS.—F. A. Meggitt, electrician's work at the Institution for ensuing half-year; Standard Telephones and Cables, Ltd., 2 400 yards of h.t. cable.

HULL CORPORATION.—Standard Telephones and Cables, Ltd., extension of automatic telephone equipment, £38 525. A German tender was about £2 000 higher.

SEAHAM HARBOUR URBAN DISTRICT COUNCIL.—Gray Bros., overhead line and l.t. switchgear; F. Reid, Ferens and Co., h.t. cable; Watson-Norie, Ltd. h.t. switchgear.

LONDON COUNTY COUNCIL.—Eastern Armature Winding Co., electric light and power wiring and fitting at St. Martin's School of Art, Westminster, £140 (recommended).

PACIFIC STEAM NAVIGATION CO.—British Thomson-Houston Co., Ltd., six months' supply of Mazda gasfilled and vacuum lamps and B.T.-H. carbon lamps (extension of contract).

ISLINGTON (LONDON) GUARDIANS.—Morris Electrical Co., Ltd., mains and wiring for supplying electric power and lighting to the schools, Andover Row, Hornsey Road, N. £1 225.

GLASGOW CORPORATION.—J. H. Scott, fire alarm copper wire for housing schemes, £6 6s. per mile; Callender's Cable and Construction Co., Ltd., laying cables at Bellefield Sanatorium, £1 593 3s. 5d.

MELTON MOWBRAY U.D.C.—Melton Mowbray Electric Light Co., public lighting for five years at £225 per annum; plus 4½d. per kWh, the company to maintain and renew standards, etc.

NEW SOUTH WALES WORKS AND RAILWAYS DEPARTMENT.—Standard Waygood, Ltd., two main (passenger) electric elevators, £9 559 15s.; Edmiston and O'Neill Proprietary, Ltd., electric (kitchen) elevators, £1 849 15s.

EDINBURGH CORPORATION.—British Brown-Boveri, Ltd., two 25 000 kW turbo-alternators, for Portobello power station, £138 000. The lowest tender for machines of British manufacture was £190 708.

GREAT INDIAN PENINSULA RAILWAY.—Metropolitan-Vickers Electrical Co., Ltd., supply of 41 electric locomotives, in connection with the main line electrification from Bombay to Igatpuri and Poona. The amount of the contract is over £650 000.

ARDSLEY EAST AND WEST URBAN DISTRICT COUNCIL.—Radio Electric Co., wiring 8 houses on Blackgates site, £31; 10 houses on Blackgates site, £45 5s.; 20 houses on West Ward site, £64 15s. and 20 houses at Garden House Lane, £64 15s.

CROYDON CORPORATION.—Ferguson Pailin Ltd., additional truck to existing switchgear, for Selhurst Well sub-station, £102; Metropolitan-Vickers Electrical Co., Ltd., blank cell and control panel at the Electricity Works, £506 (both recommended).

NORMANTON URBAN DISTRICT COUNCIL: Plant and materials for electricity sub-station.—Bruce Peebles and Co., Ltd., transformer, £215; British Insulated Cables, Ltd., cables, £896; Metropolitan-Vickers Electrical Co., Ltd., l.t. switchboard, £400.

GRIMSBY CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., e.h.t. switchgear, £1 469 10s.; J. S. Doig, Ltd., pipework, £90; Electric Construction Co., Ltd., 1 000 kW rotary converter, £4 099 15s.; Edison Swan Electric Co., Ltd., d.c. switchgear, £1 059 15s.

DUBLIN BOROUGH COMMISSIONERS.—Sir R. McAlpine and Sons, Ltd., construction of tunnel under the river Liffey, and laying electric cables, etc., £28 664 15s.; Ferguson Pailin, Ltd., switchgear for Pigeon House and Fleet Street stations, £4 704 15s. and £6 368 15s. respectively.

SHEFFIELD CORPORATION.—Steel, Peech and Tozer, Ltd., 1 000 tons of steel tramway rails, £10 12s. 6d. per ton; Cammel, Laird and Co., Ltd., 1 000 pairs of fishplates, 16s. 6d. per cwt.; 250 pairs ditto, 12s. 6d. per cwt., and 1 000 sole plates, 12s. per cwt.; Hadfields, Ltd., 19 tons mild steel tie-bars, 15s. 6d. per cwt.

DURHAM COUNTY COUNCIL.—Devereux, Moodie and Co., electric light installations at Delves Lane School, £147; and at Highfield School (extensions), £50 15s. 6d.; F. Reid, Ferens and Co., electric light installation at High Spen Boys' School, £176 8s. 6d.; T. A. Taylor, electric light installation at Leadgate School, £130 3s.

Business Items.

IBBOTSON Brothers, electrical engineers, have opened new premises in Effingham Square, Rotherham.

The Celestion Radio Co. has opened a new London showroom at 21, Villiers Street, Strand, W.C.2. The telephone number is Gerrard 0397.

Mr. Hugh H. Latimer has retired from the firm of Bennett and Latimer, wireless dealers, 9, East Street, Herne Bay, and the business will be carried on by Mr. Leslie N. Bennett.

For the annual holiday, the works of the London Electric Firm are closing on July 31st, and will re-open on August 9th. During this period a skeleton staff will deal with urgent matters.

Mr. Reginald Wood having retired from the firm of Reginald Wood and Co., electrical enginers, 37, Westgate, Huddersfield, the business will be continued under the same name by Mr. A. S. Cockcroft.

A. H. Hunt, Ltd., announce reductions in the prices of Hellesen dry batteries as from July 1st. No rebate will be given for existing stocks, as prices are fixed annually at the slackest season.

Magnetos made by the British Thomson-Houston Co., Ltd., were fitted to the aeroplanes obtaining 1st, 2nd and 3rd places for the King's Cup, and all machines completing the course were thus equipped.

Kelly's Directory.

New Edition of Reference Book of the Electrical and Radio Trades.

KELLY'S Directories, Ltd., are widely known for the excellence of the trade directories which they publish, and the third edition of their "Directory of the Electrical Industry and Wireless and Allied Trades," which has just been published at 30s. post free, certainly maintains that high standard. The work of correction and revision has again been very heavy, the numerous changes in the wireless trade adding to this task.

Comprising nearly 1 300 pages, the directory covers Great Britain and the principal places in Ireland, the Channel Islands, and the Isle of Man, and is arranged in sections giving (1) a list of places in each county with the names arranged alphabetically under towns and villages, and information as to the source of electrical supply; (2) an alphabetical list of public lighting, power and traction undertakings, with particulars of systems and voltages, and the names of officials; (3) alphabetical lists of the names with addresses; (4) alphabetical classifications of trades, with the names of each profession or trade arranged in alphabetical order under their particular trade heading; and (5) a list of branded articles and specialities used in the trade, together with the names and addresses of the manufacturers.

Every branch of the industry has been fully dealt with; and the lists of retailers, including some 4 500 wireless retailers, is a valuable feature for the manufacturer and wholesaler.

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ELECTRICITY SUPPLY.

Preston's Good Year—Plant for New Coventry Station—Maidenhead's Two-part Tariff Scheme—Accrington's Reclassification Revoked.

STEPS are being taken to form a company to supply electricity to the town of Duns. The outlay on the proposed scheme is placed at £3 000.

Blackpool Electricity Committee appeals to consumers to be economical in the use of electricity as the department is now buying coal at a very enhanced price.

Scarborough T.C. is applying for a loan to purchase the electricity undertaking. The purchase price is £165 994, plus the stores, etc., in possession of the company.

Rawtenstall T.C. has deferred consideration of the question of reducing charges for electricity. The revision of the charges for Bacup will not come into operation until October.

Darwen T.C. has approved applications by Carus and Son, Ltd., cotton manufacturers, and the Darwen Spinning Co., for supplies of electricity for power purposes on special terms.

Stalybridge, Hyde, Moseley and Dukinfield Tramways and Electricity Board has, owing to the increased price of coal, advanced the price of electricity to small consumers by ¼d. per kWh.

Ilkley Extensions.

Ilkley U.D.C. has received sanction to the borrowing of £16 500 for laying cables and for the purchase of plant to permit of an extension of the supply in the western portion of the district.

Canterbury Corporation has decided to apply for a Fringe Order to supply St. Edmund's School, the minimum payment to be £130 per annum for ten years. The estimated cost of the cable and laying is £887.

Sandwich T.C. has sold a site to the South-East Kent Electric Power Co. for a transforming station. The company will start cable laying in October, and will supply electricity at 8d. per kWh for lighting and 3d. for power.

Keighley Electricity Committee proposes to erect a sub-station at Sutton, and has purchased land for the purpose. The Committee also intends to extend the cable from Holme Mills to Wood Mill, Laycock, at an estimated cost of £475.

Preston electricity undertaking has had a very successful year. Despite the large expenditure recently upon the erection and equipment of the new power station, it will not be necessary to suspend sinking fund and capitalisation of interest charges.

Coventry City Council has decided that the plant in its new generating station shall comprise two 15 000 kW turbo-alternators, with an overload rating of 18 750 kW instead of 10 000 kW, the total estimated expenditure being increased from £558 495 to £708 495.

Paignton U.D.C. objects to Plymouth Corporation's application for an Order to supply electricity in the parishes of Marldon, Churston Ferrers and Stoke Gabriel. The Corporation suggests that the Electricity Commissioners dispense with the consent of the U.D.C.

Bolton Developments.

The Commissioners have sanctioned the borrowing by Bolton T.C. of £20 800 for mains and £13 400 for sub-station equipment. Application is to be made for sanction to borrow a further £25 000 for three years' prospective expenditure on sub-stations on consumers' premises and for transforming stations.

Thornbury R.D.C. has decided to oppose the application of Bristol Corporation for an Order extending the area of supply to the parishes of Almondsbury, Renwick and Northwick, and Olveston. The R.D.C. had previously resolved to support the proposals of the West Gloucester Power Co. with regard to extensions in the Council's area.

Curran Bros., of Belfast, who have been given the contract for the electric lighting of Whitehead (Co. Antrim), have been granted a lease for the erection of a power house on the Raphael estate. It is expected that the town will be lighted electrically by October 1st. In addition to street lighting, supplies are to be given to private houses.

The North Wales Power Co., which has concluded an agreement with the Cheshire County Council for a supply to the School of Agriculture at Reaseheath, has approached Nantwich Guardians with reference to a supply to the Institution and Isolation Hospital at present supplied with gas. The Board proposes to take expert advice on the matter.

Crediton U.D.C. has been asked to obtain written consent from local authorities through whose areas the overhead lines will pass to supply electricity to Crediton, and also to obtain consent in writing from the owners of land over which the lines will be erected. Verbal consent has already been received. Under the scheme Exeter Corporation is to supply in bulk.

The Commissioner administering the affairs of Ennis has been considering the public lighting of the town for the coming winter, and has submitted to the Ministry for Industry and Commerce a suggestion that a generating plant might be set up in the town. The Minister has replied "that this matter should be left over, as, in view of an early supply of electricity from the Shannon, the erection of a generating station at Ennis would be uneconomical. There is a possibility that mains may be laid between Limerick and Ennis before the winter of 1927."

A report is to be presented to Maidenhead T.C. on a proposal further to reduce the price of electricity by means of a two-part tariff which, it is considered, would encourage the increased domestic use of electricity, and would automatically lower the average price to consumers in proportion to the use made of the service. The Commissioners have approved a proposed system of alternating current supply to outlying districts, and preparations are in hand for laying the first 6 600 V feeder to Boyn Valley, and thence to the Isolation Hospital and Pinkney's Green.

The tramways and the electricity department at Blackpool are under one management. The T.C. decided, at a meeting last week, to refer back the proposal that a new transport department should in future manage the tramways, leaving the present Tramways Electricity Committee, with Mr. C. Furness as its chief official, in charge of the electricity department. Coun. Roberts said while the departments were carried on so efficiently and successfully it would be folly to make a change. The profits since Mr. Furniss took over control were half a million pounds.

Water Power in South Molton.

It was reported at a meeting of South Molton R.D.C. last week that Mr. Green, representing Dr. Purves, promoter of the South Molton and District Electricity Order, had met the Electricity Committee and discussed the Order. He agreed to the suggestion that the period within which the supply must commence should be reduced from five years to three years, but he was unable to give any guarantee as to a reduction of the maximum charges of 10d. and 4d. He explained that the promoters intended as far as possible to utilise local water power. The Council decided to support the scheme on condition that it should be accomplished in three years.

Accrington T.C. has revoked the reclassification of the district from E. to F. with regard to the salaries of the electrical staff. Mr. Slack asked why the application was not put in before the beginning of the present financial year. They were told the increases were automatic, but increases of plant had not taken place during the last three months. Councillor Constantine said the staff would be getting increases of salaries of £535 10s., or nearly the salary of one head official. He moved that the minute be referred back. Ald. Higham opposed the motion, and said their officials had been on a scale less than they were entitled to, their plant capacity being over 13 000 kW. The motion to refer the minute back was carried.

Silsden U.D.C. is protesting against the action of the Yorkshire Electric Power Co. in pushing out cables into residential districts in their area in which it is alleged they have only powers to supply for power purposes. The Council has been in communication with the Commissioners with regard to the granting of an Order to the Council for the supply of electricity for lighting purposes, but the Commissioners state that they are not at present in a position to inquire into the applications. The Chairman of the Council stated recently that the Council was prepared to take electricity in bulk from the company. The company was canvassing people in the neighbourhood, and was (he stated) supplying energy at power rate for lighting purposes in order to get customers.

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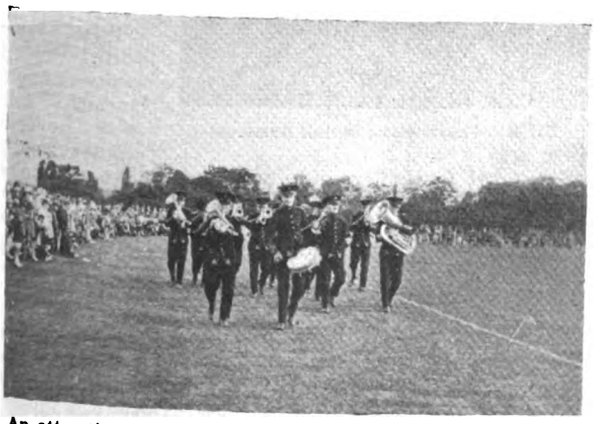
ELECTRICAL NEWS IN PICTURES

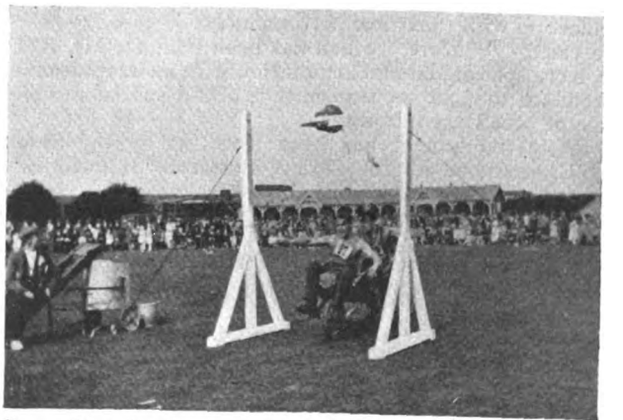
The smile of victory in the ladies' 100 yards' flat race at the General Electric Co.'s sports meeting at Wembley.

Another G.E.C. sports picture showing a closely contested finish, and, by way of contrast, some really serious expressions.

The new electrical system of traffic control by means of coloured lights operated by a policeman came into force in London on Monday at the junction of Piccadilly, Bond Street, and St. James's Street. Until the system is in perfect running order one policeman is being kept on point duty. Normally the controller will occupy the kiosk seen in the picture.



An attractive item at the Johnson and Phillips' sports at Kidbrook was the band race, here seen in progress.



Competitors in the tilting the bucket event at the J. and P. sports snapped during an anxious moment.

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WIRELESS NEWS.

Lord Gainford Discusses Future of British Broadcasting.

PRESIDING at the annual meeting of the British Broadcasting Co., Ltd., on July 8th, Lord Gainford said the supplementary licence extending their existence to December next restricted the amount to be paid to the company from licences to £500 000. Owing to that, their activities and quality of service last year had been unfortunately prejudiced. They had a surplus of £6 418 available for dividends. Licences in force at March 31st were 1 965 000. He understood that the Government had accepted the Broadcasting Committee's report and were preparing legislation to give effect to it. He wished to refer to points which would arise on the broadcasting service being taken over by any new authority. The B.B.C. had always maintained that the money collected from the public for the service should be devoted to the service, and not alienated or diverted to other purposes. Further, they represented on behalf of any new authority that they should have a claim on all money in the hands of the Government at the end of that company's licence, in order that they might proceed with development schemes immediately. In that connection, in addition to capital assets, costing approximately £315 000, which would be transferred free, they estimated that (assuming the increase of licence issues be maintained) the Government would have in hand a sum of at least £900 000. Restrictions other than financial, which had hampered them in the past, should in the future be considerably eased.

They trusted that the rearrangement of the system of distribution—namely, by regional high-power stations, with alternative wave lengths, as advocated by them for over a year—would be put in hand at the conclusion of the present Daventry experiments.

The shareholders passed a resolution, moved by Col. Ball, on behalf of Burndept Wireless, Ltd., asking the directors to get into immediate touch with the Government with a view to getting a definite decision on the future of the broadcasting service and to request the Government to bring in legislation at once, so that the industry should know where it stood, or else to guarantee the *status quo* for at least 12 months.

The retiring directors were re-elected, and a dividend of 7½ per cent. was approved.

The Government has decided to adopt the report of the Broadcasting Committee, and listeners and manufacturers are keenly interested to learn what will be the future of broadcasting in this country. It may be recalled that the committee recommended that the service should be conducted by a public corporation known as the British Broadcasting Commission, to be licensed for at least ten years. The existing contracts and staff of the British Broadcasting Co., whose licence expires at the end of this year, should be taken over by the new commission, which would consist of from five to seven members all nominated by the Crown. The licence fee for receivers should remain as at present, 10s. a year.

Wireless News in Brief.

Tetney beam station, for communication with Australia, is nearing completion.

A new departure in ship installations is the fitting of Marconi wireless telephone sets on eight whalers.

A French theatrical staffs' association demands the imposition of the same taxes on wireless transmission as are imposed in connection with theatrical performances.

The yacht "Venture," which has been built for Mr. R. C. Robb, has a special Marconi installation with an adaptation of the standard lifeboat set transmitter, and a special receiver capable of broadcast reception.

A wireless equipment has been provided by the Stourbridge Brotherhood for the Corlett Hospital. It includes a four-valve receiving set, with five loud speakers and 30 sets of headphones, the total cost being £150, to which has been added £100 for maintenance.

Mr. J. J. Walsh, Irish Free State Minister for Posts and Telegraphs, announces that a high-power broadcasting station is likely to be erected in the centre of Ireland, and low-power stations will be established at Cork, Galway, and probably Bundoran during the next few months.

The Indian Broadcasting Co., Ltd., has been registered with a capital of R.1 500 000 (about £100 000). The company undertakes to provide wireless stations at Calcutta and Bombay of the same capacity as the London stations. It is expected that the Calcutta and Bombay stations will be ready to broadcast programmes by next winter.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

BLACKFRIARS (London) District Railway station is to be reconstructed, and the work is expected to be completed by September.

The tramway track in Garstang Road, Preston, between Lytham Road and the borough boundary is being renewed, at a cost of £1 300.

The question of issuing through tickets on the Bradford Corporation tramcars and the Keighley Corporation omnibuses is under discussion.

Manchester Traffic Congestion Committee has asked the tramways manager to report on the suggestion that tramcars should be excluded from congested areas.

On the Lanarkshire Tramway Co.'s system the maximum fare is now 2d., except on Saturdays and race days. The cars run from Newmains to Cambuslang, about 14 miles.

Chesterfield Corporation has decided to convert the tramways to a railless trolley vehicle system and to accept the tender of Clough, Smith and Co., Ltd., amounting to £23 947, for the adaptation of the overhead equipment, the supply of 14 vehicles, etc.

Birmingham Corporation is applying to the Minister of Transport for an order to authorise the Corporation to make, maintain and use certain lengths of new light railways in the City of Birmingham, and to employ electric or any other mechanical power or animal power thereon. Copies of the draft order can be obtained (price 1s.) from the Town Clerk, or from Sharpe, Pritchard and Co., Palace Chambers, Bridge Street, Westminster, S.W.1.

At a meeting of Glasgow Corporation last week Mr. Reid's motion that the Corporation should terminate the appointment of Mr. Jas. Dalrymple as general manager of the Tramways Department was rejected by 44 votes to 24. Mr. Reid admitted that the tramways were run successfully from 1904 till 1920, and ex-treasurer Kelly said that by 1920 the whole of the debt of the system had been paid off and the common good received a system worth from £8 000 000 to £10 000 000. Mr. P. Dollan said he believed the tramway system could hold its own. The competing 'buses were heavily subsidised by motor manufacturers or rubber and oil companies. Mr. Laing moved a vote of confidence in Mr. Dalrymple, which was accorded.

Electrical Footballers.

An Unusual Event at the Metropolitan-Vickers Electrical Co.'s Sports.

AN amusing interlude at the annual sports of the Metropolitan-Vickers Electrical Co., Ltd., at the Belle Vue Gardens, Manchester, was a comic football match between overseas apprentices and those of the United Kingdom. The accompanying snapshot shows some of the striking costumes worn by the players.

The Met.-Vickers comic football teams.

Prizes were offered for the most original costume, the most effective costume, and the most comical footballer, and it was well that the judging of these was done by Mr. G. E. Bailey, works manager, and Mrs. J. S. Peck, the wife of the chief electrical engineer, before the game started, as very little costume was left on either side when the players left the field. Some of them departed in a bathing costume, which they had been discreet enough to don beneath their disguises.

The prize for the most comical footballer was presented to Mr. E. M. Honey; that for the most original costume was won by Mr. A. J. Shackleton; and of that for the most effective costume, Mr. E. K. Scott, as a modern flapper, was adjudged the winner. A handsome gilded wooden cup, bearing the firm's monogram, was presented to the referee for the winning team. Presumably the referee knew who had won, but it is doubtful whether anyone else did.

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COMPANY NEWS.

Electrical Share Market Quiet—Price Changes Irregular—Chili Telephone Profits Increased—The General Electric Co.'s Good Year.

THE electrical share market has been quiet in tone since we last wrote, and price changes are irregular. In the manufacturing section, selling of Johnson and Phillips shares has brought the quotation down a couple of shillings, nearly to 63s. Brush and Callender's Cable ordinary shares are each 1s. 3d. lower, at 25s. and 65s. respectively, and British Insulated Cables at 67s. 6d. have shed 6d. On the credit side of the account, Ericsson Telephones preference have improved 1s. 3d. to 22s. 6d., and British Thomson-Houston preference are 3d. to the good at 23s. In the railway and tramway department, West Riding of Yorkshire Tramway ordinary have recovered 6d., to 11s. 6d. District and Metropolitan ordinary stocks are ½ down, and District 6 per cent. and Central London 4 per cent. debentures are both a point lower. Indo-European Telegraph shares are £1 higher.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1912 to 1925. Highest	Lowest
	Electricity Supply.				
0	Brompton & Kensington Ord.	31/10½	31/10½	45/-	24/-
4	Central Elec. Supp. 4% Deb..	90	90	100	67
15	Charing Cross Elec. Ord. (£1)..	45/7½	45/7½	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/-	17/-	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	48/1½	48/1½	52/6	20/3
6	,, ,, 6% C.P. ..	22/6	22/6	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	59/4½	59/4½	61/3	14/6
6	,, ,, 6% C.P. ..	22/6	22/6	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	13½	13½	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	32/6	32/6	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	36/10½	36/10½	41/6	8/-
4½	,, ,, 4½% C.P...	17/-	17/-	18/6	9/6
7	N'castle & Dist. Supp. Ord. ..	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/10½	21/10½	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	21/10½	21/10½	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord (£5) ..	16½	16½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	43/1½	43/1½	48/9	18/-
4½	,, 4½% C.P. (£1)	17/-	17/-	21/6	13/-
8	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
6	,, ,, 6% C.P...	22/-	22/-	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	140	140	123	24
6	,, ,, 6% Pf. Stk.	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69	69	89½	40½
4	,, ,, 4% Deb. ..	79	80	103	56½
4	City & S. Lon. 4% Perp. Deb.	78½	78½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	52½	52½	73½	10
4	,, ,, 4% Pf. Stk. ..	73½	73½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	77	77	89	65
4	Lon. Un. Trams. 1st Deb. ..	47	47	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	64½	64½	101½	49
5	,, 5% Deb. ..	68½	68½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	64	64½	84½	19
3½	,, 3½ Pf. Stk.	64½	64½	88½	40½
3½	,, 3½% Deb.	69½*	70½	92½	51
3½	Met. Dis. Rly. Ord. Stk. ..	53	53½	58	12½
4½	,, ,, 4½% 1st Pref. ..	78½	78½	91	45
6	,, ,, 6% Perp. Deb. ..	112½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb.	65	65	73½	48½
—	Underground Elec. Rlys. Ord.(£10)	3½	3½	5½	21/3
5	Yorks. (W.R.)Trams. Ord. ..	11/6	11/-	27/-	1/-
4½	,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
†3½	Brit. Elec. Transformer 7% C.P.	18/9	18/9	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	67/6	70/-	62/-	26/6
6	,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	23/-	22/9	23/4	19/7½
7	,, ,, ,, 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	25/-	26/3	29/-	10/-
125	Callender's Cable Ord... ..	65/-	66/3	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref...	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)..	10/-	10/-	28/9½	1/11
7½	,, ,, 1st Pref...	22/6	22/6	26/-	5/-
10	Elec. Construction Ord. ..	31/10½	31/10½	30/4	6/7½
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	15/-	15/-	29/3	7/3
6	,, ,, 6% C.P... ..	19/-	19/-	21/3	10/6
6	Ericsson Telephones 6% C.P...	22/6	21/3	21/-	12/7½
6	Ferranti 6% Pref.	17/9	17/9	18/6	16/9
7	,, 7% 2nd Pref... ..	18/-	18/-	19/-	13/9
5	,, 1st Mort. Deb. Stock..	91½	91½	96½	80½
7½	General Elec. Ord.	30/6	30/6	59/-	13/6
20	W. T. Henley's Ord.	77/6	77/6	86/6	23/3
10	Johnson & Phillips Ord. ..	63/1½	65/-	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	25/-	25/-	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	50/-	50/-	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	28/1½	28/1½	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	28½*	28½	56/2/6	19½
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb ..	74½	74½	87½	60
10	Eastern Ord. Stk.	185½*	184½	213½	113/2/6
3½	,, 3½% Pref. Stk.	63½*	63½	84/17/6	49
4	,, 4% Deb. ..	79½	79½	103½	60
10	Eastern Extension Ord. (£10)..	18½*	18½	21½	10/12/6
4	,, ,, 4% Deb. ..	79½	79½	97½	60
22	Gt. Northern Telegraph (£10)..	27	27	42/12/6	19
7	Indo-European (£25)	46½	45½	59½	25
15	Marconi's Wireless T. Ord. ..	22/6	22/6	9/16/3	20/9
7½	,, Int. Mar.	21/3	21/3	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	18½	18½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	79½	79½	10	60/2/6

† For half-year to June, 1925. * Ex dividend.

MEXICAN TELEPHONE CO. ERICSSON.—Net pft. 871 254 kroner; div., 12 p.c.

GREAT NORTHERN TELEGRAPH CO., LTD. (COPENHAGEN).—Intm. div. 2½ p.c. actual.

LONDON ELECTRIC WIRE CO. AND SMITHS, LTD.—Intm. ord. div. 1½ p.c., less tax.

NOTTING HILL ELECTRIC LIGHTING CO., LTD.—Intm. div. 400 p.c., tax free, on def. shs.

INTERNATIONAL LIGHT AND POWER CO.—Div. 3 p.c., less tax, on pref. shs. for 6 mos. to June 30th.

NORTHERN MEXICO POWER AND DEVELOPMENT CO.—Div. 1¾ p.c. on pref. stk. for qr. ended June 30th.

CORK ELECTRIC TRAMWAYS AND LIGHTING CO., LTD.—Intm. div. 3 p.c., less tax, on ord. shs. to be paid July 31st.

BRITISH COLUMBIA ELECTRIC RAILWAY CO., LTD.—Div. at rate of 5 p.c. per annum on 5 p.c. cum. perp. pref. shs. for half-yr. to June 30th.

KALGOORLIE ELECTRIC TRAMWAYS, LTD.—Gross rev. for 1925, £24 847, agst. £26 079; net pft. £5 390, agst. £5 148. A deb. stk. further reduced by £2 750.

LISBON ELECTRIC TRAMWAYS, LTD.—Div. for period from January 1st, 1920, to December 31st, 1922, to be paid on July 19th on acct. of arrears on pref. shs., less tax, at 4s. 1½d.

LEOPOLDINA TERMINAL CO., LTD.—Report for 1925 states that electrification of additional 11 km. taken over from Tramway Rural Flumineuse in 1921 is now completed, making total mileage 51 (83 km.).

VERA CRUZ ELECTRIC LIGHT, POWER AND TRACTION, LTD.—Net pft. in Mexico for 1925, $240 414 (£24 542), agst $8 559. Debit blce. on pft. and loss acct. at December, 1924, £19 736, reduced to £18 814 at December, 1925.

KALGOORLIE ELECTRIC POWER AND LIGHTING CORPORATION, LTD.—Pft. for 1925, £22 138, agst. £18 504. Blce., after provision for depreciation and 6 p.c. deb. int., £2 752. Ord. div. 5 p.c., less tax (approved at mtg. on July 1st); fwd., £252.

HEAD, WRIGHTSON AND CO., LTD.—Pft. £17 070 agst. loss of £7 004. Deducting deb. int., pref. div. and directors' fees, leaves blce. £1 234, agst £1 461 brt. in. No ord. div. Directors state depression and fierce competition for orders continue.

BARNSLEY AND DISTRICT TRACTION CO., LTD.—Rev. £198 024. After providing for exes, including deb. int. and placing £28 000 to renewals fund, blce is £1 776, plus £23 476 brt in. Divs., 7 p.c. on pref. and 10 p.c. on ord. for yr.; fwd., £17 702.

YORKSHIRE (WOOLLEN DISTRICT) ELECTRIC TRAMWAYS, LTD.—Rev. for 1925, £175 233. After mtg. exes. and placing £25 700 to renewals, blce. is £22 511, plus £35 199 brt. in. To res. £10 000; ord. div. 6 p.c. for year, and 3 p.c. in respect of 1921; fwd., £29 272.

PETTERS, LTD.—Net pft. £28 516, agst £25 087. Provision is made for a full year's int. on funding certs. and redemption fund, £2 500. After paying year's div. on pref, shs., div. proposed of 5 p.c., less tax, on ord. shs. Placed to special res., £10 000; fwd., £24 048.

BARCELONA TRACTION LIGHT AND POWER CO., LTD.—Gross earnings in 1925, $3 678 234, against $299 287. General exes., $149 134, agst. $163 353; reorganisation exes., $47 019, agst. $342 174. Bond service $2 233 985, agst. $2 419 088. Div. of 5 p.c. on non-cum. pref. shs. paid during yr.; fwd., $160 322, agst. $74 672.

CHILI TELEPHONE CO., LTD.—Rev., £218 578, agst. £186 222; pft. £70 843, agst. £42 599, plus £3 095 brt. in. Fin. div. 3s. p. sh., making 6 p.c., tax free; to depreciation £25 000, agst. £10 500; fwd., £3 939. To meet exes. on new automatic plant at Santiago and expansion in all directions, authorised cap. to be increased by creation of 50 000 new £5 shs.

Company Meetings.

GENERAL ELECTRIC CO., LTD.—Mr. Ernest G. Byng (vice-chairman), presiding at the annual meeting on Monday read a letter from Sir Hugo Hirst (the chairman), expressing his regret at being unable to attend the meeting. In a written statement, read by Mr. Byng, Sir Hugo Hirst said the profit on trading account and income from investments for the past year amounted to £47 000 more than the previous year. The transfer to reserve of £120 000 compared with

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the previous year's transfer of £172 000; and they had a much increased carry forward, £310 000, against £214 000. When the year ended, there was no reason why they should not have been mindful of the patient support that the shareholders had given them through these difficult times, and why they should not have declared an increased dividend. It was apparent that they could have easily spared the requisite finance, but, as they were watching the effect of the present industrial situation, they considered the adoption of a higher standard was not justified. It was a pity that our country did not seem to get a fighting chance. The coal dispute must impoverish the country, and enrich our competitors. Coal, if used properly, could give the world what it required, and thus stimulate the demand for more coal. Coal contained derivatives of oil which the world wanted, and it could supply fertilisers, cheap electricity and gas. Unless mineowners and miners could agree on these fundamentals and on a programme which could give the country out of coal what it required, coal would never again be produced sufficiently cheaply in this country. He was a strong protagonist of the Electricity Bill, and could see great and lasting good to the industries of this country if the Bill passed into law. If, as it provided, after say five years, electricity were ubiquitous throughout the country, the opportunity of its use would be greatly enhanced, and if voltages and periodicities were gradually becoming standardised the British manufacturer would have at last a chance of proper mass production. He would not only be able then to supply apparatus wanted in the house, factory, and the farm cheaper, and thus popularise the demand; he would also be able to produce at such prices that he could enter again more freely the markets of the world. The report was adopted and the dividend of 7½ per cent. approved.

ORIENTAL TELEPHONE AND ELECTRIC CO., LTD.—Sir A. H. McMahon, at the annual meeting, said the gross income for the year was £145 880, against £135 704. The net result, after provision for working expenses, depreciation, etc., was £67 017, against £59 307, plus £11 889 brought in. A final dividend of 3½ per cent. was recommended on the preference shares and a final dividend of 6 per cent. plus bonus of 2 per cent. on the ordinary shares, tax free, £14 218 being carried forward. The Singapore branch had made fair progress, the increase of gross revenue being £6 393. The prosperity of a few years ago in Mauritius had been succeeded by a reaction; their business there had suffered to a corresponding extent. The cost of the trunk line services, which bore no additional toll fee, bore unfairly upon the company. The consulting engineers to the Colonial Office were inquiring into the matter, and it was hoped this would lead to a modification of the rates. The Bombay Company was unable to make any distribution for the past year. The message rate adopted in Calcutta since September, 1924, had converted a loss of 144 exchange lines during 1923 and a loss of 48 for the first eight months of 1924 into a gain of 407 for the remaining four months of that year alone, and the increase in gross revenue for 1924-5 was £6 483. The chairman then gave particulars of the results achieved by other companies in which the Oriental Co. is interested (see abstract of directors' report in our June 25th issue). The report was adopted and the dividends were approved. A discussion ensued on resolutions to carry into effect the recommendations of the board with regard to the payment of cash gratuities by the China and Japan Telephone and Electric Co. to certain of its employees and late employees, and the formation of a pension fund for the benefit of the employees of the Oriental Telephone and Electric Co., and they were carried by a large majority.

New Companies.

BERK AND DUNDAS FOX, LTD.—Cap., £2 000. Electricians, wireless engineers, etc. Reg. office: 86A, Manningham Lane, Bradford.

BEL CANTO RADIO REPRODUCER CO., LTD.—Cap., £100. Manufacturers of and dealers in loud speakers, etc.. Reg. office: 68, Farringdon Street, London, E.C.

HEYSHOTT ENGINEERING CO., LTD.—Cap., £100. Electrical and general engineers, radio specialists, etc. Secretary: A. A. Hobbs, Melton House, Heyshott, Sussex.

AMERICAN RADIO CORPORATION, LTD.—Cap., £500. Manufacturers of, and dealers in, wireless accessories, etc. Reg. office: 18, Conduit Street, London, W.1.

CROSLAND, LTD.—Cap., £2 000. Dealers in electrical and mechanical goods, electrical and general engineers, etc. Reg. office: Russell Street, Batley, Yorks.

W. HERBERT FOWLER, LTD.—Cap., £500. Contractors for advertising by means of slides and electrical devices, etc. Reg. office: 70, Victoria Street, Westminster, S.W.1.

QUTA MANUFACTURING CO., LTD.—Cap., £100. Manufacturers of and dealers in electrical apparatus and materials, etc. Reg. office: 252, Haydons Road, Wimbledon, London, S.W.19.

H. S. ELECTRIC, LTD.—Cap., £3 000. Electrical engineers and contractors, manufacturers of and dealers in electrical apparatus, etc. Reg. office: 32, Charlotte Street, Birmingham.

MAYER AND CO., LTD.—Cap., £1 200. Manufacturers and patentees of, and dealers in, electrical, and scientific apparatus and materials, etc. Reg. office: 1, Subway Road, Barry, Glam.

PROVINCIAL REAL PROPERTIES, LTD.—Cap., £10 000. To acquire real property of all kinds, to construct electric power stations, etc. Secretary: J. Apthorpe, 2, London Road, East Grinstead.

D.N.B. Co. (ROKER), LTD.—Cap., £500. To acquire patents, and to carry on any business as electrical and radio engineers, etc. Solicitors: C. R. Walker and Renney, 57, John Street, Sunderland.

CABLON, LTD.—Cap., £2 000. To buy, manufacture, etc., super high tension cables and cables of all kinds, switches, etc. Reg. office: Lincoln House, 296-302, High Holborn, London, W.C.1.

Electric Cooking.

Excellent Propaganda with Local Consumers' Testimonials at Ilford.

A FURTHER phase in the electric cooking "push" that is being so successfully developed by Mr. A. H. Shaw at Ilford, is marked by the publication of an effective 16-page pamphlet on electric cooking, which has just been issued by the Ilford Electricity Department.

Attractively printed in large type, it contains a three-page exposition of the benefits of electric cooking, in which the essentials are clearly and convincingly set out with a remarkable economy of words. The rest of the booklet gives extracts from testimonials received from Ilford users of electric cooking and heating appliances, and the appeal of the publication is reinforced by the exhortation—on the cover—to "read what Ilford users say about it."

As a matter of interest, we give below some of the appreciations:—

"I have given it [the electric cooker] fully eighteen months' trial, and would not be without it. For cleanliness and economy it is unsurpassed."

"...I find the cost compares very favourably indeed with that of other forms of cooking."

"...the comparison [of cost] between gas and electricity is much in favour of the latter."

"...I consider it as great an advance in the art of cooking as was the change over from coal to gas, and I have no desire to revert to either."

"I am quite satisfied with the cost of cooking by electricity."

"The cooker is splendid; a point that is especially appreciated is the residual heat left in the hot-plates, by which, after cooking, we can heat ample water for our washing-up needs."

Metal and Chemical Prices.

TUESDAY, July 13th.

		Price.	Inc.	Dec.
Copper—				
Best Selected ..	per ton	£63 5 0	£1 0 0	—
Electro Wirebars ..	,,	£66 0 0	£1 0 0	—
H.C. Wire, basis ..	per lb.	9⅛d.	⅛d.	—
Sheet	,,	9 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 1 5/16d.	⅛d.	—
Brass 60/40—				
Rod, basis	per lb.	7½d.	—	—
Sheet, basis ..	,,	9⅛d.	—	—
Wire, basis ..	,,	9⅛d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£4 0 0	—	2s. 6d.
Galvanised Steel Wire, basis 8 S.W.G. ..	,,	£13 10 0	—	—
Lead Pig—				
English	,,	£32 10 0	£1 0 0	—
Foreign or Colonial	,,	£31 5 0	£1 2 6	—
Tin—				
Ingot	,,	£277 7 6	£1 10 0	—
Wire, basis	per lb.	3s. 6½d.	½d.	—
Aluminium Ingots ..	per ton	£120 0 0	—	—
Spelter	,,	£34 17 6	£1 2 6	—
Mercury	per bottle	£15 10 0	—	—

Sulphur (Flowers)—Ton £11 10 0 *Sodium Chlorate*—Per lb. 3d.
,, (Roll-Brimstone)—,, £10 5 0 *Sulphuric Acid* (Pyrites, 68°)
Copper Sulphate— ,, £25 to £25 10 0 per ton, £6 15 0
Boric Acid (Crystals) ,, £37 *Sodium Bichromate*—Per lb. 3½d.
Rubber—Para fine, 1s. 7½d.; plantation 1st latex, 1s. 8½d. to 1s. 8⅝d.

The metal prices are supplied by British Insulated Cables Ltd.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BONE, Welby, Garden Suburb, Burry Port, electrical contractor. £91 16s. 10d. May 18th.

INGHAM BROTHERS, 56, Manchester Road, Bradford, electrical factors. £13 10s. 10d. June 3rd.

MAXEL ELECTRICAL CO., 28, Clipstone Street, Great Portland Street, W., electrical dealers. £22 5s. June 3rd.

SOUTHCHURCH RADIO STORES, The Broadway, Southchurch, Southend-on-Sea, electricians. £13 13s. June 8th.

SPEKE, H. H., 12/17, Bilstone Street, Wolverhampton, electrical engineer. £16 14s. 10d. June 1st.

WIRELESS INSTRUMENT MANUFACTURING CO., Avenue Works, Avenue Road, Willesden. £23 0s. 10d. June 4th.

Deed of Arrangement.

BROOKS, Thomas William, trading as BROOKS AND CLAYTON, 72, Belgrave Road, Leicester, electrical engineer. Filed July 8th. Trustee, T. F. Birch, Court Chambers, Friar Lane, Leicester, C.A. Secured creditors, £300; liabilities unsecured, £489; assets, less secured claims, £625.

Receiverships.

KIRBY (WIMBLEDON), LTD.—W. T. Greenland of 8, Dunmore Road, Wimbledon, was appointed receiver and manager on July 3rd 1926, under powers contained in debenture dated November 23rd, 1925.

McLEOD AND SONS, LTD.—G. Miller, incorporated accountant of 19, Castle Street, Liverpool, was appointed receiver and manager on March 22nd, 1926, under powers contained in debenture dated December 29th, 1924.

NAPIER-KIMBER, LTD.—Florence Tompkins, of 70, Great Portland Street, W.1, was appointed receiver on July 2nd, 1926, under powers contained in a first mortgage debenture dated June 5th, 1923.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BARTON-ON-HUMBER ELECTRIC SUPPLY CO., LTD.—Registered June 14th, £6 000 debentures (secured by trust deed dated May 26th, 1926); charged on property at East Acridge, Barton-on-Humber, also general charge. *Nil. March 3rd, 1926.

BORDESLEY ELECTRICAL ACCESSORIES CO., LTD. Registered June 23rd, £1 000 (not ex.) mortgage, to bank, charged on 162, High Street, Bordesley. *£400. November 20th, 1925.

HADDEN AND PEARCE, LTD., London, S.W., manufacturers of electrical fittings.—Registered June 10th, £1 300 debenture, to E. Pearce, 13, Mitcham Lane, Streatham, victualler; general charge. *Nil. May 27th, 1926.

HARRISON BROTHERS (ELECTRICAL ENGINEERS), LTD. Middlesbrough.—Reg. June 30th, £1 000 debenture; charged on land at Middlesbrough; also general charge. *£2 000. July 20th, 1925.

Satisfactions.

BORDESLEY ELECTRICAL ACCESSORIES, LTD.—Satisfaction registered June 23rd, £500, registered September 11th, 1924.

HOWARD (F. GEERE), LTD., London, W., electrical engineers. Satisfaction reg. June 3rd, £6 250, reg. August 15th, 1922.

MAYBROOK ELECTRICAL CO., LTD., London, E.C.—Satisfaction registered June 16th, £200 part of £1 000 1st debentures registered December 30th, 1924.

THURSFIELD (C. J.) AND CO., LTD., Birmingham, manufacturers of electric fittings. Satisfaction registered June 11th, £3 000, part of amount registered April 4th, 1912.

WATFORD ELECTRIC AND MANUFACTURING CO., LTD. (late THOMAS KESNOR AND CO., LTD.).—Satisfaction registered June 10th, £1 500, part of £3 000, registered June 11th, 1923.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

POWER AND LIGHTING SUPPLIES CO., LTD., 25, Blackfriars Street, Salford, Manchester, electrical engineers. A meeting of the creditors herein was held on July 6th at the offices of Harry L. Price and Co., I.A., 47, Mosley Street, Manchester. The chair was occupied by Mr. A. T. Eaves, the liquidator of the company, who submitted a statement of affairs which showed ranking liabilities of £1 030, of which £822 was due to the trade and £208 to the bank. The assets were estimated to realise £213, from which had to be deducted £71 for preferential claims, leaving net assets of £142, or a deficiency of £888. The company was formed in 1920, the issued capital being £2 125. The company took over an existing business, and during 1921 there was a loss on the trading of £484. The following year there was a profit of nearly £500, but in 1923 there was a loss of £439. In 1924 the loss was £297, whilst last year it was more than £600. For the period ending June 17th last the trading loss was £1,116. The deficiency was accounted for by the losses on the trading together with the depreciation written off the assets in the statement of affairs. During recent years the turnover had been as follows: 1921, £4 177; 1922, £6 932; 1923, £9,448; 1924, £6 132; and 1925, £5 212. A private meeting of the creditors was held early in June, when it was decided that failing an offer of 5s. in the £ the company should go into voluntary liquidation. Following that meeting the shareholders passed the usual resolution for voluntary liquidation and appointed Mr. A. T. Eaves as liquidator. The latter stated that he had valued the assets on the basis of a forced realisation. The business had been advertised for sale, but without success and it would appear that a sale by auction was inevitable. No resolution was passed by the creditors, and therefore the voluntary liquidation of the company will be continued with Mr. Eaves as liquidator.

WOODHEAD, Cyril, trading as WOODHEAD PARTNERS, electrical engineers, Basinghall Street, Leeds. In response to a circular letter issued by Thomas Hayes and Sons, I.A., of 10, East Parade, Leeds, a meeting of the creditors of the above was held on July 8th at the Hotel Metropole, Leeds, when a statement of affairs was presented which showed liabilities of £1 215, and net assets of £475, or a deficiency of £740. The business was commenced in 1909 by the late Mr. J. H. Woodhead, father of the present proprietor. For a time the executors carried on the business, but in July 1920 the debtor took it over, the purchase price being £1 000. Payments had been regularly made on account of the principal and interest, and at the present time there was £153 owing to the executors. Profits were regularly made in the business up to the end of 1924. The turnover had also been progressive and for the 12 months to December, 1924, the sales were £7 345, the net profit being £834. In 1925 the sales fell to £5 790, and there was a loss on the trading of £60. Up to June 30th of the present year the sales had been £3 175, with a profit of £80. The drawings had been moderate. A resolution was passed agreeing to accept a composition of 7s. 6d. in the £ payable by three equal instalments, at 4, 8 and 12 months, the last two to be secured. The principal creditors are:—Walsall Hardware Manufacturing Co., Walsall, £426; Electric Lamp Factors, London, £186; Liverpool Cable Co., Bootle, £100; S. Dawson, Leeds, £46; General Electric Co., London, £40; Ediswan Electric Co., London, £25; Belling and Co., London, £23; Philips Electric Lamp Co., London, £18; Metro-Vick, Ltd., London, £17; Simplex Conduits, Ltd., London, £12.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Company Winding-up Voluntarily.

SHEFFIELD WIRELESS DEPOT, LTD. H. Cunningham, King's Chambers, Angel Street, Sheffield, Incorporated Accountant, appointed liquidator, July 5th.

Bankruptcy Information.

WARREN, Walter John (trading as COLEMAN AND WARREN) 66, Victoria Street, Westminster, S.W.1, wholesale electrical supplies. First meeting, July 21st, 11 a.m., and public examination, August 24th, 11 a.m., Bankruptcy Buildings, Carey Street, W.C.

Notice of Intended Dividend.

GREGORY, Foster Frank, 2A, Westbourne Road, Luton, electrical engineer. Last day for receiving proofs, July 28th. Trustee, D. Helliar, The Parade, Northampton, Official Receiver.

Partnerships Dissolved.

CITY MAGNETO COMPANY (Harry BOOKER and Ernest WOODS), magneto repairers, 9, Barton Street, Deansgate, Manchester. As from February 27th, 1926. Debts received and paid by H. Booker, who will continue the business.

READING RADIO INSTALLATIONS (Archibald WILLIAMS and Arthur PHILLIPS), dealers in radio supplies, 17, King's Road, Reading, by mutual consent as from February 28th, 1926. Debts received or paid by A. Phillips, who will continue the business.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

239 002 W. Joughin and T. Hough. Variometers for wireless circuits and the like. (24/7/24.)
239 007 G. Turner. Tuning coils used in wireless telegraphy and telephony. (10/7/24.)
239 029 A. S. Cachemaille (Westinghouse Electric and Manufacturing Co.). Vacuum electric tube amplifying apparatus. (9/8/24.)
239 031 A. L. Isaac. Electrical commutators or distributors. (11/8/24.)
223 877 Western Electric Co., Ltd. Telephone systems. (24/10/23.)
239 053 J. J. Rathbone. Electrical relays. (17/9/24.)
239 066 F. W. Sturgess. Electric intermittent switches. (8/10/24.)
224 874 British Thomson-Houston Co., Ltd. Photo-electric devices. (13/11/23.)
239 072 Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921) Ltd.) (W. Dubilier). Variable electric condensers. (27/10/24.)
239 073 Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921) Ltd.) (W. Dubilier). Electrical condensers. (29/10/24.)
224 895 M. Gjersoe. Electric furnaces. (12/11/23.)
239 076 C. A. McEldowney. Armatures for electric dynamos, motors and like machinery. (13/11/24.)
227 452 E. Habann. Thermionic valves. (11/1/24.)
239 110 E. Schrack. Grid for electron discharge tubes. (3/2/25.)
239 121 A. E. Beattie. Thermionic valves. (4/3/25.)
231 473 H. Michel. Electric insulation testing devices. (26/3/24.)
239 132 T. Maher. Means for clamping together electric transformer coils. (1/4/25.)
238 513 British Thomson-Houston Co., Ltd. Electric regulating systems. (18/8/24.)
238 926 T. H. Hurst and Hurst Electrical Plant, Ltd. Electrically driven tools and the like. (27/10/24.)
239 249 W. A. Loke. Electric furnaces and the like. (10/3/24.)
239 253 H. Angel and Western Union Telegraph Co. Telegraph repeater. (30/4/24.)
239 259 A. W. Billingsley. Warning device for use with electrically controlled machinery. (8/5/24.)
239 263 F. Woods. Radio direction finders. (28/5/24.)
239 267 A. W. Sharman and Radio-Acoustics, Ltd. Tuning or inductance coil units for high frequency circuits for use in wireless receiving apparatus. (29/5/24.)
239 275 M. D. Davis. Electric connectors. (2/6/24.)
239 277 E. S. Rogers. Electrical switches and the like. (4/6/24.)
217 226 Siemens-Schuckertwerke Ges. Compound electric machines. (5/6/23.)
239 299 E. Y. Robinson and Metropolitan-Vickers Electric Co., Ltd. Vacuum electric tube devices. (11/6/24.)
239 309 G. W. Hale and Radio Engineering Co., Ltd. Radio-telephonic and other radio-frequency signalling systems. (18/6/24.)
239 310 G. W. Hale and Radio Engineering Co., Ltd. Apparatus for wireless reception. (18/6/24.) (Cognate application, 7 310/25.)
239 314 Automatic Telephone Manfg. Co., Ltd. (Automatic Electric Co.). Automatic and semi-automatic telephone systems. (25/6/24.)
239 315 British Thomson-Houston Co., Ltd. and W. F. Boyd. Electric plug-in connectors. (26/6/24.)
239 325 J. R. Bond and S. Robinson. Drums, and a method of carrying the drums for electric cables for mines and like works. (23/7/24.)
239 326 A. A. Price and Price's Battery and Radio Co., Ltd. Condensers used in connection with wireless telegraphy and telephony. (22/5/25.)
239 333 C. E. Raeburn and W. E. Taylor. Electrical condensers. (24/4/25.)
239 338 A. Gooch. Crystal detectors for wireless receiving sets. (9/8/24.)
239 341 W. Stuart. Rotary detector for use with crystal wireless receiving sets. (14/8/24.)
239 345 C. L. Arnold and "M.K." Electric, Ltd. Socket tubes for electrical connectors, wall sockets and the like. (16/8/24.)
220 944 J. H. Mellquist. Electrogalvanic method of, and electrolytic bath for, applying protective covers on electric conductors, especially metals. (18/8/24.) (Convention date not granted.)
239 352 J. Lawton and Sons, Ltd., and F. G. Martin. Holder or suspension fitting for electric lamps. (25/8/24.)
222 462 C. Lorenz Akt.-Ges. Synchronous transmission of several messages over one wire by means of alternating currents of different frequencies. (24/9/23.)
239 361 E. C. R. Marks (Hart Manfg. Co.). Thermostatically controlled electric switches. (9/9/24.)
239 373 W. B. Dale, R. A. Hopkinson and J. Hopkinson and Co., Ltd. Electric signalling bells. (23/9/24.)
239 374 Coventry Automatic Telephones, Ltd. and V. Amberg. Telephone systems. (24/9/24.)
239 395 E. C. R. Marks (Hendry Machine Co.). Electric motor driven change-speed device. (13/11/24.)
239 409 A. Kvaal. Connecting devices for the wire of telephone or telegraph cables. (5/12/24.)
226 561 British Thomson-Houston Co., Ltd. Electric heating-plates. (20/12/23.)
228 551 British Thomson-Houston Co., Ltd. Systems of electric distribution (28/1/24.)
229 705 Telefunken Ges. fur Drahtlose Telegraphie. Frequency reducing means for use with static frequency transformers. (23/2/24.)
239 441 A. G. Briant. Rotary electric ignition commutators or distributors for internal combustion engines. (26/2/25.)
231 443 Siemens und Halske Akt.-Ges. Telephone systems. (31/3/24.)
239 450 J. W. Barber and Brownie Wireless Co. of Great Britain, Ltd. Crystal holders of wireless receiving apparatus. (6/4/25.)
232 224 Akt.-Ges. Brown, Boveri et Cie. Electric furnaces. (14/4/24.)
236 518 Lurgi Apparatebau-Ges. Tiltable electric conducting liquid switch. (7/7/24.) (Addition to 230 406.)
239 555 A. Roberts and Mather and Platt, Ltd. Automatic electric motor starters. (15/3/24.)
239 560 British Thomson-Houston Co., Ltd., and A. A. Pollock. Dynamo electric machines. (7/4/24.)
239 562 J. V. Foll. Synchronous telegraphy. (10/4/24.)
215 729 British Thomson-Houston Co., Ltd. Systems of electrical distribution. (10/5/23.)
239 571 F. Creedy. Alternating current electric machinery. (8/5/24.) (Cognate application, 15 770/25. (A divided application on 27 911/24.)
239 575 Berkeley and Young, Ltd., N. W. Gilbert and H. C. E. Jacoby. Electrical rheostats and similar regulators, applicable also to fuse holders and the like. (30/5/24.)
239 577 Western Electric Co., Ltd., W. E. Mougey and J. Collard. Methods of balancing cable circuits. (5/6/24.)
239 581 V. Hutchinson. Intercommunication telephone systems. (6/6/24.)
239 586 J. P. Jayne. Inductance coils. (10/6/24.)
239 594 C. Seymour and J. L. Miller. Thermionic vacuum tubes or valves. (10/6/24.)
239 599 C. Seymour and G. Shearing. Generation of waves by thermionic valves for wireless telegraphy and telephony. (12/6/24.)
239 606 H. T. Scott-Huntington. Electroscopic apparatus for testing the conductivity of various materials. (13/6/24.)
239 609 J. F. Monnet. Production of electrodes for alkaline storage batteries. (13/6/24.)
239 610 Automatic Telephone Manfg. Co., Ltd., and H. H. Harrison. Telegraph apparatus. (13/6/24.)
239 614 E. Schroder. Manufacture of welded tubes by electric resistance welding. (14/6/24.)
239 615 British Thomson-Houston Co., Ltd., and F. P. Whitaker. Automatic control of dynamo electric machines. (14/6/24.)
226 154 Automatic Telephone Manfg. Co., Ltd. Telephone systems. (18/6/24.)
239 626 Creed and Co., Ltd. and F. G. Creed. Electrical transmitters for use in automatic telegraphy. (23/6/24.) (Addition to 191 772.)
239 632 N. Garnett. Terminals for use on wireless instruments and for like purposes (27/6/24.)
239 633 F. V. Wythes and Siluminite Insulator Co., Ltd. Electric insulating materials and electric insulators. (27/6/24.)
239 636 British Thomson-Houston Co., Ltd., A. P. Young and A. G. Salisbury. Electric measuring instruments of the moving coil type. (30/6/24.)
239 650 British Thomson-Houston Co., Ltd., F. P. Whitaker and C. J. Sarjeant. Automatic control of electric motor converters. (11/7/24.)
239 651 G. A. G. Davies and H. W. Kent. Electric connection sockets or like electrical fittings. (12/7/24.)
239 660 A. H. Railing, C. C. Garrard and P. H. Coales. Interlocking of electric switch cubicles. (28/7/24.)

Applications for Patents.

June 28th.

16 220 Allmanna Svenska Elektriska Aktiebolaget. Fault indicators for electric transformers. (27/7/25, Denmark.)
16 221 Allmanna Svenska Elektriska Aktiebolaget. Fault indicators for electric transformers. (9/11/25, Denmark.)
16 238 K. Brian, J. A. Clark and J. Malcolm. Electric accumulators.
16 291 H. J. Byrne. Clockwork device for switching wireless sets.
16 281, 16 282, 16 283 C. H. Everett. Storage batteries. (12/4/26, U.S.)
16 179 H. V. Flinn. Electrical, etc., connections.
16 232 A. J. H. Haddan (Moffats, Ltd.). Electric heating elements for cooking ranges.
16 243 Igranic Electric Co., Ltd., and P. W. Willans. Buzzers.
16 231 International General Electric Co., Inc. Electric rolling mill drives. (30/6/25, Germany.)
16 213 B. Jirotka. Telephone, etc., earpieces. (29/6/25, Germany.)
16 193 L. R. McDonald. Antimicrophonic shield for electron tubes.
16 203, 16 204 Macintosh Cable Co., Ltd., and A. W. Williams. Electric cables. (23/12/25.)
16 207 H. Rottenburg. Electrical plug connectors.
16 218 J. C. Stobie and F. W. H. Wheadon. Pole for carrying electric cables, etc.
16 256 Westinghouse Brake and Saxby Signal Co., Ltd. Apparatus for rectifying alternating current. (7/10/25, U.S.)
16 257 Westinghouse Brake and Saxby Signal Co., Ltd. Electric resistances. (7/11/25, U.S.)
16 292 E. Whiteley. Telephone plugs, etc.
16 236 A. Williams. Electric junction boxes, etc.

June 29th.

16 388 J. A. Bower. Boxes for radio sets, etc.
16 344 British Thomson-Houston Co., Ltd. Electric incandescent lamps, etc. (29/6/25, U.S.)
16 376 J. Buchli. Driving arrangements for electrically driven vehicles.
16 307 S. O. Cowper-Coles. Electric wires, etc.
16 355 F. W. Cox, W. L. Marlow and E. O. Morgan. Electrical ceiling roses.
16 308 A. G. Long and A. Stradling. Electric switchboxes.
16 342 W. J. Rickets. Telephone installations.
16 370 Standard Telephones and Cables, Ltd. Automatic switches for telephone systems.
16 338 W. A. Stevens. Control for electrically driven vehicles.
16 354 H. P. Vermeulen. Electric plug-and-socket connectors.

June 30th.

16 444 British Thomson-Houston Co., Ltd., F. A. Fossey and A. G. Salisbury. Electric switches.
16 456 G. H. Fletcher and Metropolitan-Vickers Electrical Co., Ltd. Electric locomotives.
16 493 D. C. Gall and H. Tinsley. Submarine telegraphy.
16 422 F. Hallworth. Radio receiving apparatus.
16 392 W. W. Lewis. Electrical time switches.

July 1st.

16 594, 16 595 J. L. Baird. Apparatus for transmitting views, etc., by telegraphy etc. (1/9/25.)
16 497 W. A. Beatty and D. O. T. McAteer. Modulation and amplification system for wireless.
16 559 British Thomson-Houston Co., Ltd. Electron discharge apparatus. (1/7/25, U.S.)
16 536 J. W. Canham. Thermionic valves.
16 556 G. H. Drake. Wireless receiving apparatus.
16 529 J. F. T. Engblom and Ericsson Telephones, Ltd. Electromagnetic relays.
16 555 E. H. Fleming. Mountings for thermionic valves.
16 560 Metropolitan-Vickers Electrical Co., Ltd. Alternating current electrical distribution systems. (2/7/25, U.S.)
16 561 Metropolitan-Vickers Electrical Co., Ltd. Electrical distribution systems. (13/8/25, U.S.)
16 582 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Attachment of incandescent bodies in electric lamps, etc. (2/7/25, Holland.)
16 593 P. Pairard. Electric water level indicator. (26/11/25, France.)
16 516 C. B. Tutt. Electro-percussion tools.

July 2nd.

16 621 J. M. Beddoes. Accumulator carrier.
16 654 British Thomson-Houston Co., Ltd. Voltage-regulating systems. (2/7/25, U.S.)
16 644 N. R. Campbell and General Electric Co., Ltd. Electroscopes.
16 608 T. Crisp. Electrical connectors.
16 659 J. J. Dowling. Thermionic indicating means responsive to light variations.
16 678 P. Freedman and N. Tapolsvy. Device for commutation of electric currents.
16 640, 16 641 A. J. Garrod. Thermionic valve circuits.
16 682 C. Gilbert, W. P. Lauder and Rock Electric Co. Electric batteries.
16 631 A. E. Lallemand. Inductance coil supports, and coil holders therefor.
16 663 A. H. Midgley and J. Stone and Co., Ltd. Electric motors.
16 691 Soc. des Relais a Arc. Discharge device for rectifying and amplifying electric currents. (3/7/25, France.)

July 3rd.

16 764 Allgemeine Elektricitats Ges. Magnetic core for Pupin coils, etc. (6/7/25, Germany.)
16 762 H. Boas. Plugs for electric circuits.
16 739 British Thomson-Houston Co., Ltd. Electrodes for space-current devices (8/7/25, U.S.)
16 765 A. Campbell and J. Coggans. Electric warning device.
16 720 E. Duckworth and London and Provincial Radio Co., Ltd. Thermionic valve holders.
16 747 A. Greig. Wireless receiving circuits.
16 759 L. A. Hazeltine. Converting electric power. (28/7/25, U.S.)
16 738 L. G. King. Controlling transferred electrical energy.
16 736 Westinghouse Electric and Manufacturing Co. Television systems. (13/7/25, U.S.)

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THE ELECTRICIAN

ESTABLISHED 1861.

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THE ELECTRICAL MONOPOLY.

THE progress, slow though it has been, which has been made with the Electricity (Supply) Bill, leads us to hope that it will after all pass into law this session, even though the report stage is not to be taken until the autumn. Presuming that no vital amendments are made in the measure in the remaining stages, either in the House of Commons or the House of Lords, it is pretty certain that its broad principles will not differ greatly from those laid down in the first draft. The Electricity Commissioners will continue to perform the duties imposed on the Board of Trade by the earlier Acts, and on them by the Acts of 1919 and 1922, while upon the Central Board will be laid the grave responsibility of concentrating generation and of developing a national scheme of transmission, the object in both cases being to make electricity more generally available at the lowest possible price. We are told, almost too often, how very much Great Britain lags behind other countries in this matter of electricity supply. One of the reasons given for this backwardness is our faulty organisation. Now that this fault is to be corrected, it will be interesting to examine how the problem, for it is universal, has been tackled elsewhere.

The position in America is well known. Generation, transmission and distribution are all mainly in private hands, but the activities of the companies concerned are controlled by Public Service Commissioners who both regulate prices and exercise some control over development. In Norway, a country where electricity is, of course, widely used, the municipalities play a much larger part in electrical enterprise than they do in America, and though there is no State regulation of price, there is control over the indiscriminate utilisation of the water power on which electrical generation mainly depends. In Sweden, the part played by the State is even more direct as they have taken a hand in generation, though both private and municipal enterprise do a much larger share of the work. In France, electricity supply is largely provided by companies under State control, and with State assistance, and in Canada the same is true, though the Ontario Power Commission has assumed the appearance, and to some extent the outlook, of a State Department. Details of the various enterprises need not be given, as they have been dealt with fully both in THE ELECTRICIAN and other technical journals and in publications issued in the different countries. But it is important to notice, at a time when we have been hearing so much about State interference, that in practically every country, except Great Britain and the United States, the State not only controls the operations of what must virtually be a monopoly, but often plays a direct part in the generation of electricity.

This is a distinct disadvantage. For, as Dr. GERHARD DEHNE points out, in a pamphlet on "The German Electricity Supply Industry," which we shall now proceed to examine, the role of the State should be objective and impartial. It is, however, very doubtful whether this is possible of attainment in Germany and other countries where the State is vitally interested in the provision of electricity as an undertaker.

In this connection, Dr. DEHNE draws an interesting distinction between electricity supply and railways, which, he points out, differ from one another in two essentials. In the case both of the railways and of the postal services, a single organisation with the same sort of tariff and working regulations is possible. Every consumer is dependent upon them to much the same extent and cannot withdraw his custom without economic disadvantage to himself. On the other hand, electricity is only one of several forms of energy, and it must, therefore, take the requirements of the consumer carefully into account. In Germany, it appears that 95 per cent. of the electricity sold by public supply undertakings is taken by large consumers who can at any time make other arrangements. It cannot, therefore, as Dr. DEHNE points out, be considered as a monopoly. If, for instance, the establishment of private generating stations were forbidden and it were made compulsory for electricity to be taken from the public supply, the ruin of the electrical industries generally would inevitably follow. This seems an unnecessarily lurid picture. In this country, too, electricity supply, except in a very limited sense, is certainly not a monopoly. In the domestic field, it has had and is having a hard fight against gas and coal, while in the industrial field the struggle against other forms of power has been hardly less severe. Yet good progress has been made, as, incidentally, it also has been in Germany, because electricity offers certain definite advantages which no other form of energy can give.

Another interesting thing about Dr. DEHNE'S analysis is that it shows the necessity for some final and overriding control. In 1924, 56 per cent. of the electricity con-

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sumed in Germany was generated from lignite, 29 per cent. from pit coal, and 15 per cent. from water power, but the importance of the latter form of power, especially in the south of the country, is increasing. In Bavaria, 2 200 000 kW is available, of which 591 000 kW only has been developed, while the proportions in Baden and Wurtenburg are about the same. In Prussia and the rest of Germany, 1 865 000 kW is available, of which 368 000 kW has been developed. While, therefore, for some years the greater part of the electricity generated will be obtained from coal, it is obvious that there are good arguments for pressing on with the development of the country's water power. This raises a problem which is not unknown elsewhere—wayleaves. In this country, as Mr. BRITTON has pointed out, the procedure necessary to obtain wayleaves is mediæval and wasteful both of time and money. But, except in a limited way the Post Office, no Government department directly opposes the grant of wayleaves, and opposition comes mainly from local authorities and land owners. It is therefore surprising to learn from Dr. DEHNE that in Germany the State has been abusing its position as the final court of appeal in these matters for the purpose of assisting its own undertakings. For instance, the consent to the erection of a 220 kW line from Cologne to South Germany was withheld from the Rhenish-Westphalian undertaking for several months and only granted when the Prussian Upper Weser undertaking, in which the Government was interested, had concluded a long-time contract with the town of Frankfort.

We have in this article been mainly concerned with the political aspect of the information given by Dr. DEHNE regarding the German electricity supply industry. It would not, however, be right to conclude without saying that this forms but a small part of what is an interesting and informative publication. The main portion is taken up with a succinct description of the public electricity supply industry in Germany, as viewed from what may be called the super-station point of view. Technical and financial details are given of the position in the Rhenish-Westphalian area followed by a similar survey covering the Central German, Silesian and the Northern, Eastern and Southern districts respectively. It may be added that the book is No. 91 of a series dealing with financial and economic questions which is published by Ferdinand Enke, of Stuttgart. It will form a useful basis for that part of "The World's History of Electricity Supply" which will deal with Germany.

Current Topics.

A New Electrical Market.

DURING the weather which we have recently been experiencing the fancy of English men and women turns lightly to thoughts of refrigeration. As a result ice is in demand, and there is frequently difficulty in obtaining a supply, whether it be for the home or in the restaurant. In every sort of way this is a peak load, for the part that refrigeration can play in the preservation of foodstuffs is little realised. Besides refrigeration foods have up to now been preserved by addition of chemicals. But this procedure, which has much against it, will become illegal after the end of the present year. Makers of refrigerators are therefore rightly preparing for an increased demand for their apparatus. This demand will, it is true, come first from the small shopkeeper, but the force of circumstances and a properly organised selling campaign should also make the householder a frequent buyer. This is a matter in which the electrical engineer and the British electrical industry should take an immediate interest. Within the past few weeks we have described in THE ELECTRICIAN two types of refrigerator which are suitable for this class of work. They are both of foreign origin. We understand, however, that a British refrigerator is under way and we await its appearance with some eagerness. Here is a new electrical market with great possibilities. Both manufacturers and supply engineers would do well to pay close attention to obtaining a full share of this business.

Patents in Ireland.

WE thank the British Thomson-Houston Co. for establishing a point of high importance both to themselves and to patentees in general in the Dublin High Court. Fortunately, though the decision given was against them, it was an interlocutory motion only and may be reversed when the action itself comes to be tried. Briefly, Mr. Justice MEREDITH laid down that letters patent under the seal of the British Patent Office could not apply to the Irish Free State. If, he said, the privileges of the Patent Act were to have been preserved in the Free State Constitution they should have been preserved explicitly, like certain other private interests. The application of British patents to the Free State in the circumstances would be incompatible with the constitutional status of the country. Further comment would obviously be improper at the present time. Two things are, however, clear. One that the exact position should be established, and the other that the Irish Government should regularise matters by passing both Patent and Designs and Copyright Acts as soon as possible. There is every hope that this will soon be done, so as to restrict the activities of the infringer as much as possible.

Telephone Progress.

Two important statements on the telephone system of the United Kingdom were made last week. One of these was by the POSTMASTER-GENERAL in introducing the Post Office Estimates in the House of Commons, and the other by Mr. W. A. VALENTINE, Controller of the London Telephone Service, in handing over the 500 000th telephone in London to the chairman of the Press Gallery at the House of Commons. The Post Office vote shows a net increase of £2 000 000 on that of last year, most of which was due to the development of the telephone system. The estimated capital expenditure in 1926–27 is £11 720 000, no less than £8 308 000 of which will be for local exchange systems, a striking indication of the increase of the telephone habit. Last year, in fact, that growth was unprecedented and amounted to 9·1 per cent., so that there are now 34·06 persons per telephone in this country as against 7·05 in the United States. The number of rural subscribers is increasing, and good progress in the difficult task of changing over to the automatic system is being made. Mr. VALENTINE gave some additional figures which, however, tell the same story. During the last ten years the number of telephones in London had increased by 100 per cent. About 1 750 000 calls were dealt with in 107 exchanges, and this development was accompanied by a more efficient service. London is responsible for about a third of the telephones in the country. Both trunk and Continental traffic is also increasing satisfactorily, and it was hoped that the number of calls under the first heading would amount to over 90 000 000 during 1926–1927. It is interesting to learn that the increase in trunk calls has been stimulated by the introduction four years ago of a revised scale of charges, but that is only what may be expected. When the new Anglo-Dutch cable is put into operation Mr. VALENTINE envisages a service with Prague and Vienna, and by 1927 it will also be possible to communicate with Switzerland, via France or Belgium. It must be apparent from these statistics that our telephone service is not so bad as is often stated. We cannot, however, forbear to quote from an article, "In Praise of the Telephone," which appears in "The Newspaper World." A newspaper reporter, it says, may well sing the praises of a much abused but highly serviceable friend. It is, as the examples he gives shows, an excellent method both of obtaining and giving news. In attaining this end the operators themselves lend valuable assistance and are often important factors in getting the public the morning news. It seems, therefore, that pioneer work is

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beginning to bear fruit and that we need not despair of before long becoming a telephone country.

Future of Broadcasting.

AFTER telephony, broadcasting. Sir WILLIAM MITCHELL-THOMSON'S speech in the House of Commons last week told us little that we did not know already, and will not do much to allay the anxiety of those who feel that there is not a great deal of time in which to make the proposed changes. It seems clear, however, that though the management may be altered, both in character and individually, a wholesale reorganisation of the staff is not intended. This is wise; Capt. ECKERSLEY and those who work with him have gained a great deal of experience and are actually carrying out a number of important investigations. It is of the highest importance that continued use should be made of their knowledge. This view was well expressed by Col. ERIC BALL at a luncheon given by our contemporary the "Wireless Trader" in honour of Prof. L. A. HAZELTINE, the eminent American wireless engineer, and Capt. ECKERSLEY himself in reply praised the broadmindedness of the Select Committee's report. Monopoly in broadcasting is essential, for anything else will mean a private rather than a national service and a lower level of achievement. More money is necessary to give a better service, especially so that alternative programmes can be introduced. That this is a section of the electrical industry that is worth proper handling and worth careful nourishing is seen from some figures given by Capt. IAN FRASER on the same occasion. Since 1922 wireless exports have increased from £340 000 to £1 100 000, while the export of valves alone has risen from £22 390 to £183 000. An efficient broadcasting service in this country means more listeners. More listeners mean a greater demand for apparatus from British manufacturers, and that in turn means that it will be more easy to establish a footing in foreign markets.

The E.P.E.A. and the General Strike.

THE current issue of "The Electrical Power Engineer" contains an interesting analysis of the past, present and future relations of the Electrical Power Engineers' Association with the Trades Union Congress. As is well known there has for some time been a body of opinion within the Association in favour of affiliation with the T.U.C. It was agreed by those who held this view that the General Council would not be empowered to call out the members of the Association on a sympathetic strike. But, as our contemporary remarks, though this may have been true in theory, it is certainly not altogether true in practice, and a union which resisted the T.U.C.'s mandate would find itself in a very awkward position. The Council of the E.P.E.A. have therefore decided that it is not in the interests of the Association to affiliate with the Trades Union Congress. This does not, however, mean, as is explained in a second article, that they abrogate their "right to strike," but the decision when or how this dangerous weapon shall be used will rest with the members and not with an outside body. The Council are to be congratulated on the stand they have taken. Electricity supply is too important a commodity to be made the sport of warring factions.

Electricity and Artificial Silk.

WE are often told that electricity is still in its infancy. But however infantile it may be it is outstripped in that respect by artificial silk, about which all readers cannot fail recently to have seen something. This late development is, however, an advantage to both industries, as it has enabled the electric drive to be used from the beginning in producing this commodity, with the result that on the one hand a satisfactory load, and, on the other, a high quality product is obtained. On another page of this issue we give an account of the British Visada Mill at Littleborough, Lancashire, which has been equipped electrically by the Metropolitan-Vickers Electrical Co. It is intersting to note that the early history of artificial silk is closely bound up with the manufacture of electric lamp filaments, SWAN in 1883 having patented a method for producing it from nitro-cellulose. Later STEARN and TOPHAM invented the manufacture of artificial silk from viscose and laid the foundation of the new industry. Artificial silk, our readers may be surprised to hear, had, however, been introduced in France as early as 1884, though by 1891 the annual output had only reached twelve tons. In 1892, however, PAULY invented the "cuprammonium" process and CROSS and BEVAN discovered viscose. Once again, however, there was a gap, and it was not until 1905 that Courtaulds began the manufacture of viscose silk at Coventry. The mill we describe elsewhere was stated by Sir EDWIN STOCKTON to be the first all-British artificial silk factory, and we were glad to see that electricity is so largely employed in it. We hope it will be the forerunner of many others.

Selling Powers Clause Negatived.

THE most important event in the Standing Committee's consideration of the Electricity Bill since the last issue of THE ELECTRICIAN was published was the negativing of the "selling powers" clause by 17 votes to 11. This is the more surprising since it was generally understood that the form of this clause had been agreed among the various interests concerned, especially the Incorporated Municipal Electrical Association and the Electrical Contractors' Association, though there is some doubt, which was not dispelled, by the proceedings in Committee, as to the position of the Electrical Contractors' Association. The result seems mainly to have been due to the out-and-out opponents of municipal trading, though perhaps the lukewarm approval of the Attorney-General may have had something to do with it. The position is therefore most unsatisfactory. We have 220 municipal authorities with powers to supply electricity. Of these 80 may sell apparatus and the remainder, for no fault of theirs, may not. Everyone should be put on the same level. Moreover, this clause may be described as the first fruits of the closer working between the I.M.E.A. and the E.C.A. which we have watched with much approval. A setback to a very important movement has therefore occurred. We hope for the sake of the electrical industry that it will only be temporary.

Electricity as a Trade Barometer.

"THE ECONOMIST" points out that an index of industrial production is necessary before any real effort can be made to deal with certain industrial problems. Such an index would be very difficult, if not impossible, to construct, and only one based on power consumed by various industries would be representative and accurate enough to justify its adoption. A combination of the consumption of coal and electricity by industry would come closest to the ideal, as such an index would show the fluctuations in activity of those firms which employed electric power. For these reasons, therefore, our contemporary publishes an index to which we refer our readers. It is not complete, as it ignores London and certain other districts where most of the electricity consumed is not generated in public stations. The districts chosen are, however, quite representative of the industries of the country, and enable the writer to a large extent to prove his point. It is interesting to see that since January, 1924, the consumption per head of population has not increased to any marked extent. Seasonal fluctuations are apparent, the consumption in the summer being less than that in the winter, and this is probably due to lighting; a factor on which the author does not seem to lay sufficient stress. The recovery in trade during 1924, the influence exerted by the gold standard in 1925, the marked trade improvement during the early part of this year, and the collapse due to the strike, are clearly shown by the figures. The article is interesting, but care in using the results must be exercised.

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POLYPHASE COMMUTATOR APPARATUS.

Some Illustrations of Hunting from Machines Used in Practice—Properties of the Single Phase Motor.

By F. CREEDY.

HAVING in the last section* discussed the polyphase commutator generator and explained at length its conditions of operation, it will now be desirable to deal in some detail with the various applications of such a machine. Before doing so, however, the previous discussion may be summarised by saying that it has been shown that the machine is itself self-exciting for all positions of the brushes lying between two points differing in position by ninety electrical degrees. At one extreme point of the range the machine generates direct

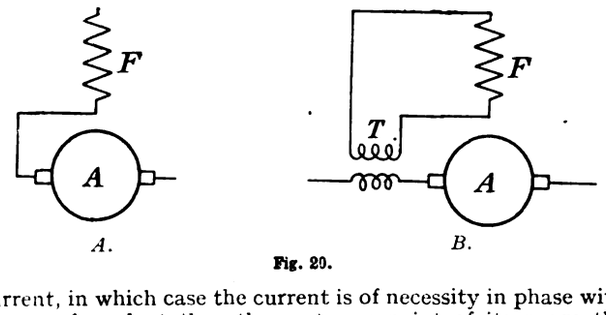

Fig. 20.

current, in which case the current is of necessity in phase with the e.m.f. and at the other extreme point of its range the machine generates an e.m.f. which is exactly in quadrature with the current. In positions intermediate between these two extreme points the machine can generate alternating current e.m.f. of a definite frequency which has a component in phase with the current to balance the resistance drop in the circuit. In order that any machine may be able to generate alternating current, two conditions must be satisfied.

(1) It must be capable of generating an e.m.f. which will balance those e.m.fs. due to the load which are in quadrature with the current, that is, it must be capable of supplying the reactive power required by this load.

(2) It must be capable of supplying an e.m.f. which will balance those e.m.fs. due to the load which are in phase with the current, that is, it must be capable of supplying the mean power required by this load.

These two conditions are entirely independent :

(1) The apparatus may be a generator as regards reactive power and a motor as regards the mean power. This is the case in all types of compensated motors which absorb mean power and generate reactive power sufficient not only to supply that required by their own reactance but frequently to supply that needed by the reactances occuring in other portions of the circuit.

(2) A machine may be a generator as regards the mean power and may require to receive reactive power from an external source, as for instance, in the induction generator, so that the independence of these two conditions is quite manifest.

The only important case in which such a polyphase commutator machine as already described is used independently, is that of the polyphase commutator motor.

It has been pointed out already that where a polyphase commutator generator can generate, for instance, direct current or some current of definite frequency, it will do so IN ADDITION to carrying current of any frequency impressed upon it from an outside source. It is the existence of currents of two distinct frequencies in the same machine which constitutes the phenomenon of hunting. It is clear that hunting can only be avoided in one of two ways :

(1) By making the natural frequency of the machine identical with the impressed frequency.

(2) By rendering the machine non self-exciting and, as already pointed out, since two independent conditions are required to render it fully self-exciting, this self-excitation can be prevented by seeing that one of these conditions is not satisfied, even though the other may be, or although it may be the whole object of the apparatus to satisfy it.

When the polyphase commutator machine is used as a motor the brush setting will usually be such that the machine is non-self-exciting.

Various cases in which polyphase commutator machines are used in practice may conveniently be discussed in turn, so as to make it clear whether hunting is possible and if not, how it is avoided. It will be convenient to include in this discussion the single phase series motor as this is one of the simplest cases and throws considerable light on the others.

* THE ELECTRICIAN, vol. 94, p. 748.

Case 1.—Single Phase Series Motor.

Attempts have several times been made to use single phase series motors for regenerative purposes on traction systems by reversing the field and making them into generators which it was hoped would restore power to the single phase line and would so brake the train.

These hopes have been disappointed, because the series generator generated direct current as well as single phase current, which is the only type which can be usefully restored to the line. Oscillograms have frequently been published showing these effects. They can be eliminated if, instead of connecting the machine as in Fig. 20*A* care is taken that the field of the series machine is coupled to the armature only inductively through a transformer as in Fig. 20*B*, in which case the generation of direct current is impossible. This is an instance of one of the points explained in the previous discussion.

Case 2.—Shunt Machine.

If the terminals of a series motor are short-circuited and leads taken out from the armature it becomes a shunt machine, of which a diagram in the elementary form used throughout these papers is shown in Fig. 21. The conditions of self-excitation of a shunt machine have already been worked out. They reduce to two distinct rules, of which the first is :

In the self-exciting shunt polyphase generator, the frequency will be such as to make the self-inductive field e.m.f. balance that component of the e.m.f. in the armature and neutralising circuit, which is in quadrature with the shunt current, while the second rule becomes *the strength of the field will be such that the component of the e.m.f. in armature and neutralising circuit in phase with the shunt current balances the Ir drop round the shunt circuit.*

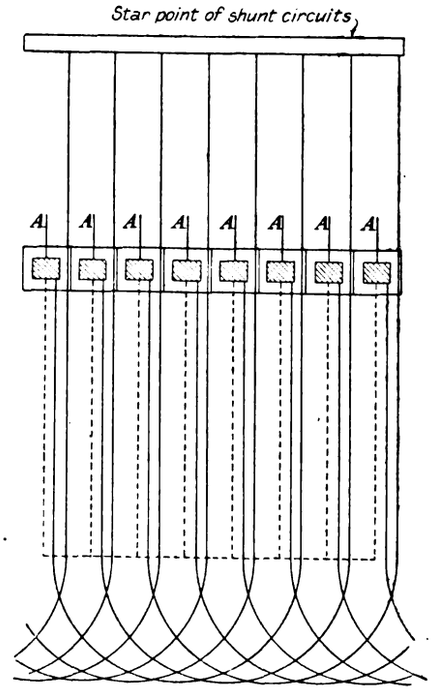

Fig. 21.

If there is no component of the armature e.m.f. in quadrature with the shunt current, the self-inductive field e.m.f. must be zero—i.e. the machine generates a continuous e.m.f.

Where the position of the brushes is such that the machine tends to generate such a continuous e.m.f. it will produce direct current in addition to carrying any alternating current which may be impressed upon it from an external source. This may be prevented as with a series machine by connecting the armature and the field only through a transformer. The existence, of course, of currents of two different frequencies in the same circuit gives rise to powerful synchronising forces

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whenever these two frequencies are close together. In other cases, however, where the frequencies are widely different no such forces are produced. For instance, in the case previously alluded to in which the series machine produced direct current as well as, say, 25 cycles alternating current, it is impossible to tell from the behaviour of the machine that anything abnormal is occurring, the only clue to the difficulty lying in the abnormal readings of any instruments that may be in circuit.

Now the word " hunting " is usually taken to mean a process of rising and falling of speed, accompanied by a periodic noise, hence such a phenomenon would not ordinarily be called hunting. In the narrow sense of the word, " hunting " must be confined to the case in which the natural frequency of the machine is close to the impressed frequency.

A type of shunt machine in which hunting is impossible is that shown in Fig. 22. In this figure the armature is represented as before by a number of star connected bars each connected to a commutator segment on which the brush rests. On the stator are a number of turns, one end of each being connected to a common star point at the end nearest the commutator, while the other ends A A A of the same turns are joined by transformers. Leads taken from the brushes are also joined to the secondaries of the same transformers. If the line is attached to leads B B B then the field circuit will be fed entirely through transformers and although the arrangement of the circuits is the same as that of Fig. 21, which would generate continuous current, yet no continuous current can be generated because there is no conductive circuit between the field and the armature, hence, if current of suitable frequency be impressed on the terminals B B B the motor can operate without self-excitation, and hence without hunting.

Case 3.—Shunt Induction Type.

As an alternative to this, the line terminals might be connected to A A A instead of B B B, in which case the armature is fed through the transformers and the line connected into the stator winding. This obviously makes no change as regards the problem of self-excitation. It is, however, the type of machine which is usually employed in such polyphase commutator machines as are used in practice, because it permits of the stator being wound for commercial voltages, while the winding connected to the commutator can be wound for a sufficiently low voltage to ensure good commutation.

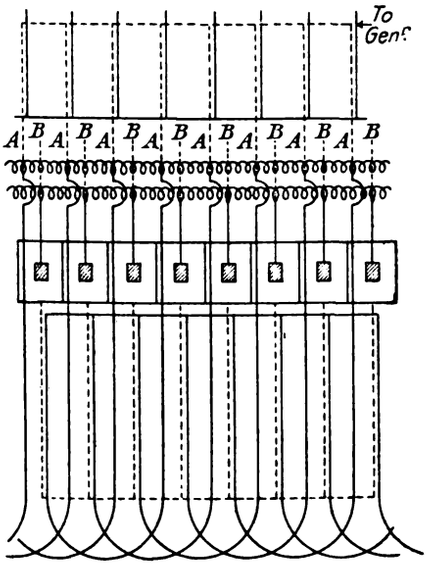

Fig. 22.

Hence we may conclude that in commercial types of polyphase commutator machines no tendency to hunting occurs.

Case 4.—Conductive Shunt Type.

There are, however, certain conductive forms such as that shown in Fig. 21, which are little used owing to their not being well adapted to commercial voltages and frequencies, but in which hunting might be possible. These forms should be avoided.

Case 5.—In Cascade with an Induction Machine for the Purpose of Regulating Speed.

Returning to Fig. 22, if, instead of the terminals A A A being connected to the line, they are connected to the slip rings of an induction machine, which is shown in the upper part of the figure, we have the more usual form in which the polyphase commutator machine is used.

When the machine is used as a speed regulator it acts as a motor below synchronism and as a generator above synchronism, the same brush position corresponding to both these functions. This position, when it acts as a generator, would cause it to generate direct current, and the solution of the possible difficulty which might be caused by this is the same as before, namely, a purely inductive connection between the field and the armature.

In Fig. 23 is shown a diagram of the same type of apparatus

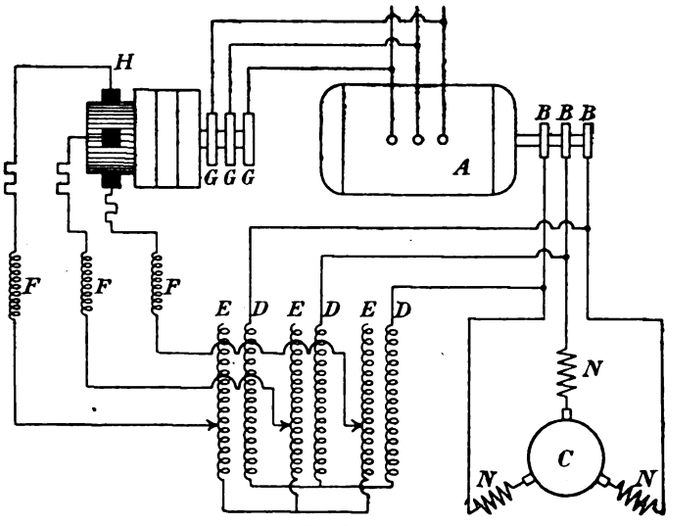

Fig. 23.

in another form. In this figure, A represents the large induction machine with slip rings B B B. These are connected in series with the armature C and the neutralising winding N N N of the shunt commutator machine. The same slip rings B B B are connected to three terminals of a star connected transformer D D D, the secondary of this transformer E E E being provided with a number of taps for adjusting the voltage. These taps are connected in series with the shunt field F F F and with another piece of apparatus which will be described later on. It is clear that in this diagram the connection between the armature and the field of the commutator machine is purely inductive, and hence self-excitation and consequently hunting is rendered impossible. This connection operates quite satisfactorily except in the immediate neighbourhood of synchronism. In the neighbourhood of synchronism the frequency falls to a very low figure and the transformer ceases to operate. Not only this, but another difficulty makes itself manifest. At frequencies differing considerably from synchronism the currents in the field circuits will lag approximately 90 deg. behind the e.m.f. applied to them, and the connections of the apparatus are arranged on the assumption that this lag of approximately 90 deg. exists. In the neighbourhood of synchronism the inductance of these coils is reduced to an extremely low figure and the current no longer lags 90 deg. but tends to approximate in phase to the e.m.f. which is applied to the coil. This prevents the proper operation of the apparatus. To correct this a further apparatus consisting of a small frequency changer having the same number of poles as the large machine is coupled to the main shaft, which takes current at line frequency through its slip rings G G G and delivers it at the slip frequency through its commutator H to the field F F F. By this means this field is separately excited with current of the correct frequency whose phase can be adjusted by adjusting the position of the brushes resting on the commutator H. This is the so-called " ohmic drop exciter." Clearly, when the commutator machine is separately excited there is again no connection between the armature and the field, and hence self-excitation and hunting are impossible.

In some cases the armature and field of this shunt machine is coupled through auto-transformers rather than through transformers having a distinct primary and secondary. This plan is also almost fully effective in preventing self-excitation, since, should there be any remanent magnetism tending to cause a continuous e.m.f. to be generated in the armature, this would produce a current which, instead of building up the field, would be short-circuited through the auto-transformer.

(*Concluded on page* 100.)

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ARTIFICIAL SILK.

Electrification and an Important Industry—The Inauguration of an All-Electric Mill in Lancashire—Temperature Control Methods.

THE manufacture of artificial silk is one of the most recently developed of our important industries. It thus naturally is at some advantage compared with other textile work, in that it has had available all the advantages of electrical operation from practically the beginning of its commercial development. An excellent example of how this opportunity has been utilised is provided by a new factory which has just been put into operation by British Visada, Ltd., at Littleborough, Lancs.

Illustrations of the Python Mill, as it is called, are given on the opposite page. It is equipped with machinery capable of producing 27 500 lb. per week of highest quality yarn of denier ranging from 75 to 300. The mill equipment was manufactured by Dobson and Barlow, of Bolton, and a power plant of the most modern type, which provides the most economical use of fuel for both power and process work, has been supplied by the Metropolitan-Vickers Electrical Co.

Process of Manufacture.

The process of manufacture is in all its essentials the standard process for producing viscose silk. Sheets of wood pulp are steeped in tanks of caustic soda solution, the excess being pressed out until the weight of the mixture is about three times that of the original pulp. The sheets are torn up into fine crumbs by machines fitted with steel teeth and then stored away for some days for a further chemical change to take place. The product is next treated with carbon bisulphide in slowly revolving "churns" and the resulting sticky substance is dissolved in caustic soda and water, giving a treacle-like brownish liquid which is known as "viscose." This thick liquid, after repeated filtering processes, is forced through minute holes, about four thousandths of an inch in diameter, into a bath containing sulphuric acid, where it becomes a gelatinous filament, strong enough to be pulled out of the bath by a roller and fed into a revolving cylindrical box. Here the filaments are twisted into a thread which is laid by centrifugal force on the inside of the box. From the hollow cake so formed the thread is wound into a skein. Even at this stage it does not look much like silk and undergoes further processes of washing, drying, desulphurising, bleaching, souring, washing, and re-drying before its final lustrous condition is attained.

The work is thus a combination of chemical and textile processes. For each 200 lb. of artificial silk yarn produced, in addition to the power required for driving the machinery, about 18 000 lb. of steam is required for process work. To meet these conditions, two turbo-alternator sets have been installed, one of 1 000 kW and one of 100 kW capacity, the larger set passing out part of its steam and the smaller set exhausting the whole of its steam for use in the manufacturing processes.

Steam Turbine Plant.

The 1 000 kW turbine is of the Metropolitan-Vickers standard Rateau impulse type. It is to operate with steam at 160 lb. per sq. in. gauge pressure and 150 deg. F. superheat, but provision has also been made in designing the turbine to permit its operation with steam at much higher conditions, such as 250 lb. per sq. in. gauge pressure and 250 deg. F. superheat, should it be decided at some later date to instal high pressure water tube boiler plant and thus still further increase the overall efficiency of the equipment. Branches are provided on the cylinder in two places for passing out steam at 25 lb. per sq. in. gauge and at 20 in. vacuum, for process work. The steam which is not so required passes on through the turbine into a Metropolitan-Vickers multiple jet type condenser, which is designed normally to maintain a vacuum at the turbine exhaust of 28 in. (bar. 30 in.). The condenser is fitted with a Metropolitan-Vickers LeBlanc rotary valveless dry air pump and a centrifugal hot water extraction pump, mounted on one shaft and driven by a squirrel cage motor. The turbine drives a 1 250 kVA 0·8 power factor, three-phase, 50 cycle, 440 V alternator with direct connected exciter through a set of double helical single reduction gearing, which reduces the speed from 4 500 to 1 000 revs. per min.

The 100 kW turbine is of the Metropolitan-Vickers back pressure geared type operating at a speed of 750 revs. per min. and exhausting the whole of its steam into a separate process steam main at 45 lb. per sq. in. gauge pressure. This machine receives steam at its stop valve under the same conditions as the larger machine. It is arranged to drive a 125 kVA 0·8 power factor, three-phase, 50 cycle, 440 V alternator with direct connected exciter through double helical single reduction gearing.

The switchgear installed is also of Metropolitan-Vickers manufacture, and comprises main oil switches with overload releases, ammeter, voltmeter, instrument transformers, reverse relays, etc., and exciter field rheostats, all mounted on black enamelled slate panels. Equipment for synchronising on the "lamps bright" system is installed.

In order to compensate for the absence of a large supply of cold water for condensation purposes, a cooling tower has been supplied and erected by the Premier Cooler and Engineering Co.

Air Supply Arrangements.

A very important feature in the manufacture of artificial silk is the control of the atmospheric temperature inside the various rooms. In order to maintain these rooms at a constant temperature, it has been found advantageous to deliver air into the rooms at predetermined points at a constant temperature. This problem increases in difficulty as a result of the fact that it is necessary, in order to maintain pleasant conditions for the operatives, to withdraw the foul air rising from the spinning process continuously and provide a complete change of air once every three minutes. Usually, this air is heated by the insertion in the air circuit of a series of steam coils. Such a procedure is, however, extravagant in the consumption of heat. A scheme has been devised whereby the hot water leaving the condenser is passed into a series of Metropolitan-Vickers patent air heaters where the whole of the heat required for air heating is obtained before the water passes along to the cooling tower. In this way a very considerable saving in heat consumption is effected.

Some of the plant used in the preparation and finishing of the artificial silk is shown in the accompanying illustrations. Every machine or group of machines throughout the mill is driven electrically, and the whole equipment is believed to be without superior in suitability and efficiency in the artificial silk industry.

A Title for Contractors.

Many Suggestions Received Following "The Electrician's" Prize Offer.

MANY suggested titles for registered electrical installation contractors have been received from all parts of the country as the result of THE ELECTRICIAN'S offer of a prize of £5 5s. for a simple and expressive title the meaning of which will be readily understood by the public. Most of the entries received so far testify to the exercise of considerable ingenuity on the part of their originators, but in the majority of cases the real guiding consideration seems to have been overlooked.

However descriptive a word may be, it should, in this case particularly, not be difficult to pronounce; many trade names of commodities and proprietary lines have failed to "catch on" for this very reason. Then again, the word should be as short as possible, although it is appreciated that the multi-syllable words which must serve as the basis for the new title render this rather difficult.

As it will be necessary before long to fix a final date for the receipt of suggestions, readers interested in this question are asked to send in their efforts as soon as possible. The conditions are quite simple. The prize of £5 5s. will be paid by us to the inventor of the word, which, having been received by us and passed on to the National Register of Electrical Installation Contractors, is officially adopted by that organisation.

Individual readers may send in as many suggestions as they like but each attempt should bear the inventor's name and address. It may be desirable to point out that no member of the staff of THE ELECTRICIAN, or of any other electrical paper, is eligible for the prize, and that the decision of the national Register must be accepted as final.

In the unlikely event of two competitors providing the adopted word the prize will be awarded to the first effort received, but if both bear the same postmark the prize will be divided.

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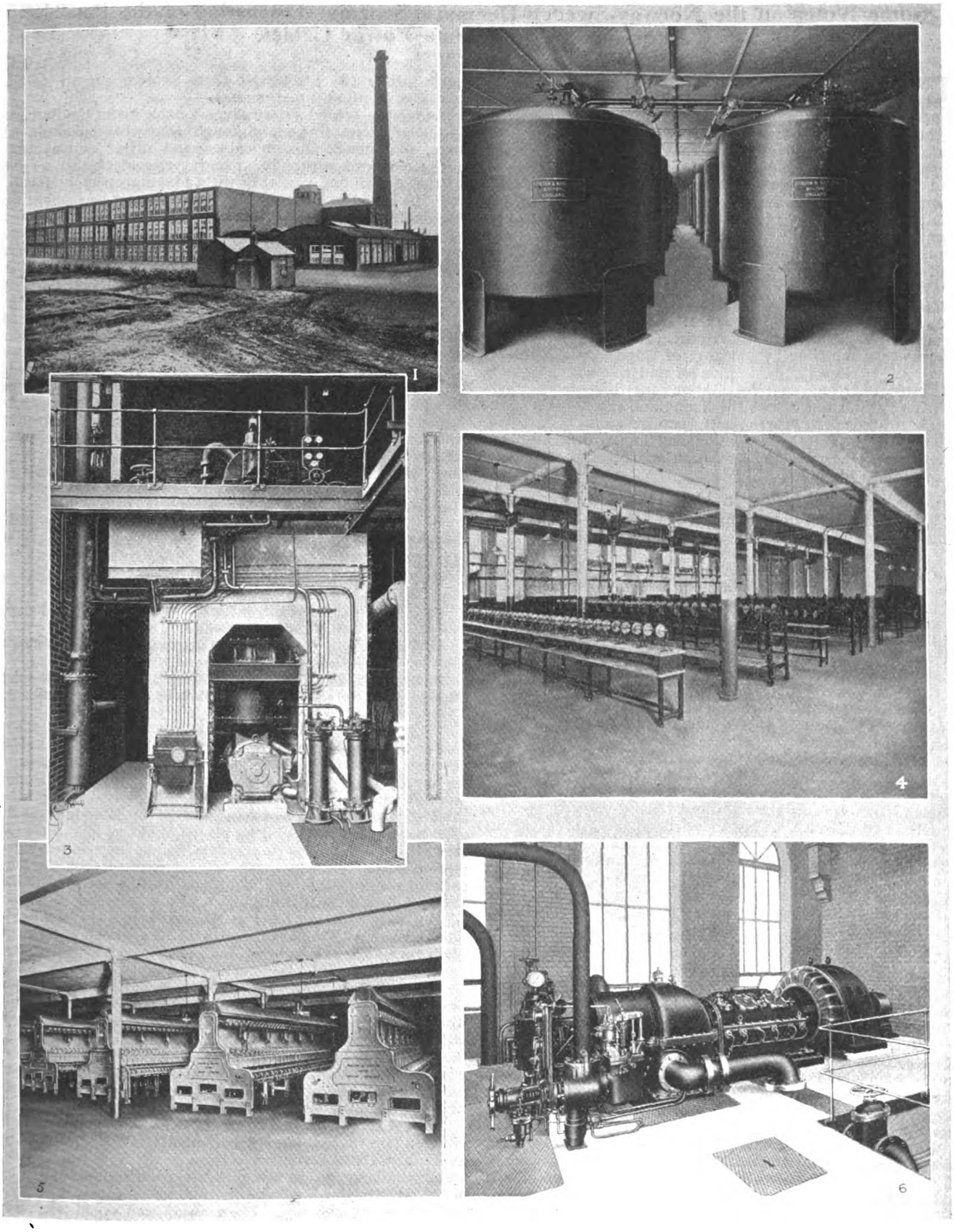
THE MANUFACTURE OF ARTIFICIAL SILK.



1. *Exterior view of the Python Mill, Littleborough, Lancs, where artificial silk is made by electrically-driven machinery.* *See article on page 94.*
2. *View in the ripening room, showing viscose containers. Details of the process are given on the opposite page.*
3. *Metropolitan-Vickers condensing plant and auxiliaries installed at the new artificial silk factory.*
4. *Part of the reeling room at the Python Mill.*
5. *A view in the spinning room.*
6. *The 1 000 kW turbo-alternator which supplies current to the Python Mill. It is to operate initially with steam at 160 lb. per sq. in. and 150 deg. F. superheat.*

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INTERCONTINENTAL TRANSMISSION.

Some Notes on the Norway-Sweden-Denmark Scheme—Discussion of the Possible Alternatives—Submarine Power Cables.

By A. BROCKNER.

THIS important and unique scheme, whose feasibility has now been definitely accepted although work on it has not yet been taken in hand, was investigated by an electro-technical committee consisting of two leading experts from each of the three countries concerned, which committee was appointed at the meeting in Oslo of the Danish, the Norwegian and the Swedish power transmission commission. This committee has held a number of meetings alternately in the capitals of the three countries, some of the meetings extending over more than a week. The report is a very bulky one with numerous maps and tables and the problem has been viewed and exhaustively dealt with from every angle. The very considerable amount of work which has been done by the different members was divided between the delegates of the respective countries as follows: 1. Denmark, investigations concerning Denmark's future requirements of electricity and power transmission by means of high voltage direct current. 2. Norway, description of and calculation of cost of transformer and coupling stations for three-phase transmission; an air line across the Sound and investigation concerning corona at three-phase transmission. 3. Sweden, phase-shifting, voltage regulation and losses at three-phase alternatives; normals and execution and costs of the power transmission lines.

Position in Denmark.

With regard to the consumption of electricity in Denmark, some 10 to 15 years hence, when, practically speaking, all lighting and motive power in the country should be supplied by electricity except railway traction, the consumption is put at about 500 000 000 kWh per annum, with a joint maximum of about 157 000 kW, that is a consumption time of about 3 200 hours. It would, however, hardly prove remunerative to base the installations upon the supposition that the entire requirements were being supplied from Norwegian power stations on account of the short time of consumption, but a portion, say, corresponding with a time of consumption of 6 500 hours could possibly with advantage be derived from Norway. This portion should amount to about 63 000 kW. Should the transmission of current from Norway commence before the lapse of 10 to 15 years, it will be advisable to reckon with a smaller amount of current, and the committee is of opinion that the first phase of installation, comprising the whole of Denmark, might suitably be based upon an amount equal to two-thirds of the last mentioned figure, that is, about 42 000 kW, delivered at five centres of consumption, of which 23 000 kW come upon the Copenhagen centre, under which come the rest of Sealand and the islands of Lolland and Falster. The different plans have been based upon these calculations, with certain modifications and alternatives.

Alternative Routes.

There are three routes along which electric energy can be transmitted from Norway to Denmark.

1. By submarine cables direct from Norway to Jutland under the Skaggerak and from Jutland on to the islands of Fuhnen and Sealand.

2. By air lines through Sweden and cables under the Kattegat, via the island of Lässö, to Jutland and from there to the islands of Fuhnen and Sealand.

3. By air lines through Sweden and cables or air lines respectively under or over the Sound to Sealand and from there to the island of Fuhnen and Jutland.

With reference to the first solution, it is pointed out that, as the depth of the Skaggerak is very considerable, as much as 600 m., and as the distance from coast to coast also is large for an installation of this nature, about 130 km. and as the sea as a rule is turbulent, the assembling on the spot of a fairly large number of short sections of cable must be considered out of the question. Consequently it will have to be one-conductor cables, as these can be obtained in one single or in any case in a few large lengths. The cables could be used either for alternate or direct current, but the committee is of opinion that the former must be abandoned on account of the many cross and parallel-running low voltage cables, partly also on account of the relatively low voltage, about 50 kV, to which with three-phase current one is limited with the present standpoint of cable technique. For a cable below the Skaggerak there is consequently only a question of using direct current.

As for the second alternative—a cable under the Kattegat—similar views prevail, although somewhat modified, and here, too, one-conductor cables and direct current have to be reckoned with. It is, however, evident that a cable of this description can only with advantage supply Jutland and the island of Fuhnen, and Sealand must be supplied via Helsingborg in Sweden. But even for the two first mentioned provinces a supply via Helsingborg will be preferable to transmission via Lässö inasmuch as the submarine cables will be shorter at the same time as the distribution system in Denmark will be simplified. The Lässö alternative therefore can be abandoned.

With regard to the third alternative, a cable under the Sound, such cable, according to experiences already made, can be constructed as well with one conductor as with three conductor cables. It may also be taken for granted that corresponding installations can be carried out under the Sounds and Belts within Denmark, and there is consequently the possibility here of using direct as well as alternating current. Investigations have also evidenced that the Sound, between Sweden and Denmark, can be compassed by an air line, which arrangement would confine the use of submarine cables to the connection between Sealand and Fuhnen and Jutland.

There thus remains four alternatives:—

(*a*) Direct current installation by cable under the Skaggerak.

(*b*) Direct current installation with air line through Sweden.

(*c*) Alternating current installation with air line through Sweden with cable under the Sound.

(*d*) Alternating current installation with air line through Sweden and air line across the Sound.

Plans and calculations have been prepared for all these alternatives, but space will not allow us to go into details.

Direct Current Transmission.

For the alternative (*a*) the electricity should be supplied by a power station in the south of Norway, constructed specially to supply high tension direct current of up to 2 × 110 kV voltage with earthed centre. This voltage is considered the highest which at present can be used in cables and plant. The power station should be placed about 50 miles from the Norwegian coast, where there is ample unexploited water power available. The cables should proceed from the Norwegian coast in the neighbourhood of Christiansand to the coast of Jutland near Bulbjerg.

The direct current lines in Norway would be built as air lines on iron poles with hanging insulators, similar to the alternate current lines (*c*) and (*d*), for 132 kV for all overland lines, both in Norway and Denmark. The cables under the Skaggerak, and eventually the Kattegat, would be one-conductor lead cables, with 16-20 mm. insulation. The single lines, both in the air lines and cables, would be 185 sq. mm. copper (for the air lines possibly with an equivalent section of steel-aluminium). In order to obtain convenient telephone connection between the power station in Norway and the transformer stations in Denmark a low current cable with four cores is proposed to be laid parallel with the cables under the Skaggerak.

The direct current system, with air line through Sweden (alternative (*b*)) is based upon the current being supplied from the State power station at the Nore falls, or some other similarly positioned power station in Norway, to be fitted with special generators for the production of high tension direct current. The transmission would take place through air lines in Sweden and Denmark and cables under the Sound, with a transformer station at Copenhagen for the 23 000 kW required for the area in question. Air lines across the Sound offer no advantage with direct current.

As regards alternative (*c*) (alternating current, air lines through Sweden, cables under the Sound) the special problem presents itself about corona loss, phase shifting, voltage regulation, etc., and normals and cost of transformer stations and transmission lines. The power station plans are the same as for alternative (*c*), with plant for 132 kV, 50 periods; the 132 kV

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is chosen because this has been fixed as normal for similar transmissions in Sweden. There will be a main transformer station at Helsingborg with transformers at 20 mVA and synchrone motors, etc., for regulating according to the different loads.

Alternative (*d*) varies from the previous by substituting air lines across the Sound instead of cables. The chief feature of this alternative is the arrangement for the air line across the Sound, which is effected by two trellis towers of 200 m. height above the level of the sea and a similar lower tower on the Danish side. This means two spans of 2 300 m. and one of 1 100 m. on the Swedish side.

The cost of the different alternatives, based upon phase iii of building, is calculated at

(*a*) 49 600 000 kr. Danish
(*b*) 56 400 000 ,, ,,
(*c*) 57 900 000 ,, ,,
(*d*) 60 600 000 ,, ,,

which comes out per kW year in Denmark at, respectively, 224, 240, 251 and 244 kr. Danish at the centres of consumption in Denmark.

In the matter of cost (*a*) is thus preferable, but there are, of course, other considerations. The Danish and Norwegian experts who have specially examined into the reliability of this system are of opinion that reliability can be effected, but as cable installations of this nature have never before been constructed, further exhaustive investigations should be undertaken before adopting this alternative. The technical difficulties at (*b*) alternative are less important, and this plan is not looked upon as presenting any difficulties in the matter of reliability, but compared with alternative (*c*) and (*d*) it has the drawback that it cannot be connected with the Swedish chief electric systems without incurring substantial additional cost.

As to alternatives (*c*) and (*d*) the committee is not aware that 50 kV three-phase cables, underground or submarine, have so far been installed or in any case subjected to an adequate practical test. Some uncertainty, therefore, prevails in recommending this system. The committee, however, has taken the view that considering the recent technical progress in the matter of cable construction, this scheme can be adopted. The committee has not yet considered it advisable to pronounce definitely in favour of either scheme.

The price for the electricity in Norway is calculated at 125 kr. Norwegian per kW year if derived from the Glommen Falls and 100 kr. per kW year from other power stations in question.

The B.E.A.M.A. Book.

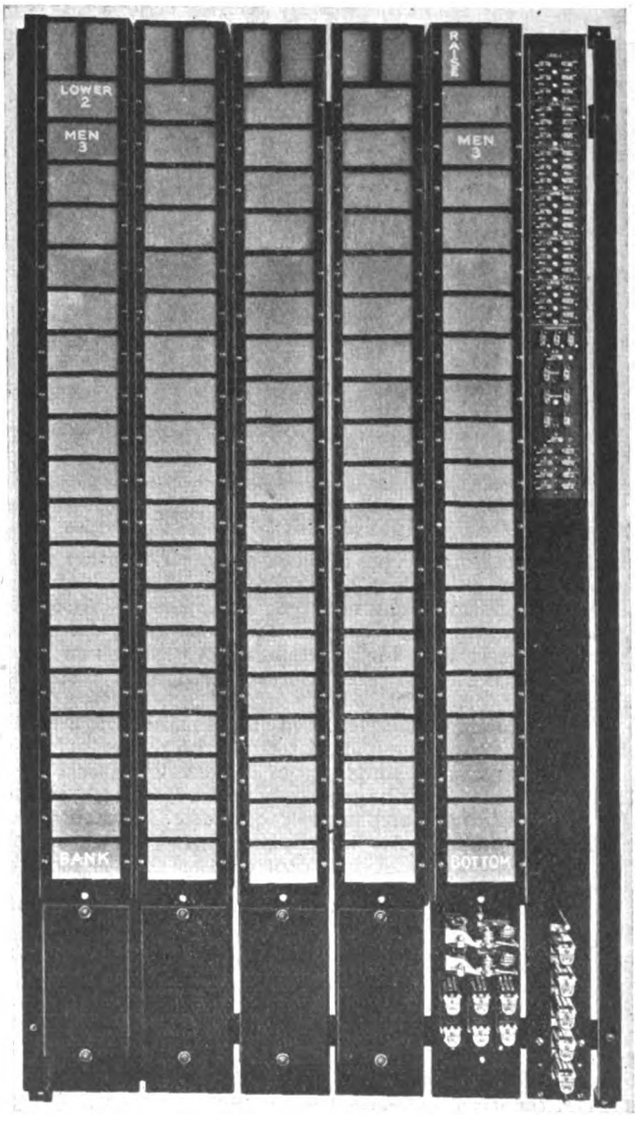
Advertising the Industry—A Tribute to Electrical Skill, Invention and Enterprise.

A VERY handsome booklet has been issued by the British Electrical and Allied Manufacturers' Association, with the entirely laudable intention of advertising their activities. A fundamental change has taken place in British industry and trade, and that change is essentially due to electrification. Hence the B.E.A.M.A. book, so that all may know the value of the contribution this body has made to the economic progress of Britain. All concerned are to be congratulated on a production which both in contents and typographically is worthy of the body issuing it. It contains an interesting record of B.E.A.M.A.'s progress since its establishment and shows that a skilled industry such as electrical engineering is a national asset. It rubs this in by giving illustrations of the products of B.E.A.M.A. firms and by describing how electricity can be used with advantage not only in industry but in the home. In conclusion, there is an impressive and so far as we can gather, a complete list of electricity's main applications.

B.E.A.M.A., it would be well to remind our readers, has four main objects: the creation of a central organisation for dealing with electrical problems, the establishment of a means of communication between sellers and buyers, the establishment of an organ for promoting trade abroad, and of an economic and technical intelligence service for the electrical and allied industries. In carrying out these activities attention has also been paid to research, standardisation and education, while the work done by the Association at Wembley and in organising the first World Power Conference should not lightly be forgotten. It is often complained that B.E.A.M.A. has surrounded its operations with an entirely unnecessary obscurity. May we hope that this new publication will form the opening of a new era?

A RECORD COLLIERY WINDING INDICATOR.

A COLLIERY winding signal indicator of record capacity has just been completed by Automatic Telephone Manufacturing Co. It is designed to register signals from five distinct levels including bank and bottom and provides for no less than 20 signals per level, or 100 in all. It has been manufactured to the order of the Lambton Hetton and Joicey Collieries, Durham, and will shortly be installed in the winding engine room of the Silksworth Colliery. This makes the fifth A.T.M. winding signal indicator to be supplied to this well-known colliery group.



A.T.M. 5 level, 20 signal colliery winding signal indicator.

As the illustration shows the indicator is designed and constructed on the standard A.T.M. luminous screen principle, the opaque glass panels being normally blank, and the individual orders and numerals standing out in luminous stencil. The 20 panels for each level are arranged vertically as shown, the only mechanism being housed under the rectangular cover seen below each section.

Cancellation of the signals is effected by a small dynamo driven by the winding engine, and is controlled by a common group of five relays. The usual A.T.M. practice is followed in arranging for cancellation of "action" signals at the commencement, and warning "men" signals at the conclusion of a wind. The vitally important indication that men are riding is thus maintained in full view of the winder during the whole time the engine is in motion.

Moreover, should the warning "3" be sent during a wind, the "men" signal will remain displayed throughout the succeeding wind instead of cancelling with the stoppage of the engine as would otherwise be the case.

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A NEW PHASE ADVANCER.

Metropolitan-Vickers Machine for Power Factor Correction—Some Important New Features—Automatic Control.

THE increasing practice of supplying electricity at charges depending on the power factor of installations has caused great attention to be paid by users of electricity to the questions of power factor improvement. An important addition to the equipment available for power factor correction is a phase advancer of new design which has been developed by the Metropolitan-Vickers Electrical Co. The new machine represents a notable advance in apparatus for this purpose, in that it is claimed to have many operating characteristics un-

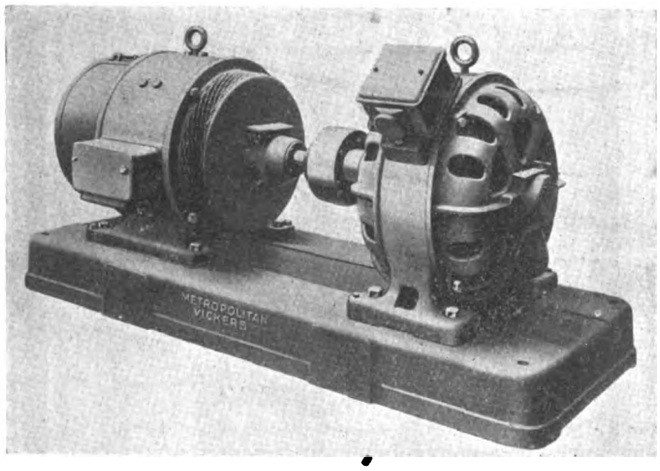

Fig. 1.—Separately driven phase advancer.

obtainable with other types of phase advancer, together with a simplicity and robustness of construction that make for low initial cost and minimum maintenance expenses. Assembled phase advancers direct coupled and separately driven are shown in Fig. 1 and Fig. 2 respectively. The new phase advancer possesses, we are informed, important distinctive features.

It's construction is simple. Only three main parts are used, consisting of stator, rotor, and a 3-arm brush rocker, achieving a notable advance in simplicity of construction (see Fig. 3). The low generated voltage (rarely exceeding 25 V) of the phase advancer, ensures almost complete immunity from insulation troubles. An interlocked three-pole throw-over switch is the only additional control gear that is required, but, in some cases, even this may be dispensed with.

The Metrovick phase advancer has, it is claimed, the advantage over other types that it can be supplied to produce either unity or any desired leading power factor at full load. At light loads, instead of the compensation falling off, as with some alternative devices for power factor correction, the main motor can be made to draw a considerable leading kVA to compensate for lagging kVA in the system. In most cases, particularly where the required power factor correction is small, the overall efficiency will be improved. In all other cases, the loss in efficiency will be practically negligible. This is particularly important as some existing methods of power correction involve a serious loss in efficiency.

The phase advancer enables the motor to deal with greater instantaneous overloads, e.g., an instantaneous overload capacity of 100 per cent. would be increased to 150 to 175 per cent.

The phase advancer also reduces the slip of the motor, i.e., the difference between full load and no load speeds, a characteristic in which it differs from other types of phase advancer.

In principle, the machine is based on the phase advancer designed for the Metropolitan-Vickers Company by Prof. Miles Walker, about 16 years ago, but important improvements have made possible a greatly simplified construction, resulting in lower first cost and maintenance expenses, greater reliability, and better operating characteristics. In its latest form, the Metropolitan-Vickers phase advancer is a simple alternating current exciter similar to the direct current exciter which is connected in the rotor circuit of a synchronous induction motor. It differs from the usual direct current exciter, however, in that it has a series connected instead of a shunt field winding. The series field arrangement gives the phase advancer a self-regulating characteristic, so that the voltage generated by the exciter increases with increase of load on the main motor. The current circulating in the phase advancer circuit is produced by the resultant of two voltages; the e.m.f. produced by the conductors on the rotor of the main motor slipping back through the rotating field and the e.m.f. generated in the armature of the phase advancer. The arrangement of the circuit is such that these two e.m.f.'s assist one another. If the load on the main motor increases, the slip becomes greater, the e.m.f. due to slip increases, and thus also the resultant e.m.f. in the circuit is increased. This causes a corresponding increase in the current circulating, which, since the phase advancer is wound with a series field, results in an increase in the voltage generated by this machine. These two voltages rise until a current circulates with sufficient power competent to produce the required torque in the main motor, the phase advancer being so designed that this current is automatically produced with the desired amount of phase compensation.

On systems where a new motor is to be installed, the phase advancer is most conveniently arranged on a common bedplate directly coupled to the motor as shown in Fig. 2. For use with existing motors phase advancers can be driven by a small auxiliary motor as shown in Fig. 1, or arranged for belt or chain drive from the existing motor or from a convenient line shaft if available.

The amount of power factor compensation is varied by rocking the phase advancer brushgear. The position of the brushes for which any phase advancer has been designed is marked clearly on the machine as also are the limits between which the brushgear may be moved to vary the amount of compensation. Cable connections consist simply of three leads from the phase advancer brushes to the main motor slip rings.

It is important for the consumer considering power factor correction to obtain the best return for his outlay. The phase advancer shows to the greatest advantage over other means of obtaining power factor correction (such as synchronous or synchronous induction motors) where only a moderate degree of correction is required, that is to say, where the motor considered requires correcting to unity or 0·95 lagging power factor. The field of application of the phase advancer includes:

(*a*) Power factor improvement on existing plant where extensions are not contemplated,

(*b*) Power factor improvement on new plant or where extensions are being made.

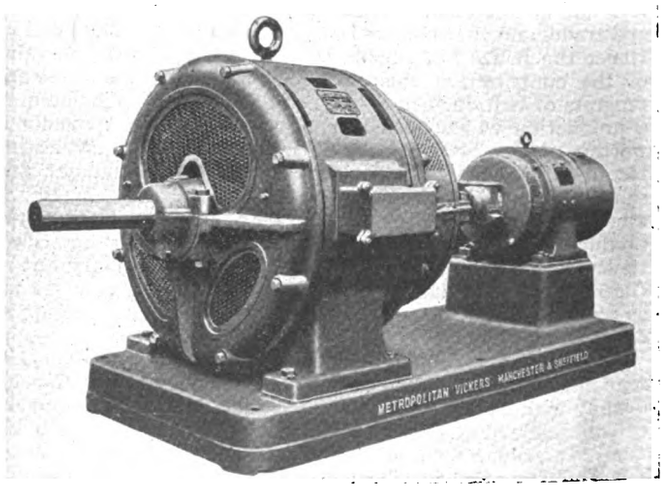

Fig. 2.—Phase advancer directly coupled to a 180 h.p. slip ring induction motor.

Under condition (*a*) the installation of a separately driven phase advancer will, in most cases, be found the most effective and economical solution, provided that one or more motors of at least 35 to 40 H.P. are available for compensation. Where there are no existing motors of sufficient individual capacity,

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a favourable case can usually be made out for the use of static condensers.

Under condition (*b*) the phase advancer used in conjunction with an induction motor shares the field of economical application with the salient pole synchronous motor and the synchronous induction motor, depending largely upon the

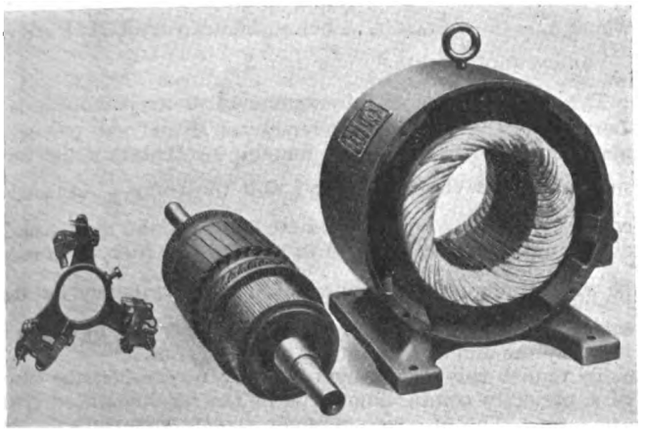
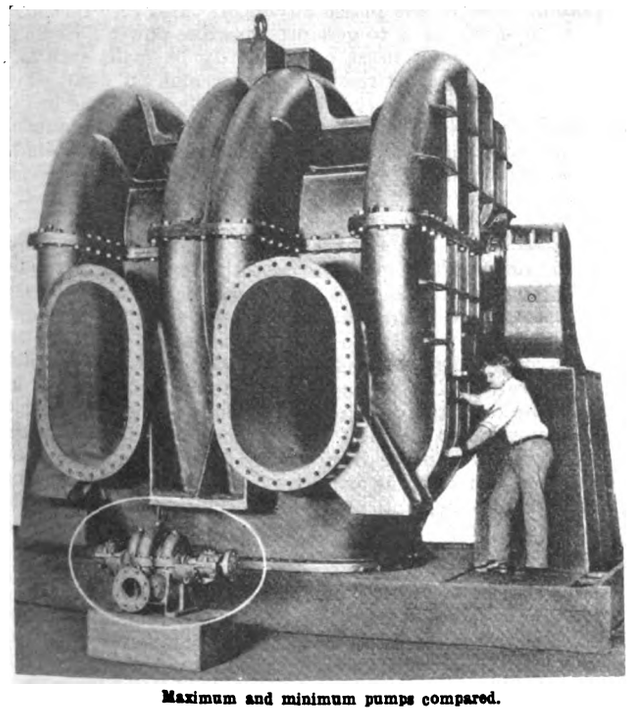


Fig. 3.—Component parts of the Metrovick phase advancer.

degree of compensation required. With medium-sized units, e.g., between 40 H.P. and 300 H.P., the use of phase advancers will, in many cases, give the necessary compensation at lowest cost.

Maximum and Minimum Pumps.

THE very large power station which has been built by the Philadelphia Electric Co. at Port Richmond, Pennsylvania, obviously required machinery of appropriate size. Accordingly when the problem arose of supplying the water to condense steam for the huge turbines, it was necessary to design and construct condensers and pumps of a size larger than anything known before. The illustration shows one of the two pumps attached to the steam condenser which was



Maximum and minimum pumps compared.

designed and built by Westinghouse Electrical Manufacturing Co.'s engineers. This pump has a capacity of 80 000 gall. per min., or on a twenty-four hours' operating basis, 115 200 000 gall. By way of comparison it may be mentioned Philadelphia's daily water consumption is approximately 300 000 000 gall. The unit weighs approximately 100 000 lb., is 16 ft. long, 15 ft. high and 13 ft. wide. A standard size 750 gall. pump is illustrated in the foreground for comparison.

CORRESPONDENCE.

INDUSTRIAL ELECTRIC HEATING.

[To the Editor.]

SIR,—I am pleased to note that you propose to open your columns for any matters of interest in connection with electrical heating, and I have read with interest Mr. Monkhouse's valuable contribution in your issue of the 16th inst. I heartily endorse everything he has said and trust that he will find many co-operators in his endeavour to broadcast the fullest information regarding progress in this most important development.

I understand that Mr. Purse, of West Ham, is endeavouring to organise periodical meetings between sales engineers of undertakings in Greater London Area, at which these matters will be discussed, and if other districts throughout the country will do likewise, there is no reason why the National Electric Heating Association advocated by Mr. Monkhouse should not come into being.

Before great progress can be made the electrical engineer must recognise that he has a by-product to sell and the manufacturer must recognise that he has to apply a totally different form of heat than any other known to-day. It is useless for a manufacturer to produce any appliances for utilising electrical heat if the engineer cannot formulate a system of charging which would enable the consumer to put any such appliance into use. Concentration of thought by both electrical engineers and manufacturers has, in the past, been centred on the utilisation of radiant heat, in competition with coal and gas, which simply cannot be done. This has put a lever in the hands of the gas engineers in advocating the sale of their commodity; but in electricity we have a form of heat which can be applied under certain conditions at a much greater efficiency than either coal or gas. The gas people trade upon the fact that electricity can only be produced in the most modern practice at about 20 per cent. of the heat value of coal, but who knows what is the efficiency of application of coal or gas heat? I venture to state that what electricity loses in generation it gains in application; therefore the utmost consideration must be given by electrical engineers to the transmission of electrical heat at high efficiencies.

What I have in mind is the inefficiencies of existing types of radiators and boiling plates. Here we have in the past endeavoured to follow on the lines of gas heating as also in the type of electric ovens. The material proof of efficiency is in the cost, and to run a three kilowatt radiator in a living room for 16 hours per day, or in an office for 8 hours per day, would, even at the low rate of one halfpenny per unit, cost 2s. and 1s. per day respectively, which is prohibitive, when compared with cost of coal. But the electric radiator has a very poor load factor; it imposes itself on top of the peak and is only used during periods when the station does not want it. If used continuously for eight hours per day during four winter months it could not yield more than 7½ per cent. load factor, or 25 per cent. less than the load factor of ordinary lighting; therefore, to make the supply pay, the maximum lighting rate should be charged, which, as I have shown, would be out of the question. It is fairly obvious that the only load worth cultivating by the use of radiators is to instal them in rooms for occasional use where the diversity of the supply would render it practical to charge a low rate.

My object in drawing the attention of supply engineers and manufacturers to the limitations of this class of heating load is to pave the way for concentration of thought upon the immense field open to us for industrial heating, and I trust that other engineers will contribute their experiences in this direction.—I am, etc.,

J. HORACE BOWDEN.

Poplar.
July 20th.

AMERICA THROUGH ENGLISH EYES.

[To the Editor.]

SIR,—The concluding sentence in Col. Crompton's article on p. 622 of your issue of June 18, 1926, entitled "America Through English Eyes," is calculated to convey an erroneous impression, and one not in accordance with the facts. It certainly calls for correction. The sentence is: "A good deal yet requires to be done, but the work, which I believe was orignally started by Prof. Comfort Adam, and has been carried out by Dr. Elihu Thomson and those working with him in the research laboratories at Lynn, is undoubtedly so remarkable that it alone justified our expedition."

We, ourselves, to whom the recent improvements in arc

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welding carried out by the Thomson Research Laboratory of the General Electric Co. are due, had no suggestions or inspiration for the work from Prof. Adams. He did not know what we were doing, and did not visit the laboratory during its progress. The work here at Lynn was entirely independent of the very valuable work with atomic hydrogen carried on by Dr. Langmuir, of the Schenectady Research Laboratory.

Prof. Adams has, indeed, been much interested in the art of arc welding as practised hitherto, and was to a great extent responsible for the organisation of the American Welding Society, which includes all forms of welding—electric, gas, thermit, etc.—but our work is a decided departure from, and a great advance upon former known methods.—We are, etc.,

ELIHU THOMSON.
PETER ALEXANDER.

Lynn, Mass., U.S.A.
July 7th, 1926.

ESPERANTO AND TECHNICAL LITERATURE.

[TO THE EDITOR.]

SIR,—My Press cuttings agency has forwarded me a cutting from your issue of July 9th headed "Esperanto and Technical Literature." I have not seen Mr. Southern's letter referred to.

I quite agree that the question of an international language and the metric system are entirely distinct. One may be in favour of one and not of the other. I may be old-fashioned, but I, for example, think the duodecimal system infinitely preferable to the decimal.

As regards the suitability of Esperanto as a medium of translation, I agree with you also that no classical masterpiece will retain, even in Esperanto translations, all its beauties, any more than it would if translated into English or any other language. I do, however, honestly believe that Esperanto is a language of very high literary value, and as a medium for the expression of exact thought and for the reproduction of the precise meaning of the original, it has no equal, even in the national tongues. This is a statement which, of course, can only be verified by personal investigation. I understand, however, that the question under consideration by the Technical Press Congress was simply that for mutual convenience it would be well if the world's technical Press could print in each issue a short abstract of the main things of general interest contained in that issue. For example, "Experimental Wireless" is now printing in each issue an Esperanto summary of its chief contents, and a Hungarian radio paper is doing the same. The Editor of "E.W." does not know Hungarian, and you can see that this kind of thing would be very helpful for the pooling of knowledge in these days of technical magazines printed in all the languages of the world.

As to the word *artificial* as applied to Esperanto, much depends upon what is meant by this word. Almost every convenience and invention of modern life, including the use of electricity, can be termed *artificial*, but in practice Esperanto is as much a natural language as a national language on the lips of those that use it.

It is in constant use in daily life by people of all ages from young children upwards, in all walks of life. In my own home, for example, it is the language of the family, and to say that "it is not a vehicle of thought" sounds rather curious in the ears of those who are using it as such every day of their lives. —I am, etc.,

MONTAGU C. BUTLER.
Secretary, British Esperanto Association.

NOTES ON WIRELESS MATTERS

[TO THE EDITOR.]

SIR,—I regret that, owing to my absence abroad, I was unable to correct the proof of my article in your issue of July 9th, 1926, and that in consequence formula (*d*) on page 43 has suffered a little in the hands of the sorely tried type-setter.

The index of ε should have a minus sign prefixed; and the fractions $\frac{1}{4}$ and $\frac{1}{3}$ should be powers (not multipliers) of λ. The formula, therefore, should be

$$F = 5{\cdot}36 \times 10^2 \cdot \frac{h\,I}{\lambda^{\frac{1}{4}}} \cdot \frac{\varepsilon^{-23{\cdot}9\,\theta}}{(\sin\theta)^{\frac{1}{3}}}$$

—I am, etc.,
L. B. TURNER.

Cambridge,
July 16th, 1926.

[TO THE EDITOR.]

SIR,—May I be allowed to point out that the formula (*b*) given by Mr. L. B. Turner in his "Notes on Wireless Matters" in your issue of July 9th, 1926, is incorrect. The main outlines of the correct solution involving multiple reflections between the upper and lower surfaces is given in a letter to "Nature" by the writer (April 4th, 1925, vol. 115, page 496) where it is shown that the e.m.f. consists of terms of the form:

$$E\,v/_{cm} = \frac{120\,\pi\,h\,I\sqrt{1-\beta^2_m}}{2\,H\sqrt{\lambda r}} \cos\left(\frac{2\pi}{\lambda} r\sqrt{1-\beta^2_m} - pt + \pi/_4\right)$$

where $\beta_m = (S-m)\,\lambda/2H$, S being the nearest integer less than $\frac{2H}{\lambda}$ and m another integer less than S.

The characteristic of this expression as compared with Mr. Turner's is that it varies inversely as H and not $\sqrt{H}$ as in his formula. At this point I imagine Mr. Turner feeling very superior and saying to himself that the factor $\frac{1}{H}$ cannot be correct, for if the energy radiated is constant (as assumed) and is uniformly distributed in the shell at P say, E^2H must be a constant and E vary as $\frac{1}{\sqrt{H}}$. Unfortunately for this argument the power radiated is not independent of H, and it is partly the aim of this note to point this out.

To realise this it is only necessary to consider the effect of a perfectly conducting earth in the neighbourhood of an oscillator. The presence of such a conducting earth doubles the radiation (for a given current) in a Hertzian oscillator placed close to it, and in the same manner the presence of a perfectly conducting upper layer increases the radiation so that E^2H varies as $\frac{1}{H}$ and E is therefore proportional to $\frac{1}{H}$.

I may mention that the results above were obtained by two entirely different methods, and there is therefore reason to expect that they are substantially correct.—I am, etc.,

T. L. ECKERSLEY,
Research Department,
Marconi's Wireless Telegraph Co.

Chelmsford.
July 12th.

Polyphase Commutator Apparatus.

Case 6.—The Phase Advancer.

(*Concluded from page* 93.)

Coming now to the phase advancer. The very function of the phase advancer is to generate reactive power. Hence the brush position may most conveniently be made such as to enable it to generate reactive power and no mean power, that is, the brushes may be placed at one extreme limiting position of the self-exciting range. Under these circumstances it is known as the Scherbius phase advancer, and its operation is perfectly satisfactory and has been described in a previous article in this series (December 19th, 1924). It is shown in Fig. 16 (June 26th, 1925).

If, however, an attempt is made to place the brushes so that the machine can generate mean power as well as reactive power and regulate the slip as well as the power factor, then it is practically certain that hunting will take place, since the phase advancer now has a natural frequency of its own and will generate current of that frequency which is very little affected by the slip of the main machine. This natural frequency can only agree with the frequency of the main machine for one particular value of the slip and for all others hunting will take place. Since both the natural and impressed frequencies of the machine are extremely low inductive couplings are unsatisfactory, and there is no solution to the difficulty except that of placing the brushes in such a position that mean power cannot be generated.

Case 7.—The Frequency Converter.

In certain cases speed regulation in large induction motors is effected by connecting a frequency converter in cascade with the slip ring circuit instead of a shunt polyphase generator, such as that already described. Such a frequency converter is obtained if to the armature of the polyphase commutator generator are connected a number of slip rings to which current is led from the line through suitable transformers. Such apparatus can also hunt unless a precaution is taken similar to that already described, namely, that of adjusting the brushes in a position such that any self-excited current would be either continuous or of very low frequency, and then coupling the armature and the field only through transformers.

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NEWS IN BRIEF.

World's Largest Electric Winder—Greyhounds to Chase Electrically-propelled Hares—Success of the "Taxiphone"—Electric Steaming Irons.

IN Stockholm there is a telephone for every four inhabitants.

Mr. G. S. Francis addressed Scarborough Rotary Club on "Electricity as a Vital Factor in National Economy."

Mr. M. H. Greenhalgh, electrical contractor, of Market Street, Church, is a new member of Accrington Chamber of Trade.

Eight electric cranes, each capable of dealing with 250 tons an hour are being provided for the Gas Light and Coke Co.'s new coal-handling plant.

Farms are being electrified in the U.S.A. at the rate of over 1 000 each month, states the Pennsylvania Public Service Information Committee.

According to the "Calcutta Statesman" the Government of Burma intends to consider a dual scheme for water and electricity supply for Rangoon.

Of 101 000 000 000 kWh generated in 1924 by 43 great nations the U.S.A. produced 54 000 000 000 kWh, or more than all the other nations combined.

Misuse of the electric pressing iron is responsible for nearly 50 per cent. of all fires of electrical origin, states the "Bulletin" of the Hydro-electric Commission of Ontario.

What will be the world's largest electric winder is being constructed in Manchester for a South African gold mine. The winding speed will be 3 707 feet per minute.

A race-course for greyhounds, on which the dogs chase an electrically-operated dummy hare with a maximum speed of 60 miles per hour, is to be opened at Manchester to-morrow (Saturday).

London County Council is recommended to agree to the giving of a guarantee in respect of the payment of interest on £1 000 000 to be borrowed by the London and Home Counties Joint Electricity Authority.

On the Eastern Bengal Railway each carriage has four exterior electric lamps, which are lighted automatically when the train stops, and continue to burn until the train re-starts and exceeds the speed of eight miles per hour.

It is reported by the "Times of India," that a scheme formulated by Mr. S. Deb, of Bengal Potteries, Ltd., for the manufacture of electrical insulators in Bihar, with the china clay resources available in the province, is receiving consideration.

A fire last week at the premises of James Brothers, electrical contractors, 13, Maryport Street, Devizes, was speedily put out, but a number of celluloid accumulator cases was destroyed. The damage, mostly caused by water, is covered by insurance.

Organised by the Women's Engineering Society, the fourth annual Conference of Women Engineers will be held at Leeds University from September 3rd to 6th. Particulars are to be had from Miss C. Haslett, 26, George Street, Hanover Square, London, W.1.

Under the auspices of the Reading Chamber of Commerce, a debate will take place to-day (Friday) between Sir Philip Dawson, M.P., and Mr. F. A. Macquisten, K.C., M.P., on the Electricity (Supply) Bill, 1926. The former will support the Bill, and the latter will oppose it.

Claiming to be empowered to place orders to the extent of about £2 500 000 for electrical equipment for ten central stations in the Union of Soviet Socialist Republics a commission has arrived in this country from Russia. It appears doubtful whether British firms could give the special credit facilities asked for.

"One way" telephones to cab ranks in Liverpool have proved such a convenience to the public that they are now to be installed in Birkenhead on the opposite side of the Mersey. All telephone subscribers are to be provided with a printed list, with call numbers, of ranks at which the "taxiphones" are installed.

In his presidential address to the Society of Chemical Industry on Tuesday, Mr. W. J. U. Woolcock said they would very much like to be associated with the electrical engineers. "I should," he said, "be very willing to approach and ask them for their co-operation, particularly with regard to our fuel policy, and I have every hope that if such a 'gesture' was made, it would receive a most friendly response."

Chesterfield and Staveley telephone exchanges will be converted to automatic working in September.

Electric fans for intermediate and third class railway carriages are proposed for the East Indian Railway.

Dunvegan Castle, Skye, which is nearly 1 000 years old, has just had an electrical installation put in for the first time.

In a new 22 000-ton liner now building in an American yard there are 325 telephones. Two loud-speaking telephone systems are also included.

The agreed E.C.A.—I.M.E.A. municipal trading clause has been rejected by the House of Commons Committee on the Electricity (Supply) Bill. (See page 104).

At the end of 1925 there were 434 494 telephones installed in Sweden, and the number of broadcasting licences in force at the end of June last was about 200 000.

Electric steaming irons, with a water reservoir, and tiny holes in the ironing surface for the emergence of steam are now being produced in America. It is claimed that this device obviates the need for damping clothes before ironing.

A reminder that space in the next British Industries Fair, at which a specially large show of electrical goods is expected, can be guaranteed only to those applying by the end of next week has been sent out by the Department of Overseas Trade.

Poplar (London) electricity showroom sales last year resulted in a net deficit of £319 11s., compared with a surplus of £358 13s. 1d. in the previous year, a decrease of £678 4s. 1d., which is attributed to the opening of the new Bow Road showrooms.

The Institution of Heating and Ventilating Engineers has been registered as a company limited by guarantee, the word "limited" being omitted from the title by licence of the Board of Trade. The registered office is at 38, Victoria Street, London, S.W.1.

There were 1 016 million telephone calls on the Post Office telephone service for the past financial year. This is an increase of 87 millions, or 9·4 per cent. over the previous year's total, and it marks the first occasion on which the total has exceeded 1 000 millions.

Mr. G. N. Taylor, Controller of P.O. Telephones in Edinburgh, addressed the members of the Edinburgh Rotary Club on "The Automatic Telephone System." The system, he said, was being installed this year in Edinburgh, with 14 000 subscribers connected to four exchanges.

It is reported that the application of an American group of copper producers for permission to form an export corporation has been postponed until September, as the Federal Trade Commission think such a combination might lead to an increase in world prices which would involve American consumers.

Whitworth Society.

Third Summer Meeting includes Visits to Manchester District Works.

THE third summer meeting of the Whitworth Society was held in Manchester on July 14th, when, by the courtesy of Mr. Chas. Day (Mirrlees, Bickerton and Day, Ltd., Stockport) about 40 members were conveyed by motor coach to the works, there inspected the construction of various types of Diesel engines, took lunch in the canteen, and were afterwards motored to the Openshaw works of Sir W. G. Armstrong Whitworth and Co., Ltd., where a party, over 50 in number, was welcomed by Mr. C. G. Falkner, the local secretary. They were shown round the works, took tea in the canteen and returned to Manchester.

In the evening, the President, Mr. Wm. Sisson, of Gloucester, received 44 members at the Engineers' Club, Albert Square, Manchester, where they dined together. Dr. F. P. Purvis, the president-elect, was unable to be present through ill-health but his address was read from the chair. The roll of the society now contains 497 names, and full particulars may be obtained from the hon. secretary, Whitworth Society, c.o. The Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W.1.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

MR. H. C. Ludgate has been appointed general manager of the Morecambe Corporation Tramways.

Mr. A. Cartwright has been appointed a director of Vickers, Ltd., and Mr. G. G. Sim has been appointed secretary of that company.

Mr. Alfred E. Terry, director of Herbert Terry and Sons, Ltd., Redditch, is now making satisfactory progress following a serious operation.

Mr. S. S. Southwood, who won the Stephens Cup presented by the Richmond Rifle Club, was formerly employed by the Oxford Electric Co.

The late Mr. James Henry Howell, a director of the Bristol Tramways, the Imperial Tramways and other companies, left £40 937; net personalty £36 342.

Mr. G. Patchin, head of the metallurgy department of the Sir John Cass Technical Institute, has been appointed Principal, in place of Dr. C. A. Keane, who has resigned.

Mr. T. G. Richardson, who has been for six years general manager of West Hartlepool Corporation Tramways, has been appointed manager to the Rhondda Valley Tramways Co.

The late Baron Stuart of Wortley, deputy chairman of the City and South London Railway Co. and the London and Suburban Traction Co., Ltd., left net personalty £32 639.

Mr. N. H. Clough, a member of the staff of the Marconi Scientific Instrument Co., Ltd., was married, at Cleckheaton, to Miss A. B. Hayes, only child of Mr. G. W. Hayes, of Cleckheaton.

Birmingham Corporation has decided that the services of Mr. A. Baker, general manager of the Tramways Department, be continued after August 4th next, when he attains the age of 65 years.

Sir Timothy Coghlan, Agent-General in London for New South Wales and a director of the West India and Panama Telegraph Co., left property in England valued at £1 420; net personalty £239.

Engineer Vice-Admiral Sir Robert B. Dixon, the Engineer-in-Chief of the Fleet, has accepted the presidency of the Junior Institution of Engineers in succession to Mr. J. S. Highfield, as from December next.

Mr. H. G. Wright, engineer and manager of the Cleveland Trust Electricity Works, Saltburn-by-the-Sea, has been appointed electrical engineer to the Aldershot Gas, Water and District Lighting Co.

Mr. M. Love, electrical contractor, of Wokingham Road, Reading, has been appointed hon. secretary of the Reading and District Wednesday Football League and the Reading and District Minor Cup Competition.

Tonbridge U.D.C. has increased the salary of Mr. M. P. Plunkett, the electrical engineer, from £560 to £640 per annum and that of the mains superintendent from £255 to £275 per annum, with a further increase to £300 on July 1st, 1927.

Mr. A. M. Jacobs, Electricity Commissioner for the Union of South Africa, is paying a fairly extensive visit to this country. During his stay here his address will be c/o International Combustion, Ltd., Africa House, Kingsway, London, W.C.2.

Mr. J. B. Dow, who was appointed early last year assistant secretary, has been promoted to the position of accountant to the Birmingham Electric Supply Department rendered vacant by the retirement on superannuation of Mr. F. H. de Lattre.

Mr. Price White, engineer and manager of the Bangor Electricity and Gas Departments, is to have his salary increased from £450 to £550 per annum with a second increment of £25 twelve months hence and a third increment of £25 two years hence.

Hackney (London) Borough Council is recommended by the Establishment and General Purposes Committee to transfer Mr. J. F. Heathman (chief clerk at the Electricity Demonstration Hall and Offices) to a position at the Electricity Works, at the maximum salary of Class 2 of the Council's scale.

Dr. W. E. Curtis has been appointed professor of physics and director of the physics department at Armstrong College, Newcastle, in succession to Prof. Henry Stroud, who is retiring. At present reader in physics in King's College, London, Dr. Curtis was for some time a lecturer in physics at the University of Sheffield.

Members of the Institute of Transport who have been elected to the Council for 1926–27, include Sir E. W. Moir, Sir Philip Dawson, M.P., and Messrs. C. R. Byrom, Stenson Cooke, George Ellson, J. H. Estill, S. E. Garcke, W. G. P. Maclure, and E. S. Shrapnell-Smith. Mr. H. Wheeler, an associate member, has also been elected to the Council.

The resignation of Mr. T. G. Richardson of the managership of the West Hartlepool tramways, was received by the T.C. on Monday, when Mr. J. H. Parker, the borough electrical engineer, was appointed, for an experimental period of 12 months, to act also as manager of the Tramways Department at an additional salary of £150 per annum.

Mr. F. H. de Lattre is retiring at the end of the month from the position of accountant to the Birmingham Electric Supply Department, after thirty-four years' service in that capacity. He was one of the officials transferred to the service of the Corporation in 1900, when the undertaking was acquired from the Birmingham Electric Supply Co. Ltd.

In the will of Mr. E. A. Graham, the former head of Alfred Graham and Co., is a bequest of £10 000 to Miss D. K. Hearn, "for her long and loyal services in the capacity of private secretary." Miss Hearn has been with the company some thirteen years during which time she worked her way up from the bottom. Besides her administrative and secretarial duties she assisted Mr. Graham in his research work. Mr. Graham left £140 536; net personalty £105 911.

Electricity Tariffs.

Reductions in Charges for Current Notified in Many Districts.

THE following reductions in electricity charges have been notified:—

BARNSLEY.—Residential two-rate tariff ¾d. per kWh instead of 1d.; weekly charge on council houses 9d., instead of 1s., plus ¾d. instead of 1d., per kWh. CAERPHILLY.—7d. per kWh lighting, 3½d. power. CHELMSFORD (Electricity Supply Corporation).—Lighting 9d., less ½d. discount. DONCASTER.—Lighting, 4½d., instead of 5½d., per kWh in summer; 5½d. in winter, with rebate of 1d. per kW on equivalent number of kWh used in summer; signs and shop windows, 2d., instead of 2¾d., per kWh; prepayment meters, 5½d., instead of 6½d.; domestic supplies, 12½ p.c., instead of 15 p.c., on net rateable value plus ¾d. per kWh in summer and 1d. in winter. DUNDEE.—Lighting, 5d., instead of 5¼d.; power, 2¾d., instead of 3d. GILLINGHAM.—Heating, cooking and domestic purposes, 1d. per kWh for first 100 kWh per quarter, 1d. beyond. GLOUCESTER.—Lighting, first 500 kWh per quarter, 6d. per kWh, next 1 000, 5d.; next 8 500, 4d.; beyond, 2d. ISLINGTON (LONDON).—Factories using electricity for lighting 75 p.c. of premises to be charged for power (if electric power only is used) at existing power rates and for lighting between 2 p.m. and 7.30 p.m. the ordinary lighting rate, and from 7.30 p.m. to 2 p.m. 2d. per kWh, plus 10s. per quarter meter rent. LLANDILO.—8d. per kWh, instead of 10d. PORTSMOUTH.—Public lighting, side street lamps £4 5s., instead of £4 10s. per lamp per annum; 300 W lamps £13, instead of £13 12s.; 400 W lamps £15 5s., instead of £16 5s.; 600 W lamps £19 5s., instead of £20 10s. PRESTON.—To poultry farms, 1 000 kWh per quarter, 2d. per kWh; beyond, 1¼d., 5 per cent. discount. SLAITHWAITE.—Flat rate 6d., instead of 7d.; domestic rate 15s. per room per annum, plus 1d. per kWh, instead of 2d. WORTHING.—Lighting 6d., instead of 6¼d., with discount 5 p.c. on total consumption of 1 000 kWh per annum and 10 p.c. on consumption in excess of 5 000 kWh per annum; power and heating, 1¼d. per kWh flat rate, instead of scale varying from 2¼d. to 1¾d.

I.M.E.A. Council.

Election of Members Representing Large and Small Undertakings.

AS the result of the I.M.E.A. annual ballot for 1926, the following have been elected to the Council:—

REPRESENTING LARGE UNDERTAKINGS: A. W. Barham (Watford); C. G. Morley New (Cardiff); Col. W. A. Vignoles (Grimsby); W. J. H. Wood (Bolton). REPRESENTING SMALL UNDERTAKINGS: G. Porter (Worthing). COMMITTEE REPRESENTATIVES: Ald. W. T. Dagnall (Manchester); Col. A. Sinclair (Swansea).

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TRADE PUBLICATIONS.

Details of Catalogues and Dealer-Helps Issued by Manufacturers.

A STRIKING showcard illustrating the Mullard master valve suspended in space and surrounded by flying fays and elves is to hand. The card is of moderate size and it can be obtained from the Mullard Radio Valve Co., Ltd., 45, Nightingale Lane, Balham, London, S.W.12.

A newly issued "C.T.S." catalogue is to hand from the St. Helens Cable and Rubber Co., Ltd., Slough. Areas, dielectric and radial thickness, weights and prices of single, twin, three and four core cables are given, and the company's electric vulcaniser is also described and illustrated.

The English Electric Co., Ltd., Queen's House, Kingsway, London, W.C.2, has produced technical guide No. 1 510A, entitled "Small Induction Motors Class PWR, for driving textile machinery, etc." Illustrations of the machines for different applications, and particulars of their design are given.

One of the large mailing cards sent out by the City Electrical Co., Emerald Street, Theobald's Road, London, W.C.1, bears an illustration of a complete vehicle battery charging plant (two-phase to 140 kW, 90/110 V) installed at Selfridge's in 1921. It is stated that the only replacements have been 18 carbon brushes.

The pocket guide for the electrical trade (List 6 241), issued by Baxendale and Co., Ltd., Miller Street, Manchester, is to hand. It contains illustrations, prices and other details of a wide range of adaptors, woodblocks, ceiling roses, cut-outs, casing, conduits, flexible cords, fuse wires and boards, lamp-holders, switches, wires and cables, etc.

Claritone loudspeakers and headphones are described and illustrated in booklet No. 71, published by the Automatic Telephone Manufacturing Co., Ltd., Milton Road, Edge Lane, Liverpool. The "Kitten" design appears on the cover of the booklet and also on a new small and attractive showcard, both of which can be obtained on application.

The Zenith Manufacturing Co., Villiers Road, Willesden Green, London, N.W.2, send us their new catalogue (section 1) of regulating resistances, Zenite units and small transformers. A speciality explained in the book is graded windings with adjustable sliding resistances. These windings can be so arranged that as the slider is moved to diminish the ohmic value the portion of the winding remaining in circuit increases in section proportional to the increase in current. Dimensions and prices of tubular and slate resistances and hints on the choice of resistances for particular purposes are also included in the book.

POINTS OF VIEW.

Interesting Pronouncements on a Variety of Topical Electrical Subjects.

INDUSTRY first must be the battle-cry of our country and of our people.—*Sir Ernest Petter.*

* * *

You are not going to build an electrical civilisation on the steam age mind.—*Mr. G. F. Francis.*

* * *

Whatever superiority electricity may have for domestic services, the cost must be competitive.—*Prof. S. Parker Smith.*

* * *

We are getting appreciably nearer the time when the trans-Atlantic telephonic service will be a practical proposition.—*Sir W. Mitchell-Thomson.*

* * *

The [Electricity] Bill has not been in any way emasculated in its passage before the Committee, and has, indeed, been improved in various ways.—*Sir Philip Dawson.*

* * *

Although ploughing is generally looked upon as a seasonal occupation, it has been found that an electric plough can be kept fully occupied for at least 200 days in the year.—*Mr. R. Borlase Matthews.*

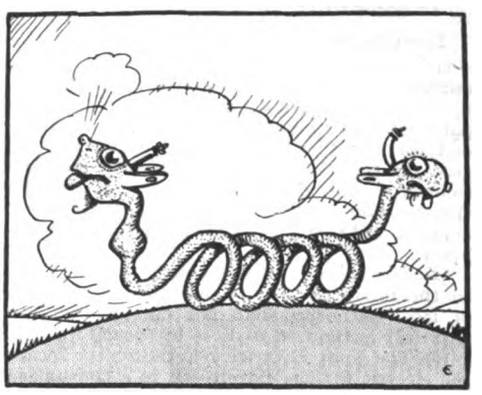
* * *

One of the misfortunes of the industrial revolution of the last century is that manufacturer and dealer, master and servant, seller and customer, have drifted apart. It is a misfortune for which everybody is beginning to pay, and for which the whole world will have to pay.—*Mr. Miles-Knolles.*

IN LIGHTER VEIN.

Random Comments and Reflections on Electrical Topics of the Week.

FOR our zoological note this week we have selected the Resistopede, a truly humorous reptile with a kind of "In Lighter Vein" column feeling running up and down his spine, and leaking out at both ends. The one shown in the illustration is just dropping a volt before sending it ohm. It takes all kinds of volts, but prefers them high, with a few amps for lubrication; if given iron it chokes, gets indigestion and back E.M.F.



The Resistopede, the latest "Electrician" discovery.

One of a long line of conductors, it has an excellent pedigree, being directly descended from the Insulators (quite big pots) and connected to the Circuits (twice removed), and for this reason is often at stud.

* * *

The Resistopede makes an excellent pet and is very constant if not handled. One variety is very variable, but can be handled and controlled with ease if kept on a lead and put in the fields.

* * *

The two heads will be noticed. They are very useful, as alternating things cannot escape by going backwards and forwards; for the resistopede has them both ways. Although its capacity is quite small, there is no limit to the number of volts it can drop. A most persistent reptile, it worms and twists its way into most affairs, generally ending in control. It makes Blotors creep and Grids leak, but on the whole is very well behaved.

* * *

These views are borne out by our poet, who says:

Resistopede, O friend in need,
Obliging he can be.
A few spare volts he gladly bolts,
But likes an amp for tea!

Give him more amps; he'll eat more volts,
And let the amps go free.
It makes him hot to eat the lot—
He runs right ohm to tea.

He's such a twist he can't resist
Gorging until he'll choke,
Not refusing until fusing
Broken ends in smoke.

* * *

Correspondents are implored not to write pointing out the ease with which a certain gas department's coal-strike time slogan "Use less gas," can be transformed into "Useless gas." We've heard it before.

* * *

Broadcasting has produced a new type of revolutionary, who goes about telling people he wants to change the earth.

* * *

"Daddy, the wireless set's on fire! Look at all the smoke!"
"Oh, keep quiet, my boy. It's all right; I've just got Sheffield!"

* * *

During the year ended May 31st, 2 186 sums of money were found in Glasgow Corporation tramcars. This supports the Aberdonians' view that there are no real Scots in Glasgow.

* * *

A recent American broadcast included a musical item by Chinese engineers "on a Chinese instrument that looks like a cathedral, feels like a miniature organ, and sounds like a flute. It is called a sen." Very sen-sible, too!

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SELLING POWERS.

Unexpected Rejection by Commons Committee of an Agreed Clause—Points from the Debate—The E.C.A. Position.

ONE of the real surprises in the committee stages of the Electricity Bill was furnished last Thursday when the clause regarding the sale of electrical fittings, which had been agreed to by the E.C.A. and the I.M.E.A. was rejected by 17 votes to 11.

The Clause provided :

(1) Subject to the provisions of this Section a joint electricity authority and any local authority authorised by special Act or by Order to supply electricity may sell electric lines, fittings, apparatus, and appliances for lighting, heating and motive power, and for all other purposes for which electricity can or may be used (in this Section called "electric fittings"), and may instal, connect, repair, maintain, and remove the same, and with respect thereto may demand and take such remuneration or rents and charges, and may make such terms and conditions as may be agreed upon.

(2) The exercise of the powers of this Section shall be subject to the following restrictions : (*a*) The joint electricity authority or local authority shall not manufacture electric fittings unless expressly authorised to do so by special Act or Order ;

(*b*) The joint electricity authority or local authority shall not sell electric fittings except—(*i*) to a consumer or a person who intends to be a consumer of electricity supplied by them ; or (*ii*) to a person engaged in the business of selling electrical fittings and who requires such fittings to enable him to supply them to a person who is, or intends to be, a consumer of electricity supplied by the joint electricity authority or local authority ;

(*c*) The prices charged by a joint electricity authority or a local authority for the sale of any electric fittings (except to a person engaged in the business of selling such fittings) shall not be less than the recognised retail prices, and if any question shall arise as to what are the recognised retail prices of any electric fittings, that question shall be determined by the Committee appointed as hereinafter provided ;

(*d*) Every such joint electricity authority or local authority shall so adjust the charges to be made by them for the sale of electric fittings under this Section as to meet any expenditure incurred by them in the exercise of the powers of this Section (including interest upon and sinking fund charges in respect of money borrowed for the purposes of this Section) ;

(*e*) The total sums received and expended by any such joint electricity authority or local authority under this Section in each year, including interest upon and sinking fund charges in respect of money borrowed for the purposes of this Section, shall be shown separately in the published accounts of the electricity undertaking of such joint electricity authority or local authority.

(3) The Minister of Transport shall appoint a Committee after consultation with such referees or bodies representative of local authorities and persons engaged in the business of making or selling electric fittings and consumers of electricity as he thinks fit, and that Committee shall determine any question which may be raised under this Section as to the recognised retail prices of any electric fittings and shall advise and assist the persons concerned as to the method of giving effect to the provisions of this Section.

(4) The purposes of this Section shall be deemed to be purposes for which the joint electricity authority or the local authority may borrow money.

Preventing Price-Cutting.

Mr. H. W. Looker, in moving that the clause be read a second time, said the clause was really carrying out the recommendation of the Weir Report. It was time this question was settled. The power to sell fittings was possessed by gas and water companies. When a local authority was once authorised to sell electricity, it was difficult to see how they could reasonably be refused the necessary complementary powers to enable them effectively to carry out their sales. If local authorities could show the small consumer the kind of apparatus he wanted, and had the power to supply him on the hire-purchase system, he would then get his electrical facilities with the minimum of delay.

Mr. J. Hudson, who also supported the clause, said he felt inclined to complain about the way it was suggested that local authorities should be limited in their actions by an association of retail traders. Those who dealt in electrical fittings to-day, had ample means of preventing a local authority from selling a commodity at too low a price. To give further opportunities by setting up a committee of wholesale and retail traders, would, he thought, place too many shackles on the local authorities. There was, for example, one vacuum cleaner sold at a price between £20 and £25. From personal investigation he found that the actual cost of production was not more than £3 or £3 10s., and £10 of the price consisted of money spent upon advertising and paying salesmen at a very extortionate rate. If, however, a local authority set up a shop and displayed vacuum cleaners in an attractive way, it should be possible to save the vast amount of money spent upon a stupid system of salesmanship. But by subsection (3) of the proposed clause, it would be possible for an association of wholesalers and retail traders to keep up the price of this article at the general level that producers of these fittings might have decided upon.

The Attorney-General said he was in a little difficulty over the clause as it was not one relating to the Board, or to its scheme, to which he was so anxious to confine matters. A decision on the point raised, however, was urgently needed. He did not like municipal trading, but when that House had seven times during the last eighteen months granted this power to every local authority that had asked for it, and when 80 of them had already got it, it was difficult for him to uphold an anomalous position. The position had now gone so far that he could not logically ask the Committee to reject the clause.

Mr. J. B. Burman said the clause was supported by the local authorities and approved by the contractors. It would satisfactorily settle a long-standing dispute.

Attitude of Scottish Contractors.

Mr. P. J. Hannon said that because Private Bill legislation had conferred powers on some local authorities there was no reason for placing this clause as a general principle in a great national Measure. He was opposed to municipal trading of every sort and no provision of this kind should be embodied in any Act of Parliament. If the municipalities were given the powers embodied in this new clause they would be able to undertake various operations now performed by contractors, and probably these operations would be much less efficiently carried out than they would be by qualified and highly trained contractors. Further, the municipality was spending the ratepayers' money and were not restrained by the same considerations as the contractor. He was not at all satisfied that there had been general agreement between the contractors and the municipalities. He had a letter from the E.C.A. of Scotland, and they certainly did not agree to the clause.

Sir Philip Dawson said the proposal meant that local authorities would be able to keep considerable staffs to instal wiring in private houses, work which had hitherto been done by contractors. Unless such work were excluded he would vote against the clause.

Mr. R. Waddington said it would regularise matters if the powers were given. He understood that the clause was agreed to by the Association of Municipal Corporations, the I.M.E.A., the A.M.A., the B.E.A.M.A., the Electrical Accessories Manufacturers' Association, the E.C.A., the E.C.A. of Scotland, the Electric Light Fittings Association, the E.L.M.A., and the E.W.F.

Sir Cooper Rawson said he would like to correct the statement that the clause had the support of the E.C.A. He knew that an official of that Association was browbeaten into giving a sort of timid consent, because he was fed up with the negotiations. He had reason to believe that the E.C.A. of Scotland was strongly opposed to the proposal. Apart from the big contracting firms there were at least 4 000 small contractors, the majority of whom would be smashed up by this proposal. Throughout the country there were about 50 000 electricians, who, under this clause, would be handed over to municipalities. The argument that many local authorities now had these powers was no justification for supporting a pernicious system. Municipalities would be competing with local private traders under terms which were a great disadvantage to the small men.

Mr. C. R. Attlee said that wherever a municipality was active in this way it assisted the contractor's business. The need was for mass production, and this would not result from keeping business in the hands of a few small contractors. This was no longer a party question. There were certain members of that Committee who listened to what was said by a small group of contractors. He denied that the mass of contractors were against the clause ; he knew of important boroughs where they were in favour of it. The company undertakings had power to sell, but there was nothing to

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show that contractors in their areas were extirpated. It was an ordinary business principle that anyone selling a product should have power to sell the apparatus for using it, as was the case with gas companies.

On the question being put the Committee divided, 11 voting for and 17 against.

Those voting in favour of the clause were: Lt.-Col. W. Ashley, Mr. C. R. Attlee, Major R. G. C. Glyn, Mr. D. R. Grenfell, Mr. G. D. Hardie, Mr. J. H. Hudson, Mr. W. T. Kelly, Mr. H. W. Looker, Lt.-Col. Moore-Brabazon, Mr. A. E. Townend and Mr. R. Waddington.

Votes against the clause were recorded by Mr. E. E. Alexander, Lord Apsley, Mr. George Balfour, Mr. R. G. Clarry, Sir Philip Dawson, Viscount Elveden, Mr. E. B. Fielden, Lt.-Col. Sir F. Hall, Mr. C. Hanbury, Mr. P. J. Hannon, Capt. H. P. Holt, Sir G. H. Hume, Mr. J. S. W. Milne, Mr. Ellis Nuttall, Sir Cooper Rawson, Mr. A. S. Sandeman, and Brig.-Gen. W. W. Warner.

IN PARLIAMENT.

New Clauses and Schedules Considered by Electricity Bill Committee.

WHEN Standing Committee "C" met on July 15th, Sir Douglas Newton moved to insert in the Electricity (Supply) Bill a new clause giving authorised undertakers power to lay electric lines and apparatus in private streets. The Attorney-General said there was already power to do this, with the consent of the Ministry of Transport. The clause was rejected. A clause, proposed by Sir Joseph Nall, giving power companies the right to ask that the whole of their undertaking should be purchased was negatived, as was a proposal, also by Sir Joseph Nall, that officers and servants of the Board must not be concerned in any contracts. Col. Ashley said the Board could make any conditions it thought fit.

Mr. H. W. Looker moved to insert a clause permitting local authorities to sell electrical fittings. The Attorney-General did not oppose the clause, but it was rejected. Points from the debate on this clause are given on page 104.

A clause proposed by Mr. R. G. Clarry was passed, enabling gas companies to act as distributors of electricity.

Mr. Robert Hudson moved a clause providing power to set up a committee to investigate prices, etc., of electrical equipment. He thought it the duty of the Government to see that the enormous increase in demand did not lead to increased prices. The Chairman ruled the matter out of order.

On Monday, in regard to Schedule 1, which provides the system and the basis of value, for taking over a generating station or main transmission line, and the matters to be taken into consideration by the Electricity Commissioners, Mr. C. R. Attlee moved an amendment to strike out qualifying instructions and make the matter simply actual cost, with a right of appeal if the vendor is dissatisfied with the award. The Attorney-General said the Government did not want to make it too tempting for authorities to dispose of their generating stations. The Government did not want to be unfair either to municipally-owned undertakings or to private companies, but if there had been anything like improvident finance on the part of either, that was hardly a reason for paying more for the undertaking than it was worth. After discussion, the amendment was carried.

There were 30 amendments to Schedule 2, which sets forth what shall be properly included in calculating the cost of production of electricity at any station. An amendment was accepted to the effect that the cost should include "Any contributions for pensions, superannuation, and insurance of officers and servants, and for renewals not chargeable to capital account, and insurance."

An amendment by the Attorney-General was adopted, substituting for "capital properly expended" the words "money properly expended for capital purposes, whether expended out of capital or revenue."

On the proposal of Sir Joseph Nall, the further words were added: "and interest on working capital properly attributable to the station and the production of electricity therein."

On Tuesday Mr. G. D. Hardie moved, as an amendment to Schedule 2, relating to the determination of cost of production at "selected stations," that the rate of interest on capital to be taken into account should not exceed 5 per cent. The amendment was rejected. An amendment was moved by Mr. P. J. H. Hannon that the rate to be taken into account in the case of London companies should be the average of the interest payable by the company and of the dividend it was entitled to retain or distribute, with a proper proportion of co-partnership benefit payable. After discussion the proposal was withdrawn.

The Minister of Transport (in the absence of the Attorney-General, owing to illness) moved a proviso that where part of the expenditure was defrayed otherwise than by means of loans the allowance for depreciation should be increased by such amount as the Electricity Commissioners thought just. This was agreed to, as was an amendment moved by Mr. Hannon, that, in the case of a London company, the amount of the allowance for depreciation should be not less than the contributions required to be made to the sinking fund. Schedule 2 was then passed.

A number of amendments to Schedule 3 were withdrawn upon the Minister of Transport's promise that the schedule should be "tidied up" on the report stage.

A proviso was inserted that where the cost of construction of the transmission line was defrayed out of revenue the allowance for depreciation should be increased by such amount as the Electricity Commissioners thought just. An amendment moved by Mr. Hannon was agreed to, that, in the case of London companies, the allowance for depreciation should be not less than sinking fund contributions. Schedule 3 as amended was passed.

In regard to Schedule 4, which deals with the form and basis of compensation for officers or servants of authorised undertakings who might be removed from or worsened in their employment as a result of the Act, a proposal, supported by a number of Labour members, was to the effect that provision should be made for the compensation of all kinds of employees. The proposal was rejected. After drafting amendments had been dealt with, Schedule 4 was passed.

Replies to Questions.

The following are points from recent answers to questions in the House of Commons:—

In England and Wales in the year 1925, 105 fatal and 5 154 non-fatal accidents were attributed to tramcars.

The Government of Tanganyika Territory intend to erect a wireless station at Dar-es-Salaam during the current financial year.

The number of persons who have been prosecuted for the use of unlicensed wireless apparatus is 296. It has not been necessary to prosecute any person more than once.

The number of telephones per 100 inhabitants in Great Britain is 3·28. On January 1st, 1925, the number per 100 in U.S.A. was 14·2, in Canada 11·6, in Sweden 6·9 and in Germany 3·9.

The amount paid in dividends by electricity companies in the County of London for 1925 was £901 770, and the amount placed to depreciation and reserve was £1 852 595. The figures for 1924 were £903 105 and £1 593 050 respectively.

No special investigations in regard to the utilisation of coal in the form of powdered fuel have been carried out by the Department of Scientific and Industrial Research, but they have published a report on "Pulverised Coal Systems in America," the third edition of which was issued by H.M. Stationery Office in 1924.

In reference to a suggestion that the Prime Minister should consider offering a substantial money prize for the best system of obtaining complete combustion of powdered coal, the President of the Board of Education stated that the suggestion was brought to the notice of the Royal Commission on the Coal Industry (1905), and they made no recommendation of the kind.

The Swindon Bill.

The Swindon Corporation Bill was read a second time in the House of Lords on Tuesday. Lord Banbury gave notice that on the third reading he would move a new clause providing that a corporation supplying electric current should be liable for all damage or loss that might be sustained by the consumer with whom an agreement to supply current was in force if the corporation had failed or neglected without reasonable excuse or unlawfully refused to supply current to the consumer. The corporation should be liable to a penalty not exceeding £50 per day for each day during which default continued.

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LEGAL INTELLIGENCE.

Scottish Electrical Contractors and a Municipality's Trading Powers.

IN the Scottish Court of Session (First Division) last Friday, Hurry Brothers and six other Greenock electrical contractors sought, in a special case, the opinion of the Court as to whether Greenock Corporation was entitled under its statutory powers to engage in certain forms of retail electrical trading.

The Court held that the Corporation was entitled to carry out installation work by supplying and installing for consumers within their area of supply, main switches, fuses, wiring, branch switches, and lighting fittings; that they were not entitled to carry out such work upon terms whereby they stipulated for receiving payment therefor apart from hire, either by way of an immediate cash payment or by way of instalment payments payable within the period of five years from the date of installation or supply; that they were not entitled to sell in and from their showrooms electric radiators, cookers, irons, motors, lamps, and other mechanical accessories to persons resident either in the Corporation's area of supply or beyond that area; and that the Corporation were not entitled to undertake and execute for consumers within the area of supply, in return for cash payments, repairs to electrical installations and fittings other than installations and fittings provided, let, or hired by them in exercise of the powers conferred on them by Section 23 of the Electricity Supply Act of 1919.

The contractors were awarded expenses.

Telephone Dispute—Verdict for Plaintiff.

The action brought in the Chancery Division by Mr. Henry Rose against Siemens Brothers and Co., Ltd., claiming commission on an order for a telephone exchange for Egypt—the opening stages of which were fully and exclusively reported in THE ELECTRICIAN last week (see page 77)—was again before Mr. Justice Russell on July 15th, when Mr. H. Mayne was further examined. Witness said the matter of telephones for Cairo lay entirely in his hands. Tenders were received in October, 1924, and opened at the end of the month. Four firms tendered, and one put in an alternative scheme. The second cheapest tender was the defendants', and their samples were excellent, and on that witness strongly recommended that they should be given the order, and it was placed with defendants in January, 1925. Witness was not in any way influenced in the matter of the recommendation of the tender, as efficiency and price were the only things that counted.

His Lordship reminded the witness that the previous evening he had stated that the decision of the Egyptian Government in this matter was arrived at some time before the end of April, 1924. That was consistent with plaintiff's case. What his Lordship wanted to know was the reason for witness shifting his ground and saying the final decision was at the end of 1923.

Witness replied that he had followed his train of thought and came to the conclusion that the end of 1923 was the proper date.

Col. V. B. Gray said he was director and general manager in Egypt of the Association of British Manufacturers in Egypt, which included the defendant company. He saw plaintiff in Cairo in the winter of 1922-23 and a year later, and he never did anything to give plaintiff the impression that he was working with, or in co-operation with, the plaintiff in regard to the automatic telephone service for Cairo.

Mr. F. H. Lennard, departmental manager of the defendant company, gave evidence and said Salima Pasha visited the works long before the plaintiff came on the scene, and showed the greatest interest in the automatic telephone department and showed a certain amount of knowledge. Later, when the plaintiff came, witness understood he was a sort of professional adviser or a minor Minister of some sort. Witness believed that the defendants could be excused from payments if they could prove that the contract had not been procured by plaintiff. Defendants wanted plaintiff to get behind the officials to the Minister, and if he did he would be giving defendants material assistance.

Mr. Beaumont, telephone engineer, also gave evidence and counsel addressed the Court.

His Lordship pointed out that the two things here were: did the defendants get the contract, and, secondly, did the plaintiff render them any material assistance? Defendants got the contract, and now the question was: Did the plaintiff render the defendants material assistance in the development of automatic telephones? It was regrettable that the charge of fraud had ever been made by the defendants against the plaintiff. To his Lordship's mind this was a plain case. On the evidence, his Lordship had no doubt that Zaghlul Pasha and the plaintiff were on terms of close friendship. Zaghlul Pasha had asked the plaintiff's advice on many matters, and the plaintiff had advised him. The commission note was that the plaintiff should render material assistance. He was given an amount of literature on the subject, and armed with this he went to Egypt and saw Zaghlul Pasha, showing him the documents and commending the automatic service. He was passed on, and it was clear that the plaintiff did render the defendants material assistance by getting in touch with other high officials in Egypt. His Lordship came to the conclusion that the contract was brought about by the plaintiff in his friendship with Zaghlul Pasha and others and that he did render the defendants material assistance. The plaintiff was entitled to his commission. In his opinion, the claim of the plaintiff was a just and legitimate one.

The plaintiff succeeded and his Lordship made a declaration that plaintiff was entitled to his commission of 2 per cent., and he ordered an account to be taken. The defendants must pay the costs of the action. The defendants' counter-claim would be dismissed with costs.

A stay was granted on the defendants paying the money into Court.

B.T.-H. Action Dismissed in Ireland.

Mr. Justice Meredith, in the High Court, Dublin, last Friday, declined to grant the British Thomson-Houston Co. an interlocutory injunction to restrain Litton and Co.. of Dublin, from manufacturing or selling articles which it was alleged infringed the plaintiffs' patent. The Judge decided that Letters Patent under the seal of the British Patent Office, including all British patents issued before December, 1922, were not valid in the Irish Free State. If it were wished to preserve the privileges of the Patent Act they must be preserved explicitly. The main action, however, was not dismissed, and will be heard later.

Claim for Return of Testing Set.

At Bow (London) County Court on July 15th, the Fame Electric Co., of Stratford, sued Mr. A. Cave, formerly of Sheffield, an iron merchant and electrical agent, to recover £7 10s. Mr. Batchelor, for plaintiffs, said they were asking for the return of an insulation testing set or its value. Defendant was a sales agent for the firm, but this engagement had been terminated, and all machines had been returned, with the exception of this insulation set.

Judge Snagge ordered it to be returned in 14 days, or, alternatively, judgment for £7 10s. and costs.

WORK IN PROSPECT.

Trade Possibilities for Electrical Installation Contractors.

BARNET.—Houses (57), for Rural Council. Particulars, the surveyor, Mr. J. Wilshire.

DARTFORD.—Additional 74 houses, for Rural Council. Particulars, the Surveyor.

DATCHET.—Extensions to Church schools. Particulars, the architect, Mr. A. H. Ryan Tenison, 21, Great Peter Street, Westminster, S.W.

DERBY.—Houses for Town Council. Particulars, the contractors, Mr. E. Revill, Chesterfield (12), Perks and Sons (60), J. Pegg and Sons (76), and Mr. J. Warner (16).

NEWMARKET.—Houses, Reach, Swaffham Prior, for Rural Council. Particulars, Mr. A. E. Austin, 4, Hills View, Great Shelford, Cambs.

SMALLFORD.—Housing scheme (20), for St. Albans Rural Council. Particulars, the Surveyor.

SOUTH MIMMS.—Housing scheme (18), Mutton Lane, Potter's Bar, for Rural Council. Particulars, the clerk, Mr. H. W. Poole, 93, High Street, Barnet.

ST. ALBANS.—Housing scheme, Leverstock Green, for Rural Council. Particulars, the contractors, Arthur Cole, Ltd.

WILMSLOW.—Houses (50), for Urban Council. Particulars, the contractors, J. Gerrard and Sons, Swinton, Manchester.

WINDSOR.—Houses for Rural Council. Particulars, Mr. John H. Blizard, engineer.

WORKINGTON.—Houses (40), Slaterbeck, for Town Council. Particulars, the contractors, T. Armstrong and Co.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given. Unless otherwise stated, particulars are to be had from the Department of Overseas Trade, 35, Old Queen Street, Westminster, London, S.W.1.

ELSTREE PARISH CHURCH.—Electric light installation. Particulars from the Rector, Rev. A. R. T. Eeales.

STIRLING COUNTY COUNCIL EASTERN DISTRICT COMMITTEE.—Supply and erection of electric street lamp fittings in the Larbert and Bonnybridge Special Lighting Districts. Specifications, etc., from Mr. T. G. E. Lampard, District Offices, Falkirk.

CORK BOROUGH COMMISSIONER, July 23rd.—Repair by electric welding of turntable undercarriage at Parnell Bridge. Specification from Town Clerk; deposit £1.

IRISH FREE STATE DEPARTMENT OF POSTS AND TELEGRAPHS, July 23rd.—Supply of 50 miles of wire and cable. July 28th.—Supply of 7 000 screwed spindles for telegraph insulators. July 29th.—Supply of 21 tons of g.i. wire. Particulars from the Controller of Stores, Aldborough House, Dublin.

SAFFRON WALDEN CORPORATION, July 24th.—Engine and dynamo, switchgear, booster, balancer, batteries and mains. Specification from Mr. R. A. Smith, 14 Victoria Street, Westminster, S.W.1; deposit £1 1s.

WEST MIDLANDS JOINT ELECTRICITY AUTHORITY, July 24th.—Supply and erection at Birchills power station of three steam boilers, pulverised fuel plant, ash and coal handling plant, and boiler house auxiliaries. Specifications, etc., from Mr. E. M. Lacey, 12, Victoria Street, Westminster, S.W.1; deposit £5 5s.

CARLISLE CORPORATION, July 26th.—Lighting installation at the new electricity works at Willow Holme. Specifications from Mr. C. W. Salt, city electrical engineer.

HUMBER CONSERVANCY BOARD, HULL, July 26th.—Lightship, with lantern, wireless installation and electric fog-signalling apparatus. Specification (£2 2s.) from the Secretary.

MANCHESTER CORPORATION, July 26th.—One 500 kVA static transformer, for sub-station on the premises of Beyer, Peacock and Co. Specification (No. 167) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

PORT OF BRISTOL AUTHORITY, July 26th.—Electric light installation at premises in The Grove. Particulars from Mr. T. A. Peace, engineer, Avonmouth Docks.

SALFORD GUARDIANS, July 26th.—Extension of electric lighting installation at the Poor Law Offices, Eccles New Road, Salford. Specifications from the Clerk to the Guardians.

SALFORD GUARDIANS, July 26th.—Electric lighting extension at Poor Law Offices, Eccles New Road, Salford. Specification from the Clerk.

SMETHWICK CORPORATION, July 26th.—Electric wiring of 194 houses on Slatch House Estate, Worley. Specification rom the Borough Engineer and Surveyor.

BEDWELTY URBAN DISTRICT COUNCIL, July 27th.—Cables, overhead lines, etc. Forms of tender, etc., from Mr. R. H. Fletcher, 3, Park Place, Cardiff.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., July 28th.—Electric light wire and cable. Forms of tender, etc., from the Controller of Supplies, King Charles Street, Westminster, S.W.1.

BETHNAL GREEN (LONDON) GUARDIANS, July 29th.—Installation of internal telephone system at Children's Homes, High Road, Leytonstone, E.11. Specification, etc., from Mr. C. Faulkner Jones, Clerk to the Guardians, Bishop's Road, London, E.2; deposit £2 2s.

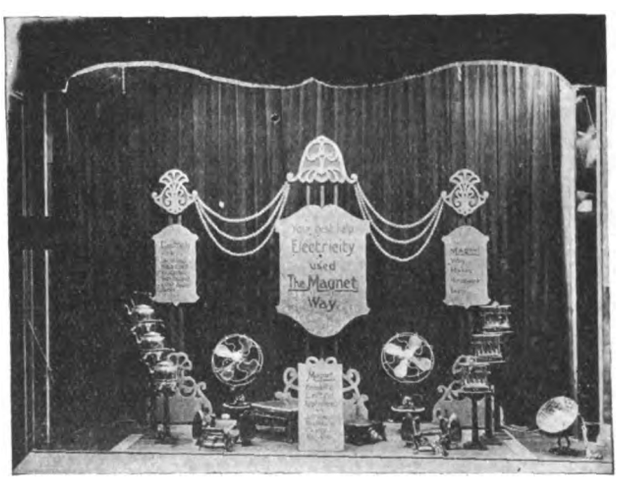
DUNSTABLE CORPORATION, July 29th.—Electric light wiring of 18 houses in West Street, Dunstable. Particulars from the Borough Surveyor.

SPALDING URBAN DISTRICT COUNCIL, July 29th.—Electricity mains and kiosks. Specifications from Mr. R. W. Hastings, Clerk of the Council, or from A. H. Seabrook and Partners, 146, Bishopsgate, London, E.C.2; deposit £3 3s.

STEWARTON CORPORATION, July 29th.—Electric light installation in houses at Cocklebie Croft. Particulars from the architect, Mr. W. F. Valentine, 5, John Dickie Street, Kilmarnock.

WATERFORD CORPORATION, July 29th.—About five miles of 10 000 V three-phase overhead line, with three-phase four-wire medium pressure lines on same supports; medium pressure four-wire overhead distribution network; and street lighting system. Specifications, etc., from McEntee and O'Kelly, 22, Nassau Street, Dublin; deposit £2 2s.

BELFAST CORPORATION, July 31st.—One 15 625 kW turbo-alternator, with condensing plant and auxiliaries, and, alternatively, one 18 750 kW turbo-alternator, with condensing plant and auxiliaries. Specifications (Nos. W48 and W48a) from Mr. Johnstone Wright, city electrical engineer and manager, East Bridge Street, Belfast; deposit £3 5s.



A fine window display of "Magnet" appliances at the Brighton establishment of Page and Miles, Ltd., registered electrical installation contractors.

WORKSOP RURAL DISTRICT COUNCIL, August 3rd.—Electric light installation in 20 houses at Carlton. Specification from Mr. A. E. Hewitt, 66, Bridge Street, Worksop; deposit £1.

MANCHESTER CORPORATION, August 4th.—Supply of electric cooking ranges during 12 months. Specification (No. 168) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

KILKEEL RURAL DISTRICT COUNCIL, August 5th.—(*a*) Cold-starting crude oil engine; (*b*) generator booster and switchboard; (*c*) storage battery; (*d*) pole erection work; (*e*) line erection work; and (*f*) erection of power house for electric lighting of Rostrevor. Specifications for each section (deposit £1 1s.) from Mr. P. T. White, 50, Queen Street, Newry.

BRIDLINGTON CORPORATION, August 6th.—(1) Surface condenser, with extraction plant and circulating pump, pipework and valves, to work in conjunction with 600 kW turbine; and (2) one wooden cooling tower, with tank and foundations, to work in conjunction with 600 kW condensing plant. Specifications, on and after July 19th, from Kennedy and Donkin, 8, Broadway, Westminster, S.W.1; deposit £2 2s. for each specification.

NEWARK CORPORATION, August 12th.—One 200 kVA oil cooled static transformer (contract F.2); and e.h.p. 11 000 V switchgear cubicle (contract F.3). Specifications from the Electrical Engineer, Bank Chambers, Market Street, Newark; deposit £2 2s. for each contract.

INDIA STORE DEPARTMENT, August 17th.—Supply of three electrically driven metre-gauge rope inclines, with gears, ropes, cars and rollers, for Uhl river hydro-electric project. Specification (5s.) from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD, August 23rd.—Supply and erection of a central evaporating equipment at the company's Barking power station. Specifications, etc., from Mr. F. C. McQuown, joint manager and secretary, Moorgate Court, Moorgate Place, London, E.C.2; deposit £5 5s.

COVENTRY CORPORATION, September 3rd.—Buildings, foundations and subways; eight 15 000 kW turbo-alternators, condensing plant and economisers; eight water-tube boilers,

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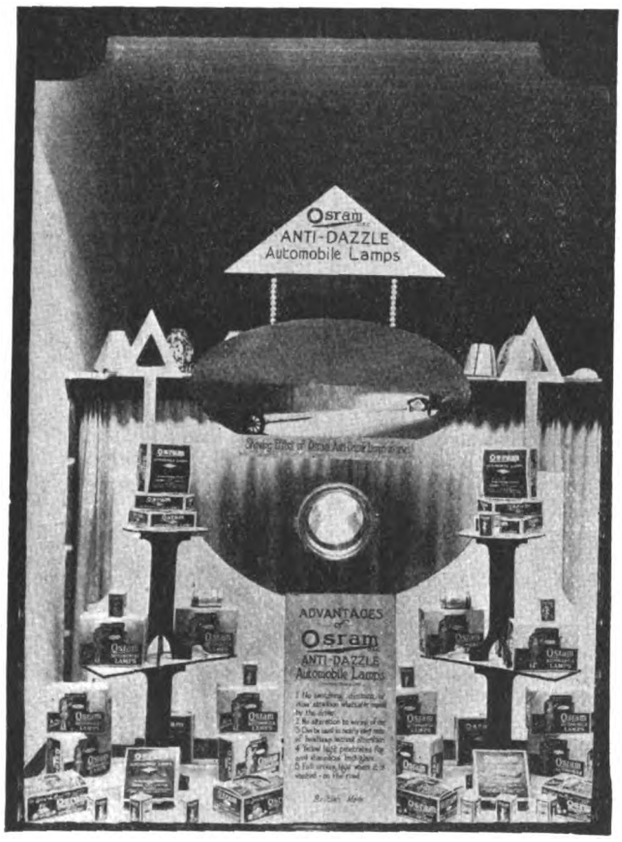
complete with induced draught plant, and chimneys; coal and ash handling plant; switchgear; steam and water pipework; crane; and cooling towers. Specifications, etc., from Mr. Geo. Tough, engineer and manager, Electricity Department, Council House, Coventry; deposit £5 5s.

STOKE-ON-TRENT CORPORATION, September 7th.—Supply and erection of one 10 000 kW turbo-alternator and condensing plant (contract 2 614); one natural-draught cooling tower (contract 2 615); and ironclad l.t. three-phase switchgear (contract 2 616). Specification, etc., from the City Electrical Engineer, St. George's Chambers, Wolfe Street, Stoke-on-Trent; deposit £2 in respect of each contract.

Overseas.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

VICTORIAN ELECTRICITY COMMISSION, July 26th.—Supply of 22 000 V porcelain bushing insulators, in connection with Yallourn power scheme. Specification (No. 56/23) from the Agent-General for Victoria, Australia House, Melbourne Place, Strand, London, W.C.2.



This striking window display, showing graphically the advantages of anti-dazzle automobile lamps, was staged by Mr. H. J. Galliers, registered electrical installation contractor, in one of his Brighton establishments.

INDIA STORE DEPARTMENT, July 27th.—Electrically driven centrifugal pumping sets, mounted on pontoons. Tender forms from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1.

JOHANNESBURG MUNICIPALITY, July 29th.—Supply of transformers (contract 647). (Reference B.X. 2 636.)

JOHANNESBURG MUNICIPALITY, July 29th.—Supply of 10 miles of copper trolley wire and 50 miles of underwriters' wire.

JOHANNESBURG MUNICIPAL COUNCIL, July 31st.—Supply and erection of electrically driven triplex plunger sewage pump.

EGYPTIAN MINISTRY OF THE INTERIOR, August 1st.—Installation of electric power station equipment at Keneh and Luxor for production of three-phase current, 3 300 V, 50 cycles. (Reference B.X. 2 627.)

DEPUTY POSTMASTER-GENERAL, MELBOURNE, August 3rd.—Supply of telephones and dials. (Reference B.X. 2 564.)

STATE ELECTRICITY WORKS, MONTEVIDEO, August 5th.—Porcelain insulators, etc. (Reference B.X. 2 618.)

INDIA STORE DEPARTMENT, August 6th.—Boiler house equipment with other plant and piping for power house, or, alternatively, complete boiler house installation, including pulverised fuel equipment, etc. Specification (£2) from the Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1.

INDIA STORE DEPARTMENT, August 9th.—Electrical generating plant for the Peshawar power station of the North-Western Railway. (Reference B.X. 2 644.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, August 10th.—Dry cells. (Reference B.X. 2 649.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 10th.—Supply of telephone exchange indicators (schedule C. 99). (Reference B.X. 2 597.)

MELBOURNE CITY COUNCIL, August 11th.—Supply of high and low tension three-phase sub-station switchgear (specification No. 810). (Reference B.X. 2 565.)

SOUTH AFRICAN RAILWAYS AND HARBOURS ADMINISTRATION, August 12th.—Supply of cables and wires and bare copper wire during 1927 (tender No. 834). (Reference B.X. 2 639.)

AARHUS (DENMARK) LIGHTING DEPARTMENT, August 17th.—Steam turbo-generator and boiler plant, for new power station. (Reference A.X. 3 371.)

INDIA STORE DEPARTMENT, August 17th.—Transformers for power station in connection with G.I.P. Railway electrification. Specifications (10s.) from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1.

JOHANNESBURG MUNICIPALITY, August 19th.—Overhead tramway equipment, comprising double pull-offs, straight line hangers and insulator pins. (Reference B.X. 2 702.)

CHILIAN STATE RAILWAYS, August 20th.—Signals, telegraphs, telephones, etc. (group 36); electric materials for sub-stations, aerial lines and lighting, 1st-zone (group 37). (Reference C. 1 935.) Booklets (in Spanish) numbered to correspond with the group numbers, and giving further particulars, will be loaned to British firms in the order of application.

VICTORIAN ELECTRICITY COMMISSIONERS, August 23rd.—Supply of 10 in. diameter disc suspension insulators, with cotton split pin or similar coupling device. (Reference B.X. 2 614.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 24th.—Synchronous condensers (section 18, Waikaremoana). (Reference B.X. 2 608.)

PRETORIA MUNICIPALITY, August 26th.—Equipment for five transformer stations. (Reference B.X. 2 721.)

SOUTH AFRICAN RAILWAYS AND HARBOUR ADMINISTRATION, August 26th.—Material for distribution system in connection with the Cape Town suburban electrification. (Reference B.X. 2 680.)

CITY ELECTRIC LIGHT CO., LTD., BRISBANE, August 27th.—Supply, delivery and erection of one 12 500 kW turbo-alternator. (Reference A.X. 3 085.)

NEW ZEALAND RAILWAYS DEPARTMENT, August 30th.—Supply of slip-ring induction 400 V 50 cycle three-phase motors and starters. (Reference B.X. 2 561.)

DEPUTY-DIRECTOR OF POSTS AND TELEGRAPHS, MELBOURNE, August 31st.—Telegraph equipment (schedule C. 109). (Reference B.X. 2 653.)

PERNIK STATE COAL MINES, BULGARIA, September 1st.—Electricity generating plant, consisting of two 4 000 kW steam turbo-generator sets, buildings, etc.

VICTORIAN RAILWAY COMMISSIONERS, September 1st.—Equipment for automatic control of two rotary converters at Seaford sub-station.

VICTORIAN RAILWAY COMMISSIONERS, September 1st.—Automatic sub-station equipment (contract No. 39 287), for Elwood sub-station. (Reference B.X. 2 598.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 2nd.—Electro-pneumatic working of points and day colour light signalling, with alternative current track circuits, in connection with the electrification of the Cape Town suburban railways. Specifications, etc., from the Office of the High Commissioner for the Union of South Africa, Trafalgar Square, London, W.C.2, or from the Chief Railway Storekeeper, Park Station Chambers, Johannesburg; deposit £5 5s.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 7th.—Synchronous condenser for Arapuni power scheme, section 165. (Reference B.X. 2 665.)

DUNEDIN (N.Z.) CORPORATION, September 8th.—(i) Reaction water wheel for direct connection to a.c. generator; (ii) one 3 000 kW, 6 600 V, 50 cycle generator; (iii) four 1 000 kW 6 600/20 000 V, 50 cycle transformers; (iv) switchboards,

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oil-break switches, disconnecting switches, voltmeters, ammeters and wattmeters, current and potential transformers, etc. (Reference B.X. 2 654.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, September 14th.—Telephonists' telephones and handsets (Reference B.X. 2 696.)

POSTS AND TELEGRAPHS DEPARTMENT, Melbourne, September 21st.—Switchboard keys, and parts (schedule 26/720.) (Reference B.X. 2 699.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 28th.—Three motor-driven low lift pumps with control apparatus, for Taieri drainage scheme. (Reference A.X. 3 274.)

CHRISTCHURCH (N.Z.) DRAINAGE BOARD, October 19th.—Supply and erection of three sets of electric centrifugal pumping plants (contract 26/329.) (Reference A.X. 3 215.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Indoor control gear and switchgear for Waikaremoana electric power development (section 14). (Reference B.X. 2 675).

Tenders Accepted.

PORTSMOUTH GUARDIANS.—H. A. Evans, lamps and other electrical stores.

ALDERSHOT HOSPITAL.—C. R. Allen, installation of a wireless set, £80 15s. 9d.

STOCKPORT CORPORATION.—English Electric Co., Ltd., e.h.t. feeder switchgear, £8 090.

HULL CORPORATION.—J. Houlton and Son, erection of five telephone cabinets, £227 5s.

PRESTON CORPORATION.—English Electric Co., Ltd., double deck tramcar, £2 185 (recommended).

NORTH UNITED FREE CHURCH, ST. NINIANS.—Lockhart and Macnab, electric light installation.

DAWSON BROS., City Road, London.—Medway's Safety Lift Co., Ltd., high speed passenger lift.

HALIFAX CORPORATION.—Bury Lighting and Heating Co., Ltd., electric wiring, etc., of new abattoirs.

STOKE-ON-TRENT T.C.—Babcock and Wilcox, Ltd., additional boilers for the power house, £35 770.

WINCHESTER CORPORATION.—Chamberlain and Hookham, Ltd., one year's supply of electricity meters.

DUNDEE CORPORATION.—J. Davis, electric light wiring, etc. of 120 houses at Broughty Ferry, £955 2s. 6d.

EGYPTIAN STATE RAILWAYS, ETC.—British Thomson-Houston Co., Ltd., incandescent lamps, £E853·22.

GOLCAR URBAN DISTRICT COUNCIL.—E. Raynor, electric wiring of four parlour-type houses in Scar Lane, Golcar.

DUNDEE EDUCATION COMMITTEE.—A Westwood and Son, electric wiring and fitting of new advanced school, £1 081.

HODDESDON U.D.C.—North Metropolitan Electric Power Supply Co., for wiring and fitting public lavatories, £13 10s.

METROPOLITAN ASYLUMS BOARD.—P. M. Braidwood, electric wiring, etc., of hut buildings at Pinewood, £172 (recommended).

LONDON COUNTY COUNCIL.—A. Hawkins and Sons, electric light installation at Alton Street School, £549 (recommended).

UXBRIDGE URBAN DISTRICT COUNCIL.—Tangyes, Ltd., two electrically driven centrifugal pumps, for sewage works, £286.

GREENWICH AND DEPTFORD (LONDON) HOSPITAL.—Medway's Safety Lift Co., Ltd., electric hospital lift for the nurses' home.

TORQUAY CORPORATION.—Brackett and Co., Ltd., mechanical screening plant for Newton Abbot power station, £3 212.

SHIPSTON-ON-STOUR GUARDIANS.—Shipston New Electric Lighting Co., electric light installation at the casual wards, £17 10s.

DONCASTER CORPORATION.—Bruce Peebles and Co., Ltd., 1 000 kW motor-converter and switchgear, £5 295 (recommended).

EAST HAM CORPORATION.—Enfield Cable Works, Ltd., supply of 1 450 yards of lead-covered cable, £513 6s. (recommended).

STEPNEY (LONDON) BOROUGH COUNCIL.—A. F. Goodwin and Co., electric light wiring, etc., at Philpot Street conveniences, £45.

BATTERSEA (LONDON) BOROUGH COUNCIL.—British Electric Transformer Co., Ltd., voltage regulator, for Broomwood Road feeder, £216.

CALCUTTA PORT TRUST.—Stothert and Pitt, Ltd., supply of 24 two-ton electric dockside cranes for the new King George Dock, Calcutta.

HACKNEY (LONDON) BOROUGH COUNCIL.—Chloride Electrical Storage Co., Ltd., battery for electric vehicle, £157 12s. (recommended).

WORTHING CORPORATION.—Phillips and Dart, electric light installation at Swandean Hospital, £327; Enfield Cable Works, Ltd., £2 509 10s.

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY.—Fuller's United Electric Works, Ltd., supply of 736 T.G.13 type 180 Ah train lighting cells.

ECCLES CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., 12 months' supply of single phase, house service, integrating watt-hour meters.

LANARK COUNTY COUNCIL MIDDLE WARD COMMITTEE.—Shaw and Gibson, electric light wiring and fitting in 86 houses at Crosshill, Baillieston, £582 6s.

STEPNEY (LONDON) BOROUGH COUNCIL.—L. G. Tate and Co., Ltd., wiring Carter House, Butler Street, (v.i.r. cable and screwed tubing), £411 2s. (recommended).

HAWORTH URBAN DISTRICT COUNCIL.—G. A. Rix, supply and installation of a charging set at the electricity works for the charging of wireless and motor car batteries.

AUSTRALIAN FEDERAL CAPITAL COMMISSION.—Australian General Electric Co., Ltd., special cast plaster electric light fittings for Parliament House, Canberra, £1 875 12s.

CHESTERFIELD CORPORATION.—Clough, Smith and Co., Ltd., conversion of tramway overhead equipment to railless trolley system, new turning circles, and 14 single-deck trolley vehicles.

INDIA STORE DEPARTMENT.—General Electric Co. of (India), Ltd., white marble switchboard for kW generating set, R.5 440, and 225 V Osram lamps, R. 1 000; Greaves, Cotton and Co., pumping set. R. 29 784, and generating set, R. 8 050.

GLASGOW CORPORATION.—G. Gordon and Co., commutators; Hadfields, Ltd., tramway points and crossings; Electro-Mechanical Brake Co., Ltd., and Traction Equipment Co., Ltd., resistances; Steel Co. of Scotland, steel tyres.

SALFORD CORPORATION.—Hewittic Electric Co., Ltd., 500 kW mercury arc rectifier equipment for Irlams-o'-th'-Height sub-station, £2 937 5s.; W. T. Glover and Co., Ltd., 2 670 sq. yards of e.h.t. cable, £1 762 4s. (both recommended).

LIVERPOOL CORPORATION.—Herbert Morris, Ltd., 15-ton electric travelling crane for Pumpfields electricity station, £790; British Insulated Cables, Ltd., 2 000 35 in. copper bonds, 2s. 9d. each, and 250 steel draft pins, 9s. 6d. per gross (both recommended).

ILFORD URBAN DISTRICT COUNCIL.—Metropolitan-Vickers Electrical Co., Ltd., converter for the Uphall Road, sub-station, £3 377. Other tenders: General Electric Co., Ltd., £5 292 16s.; Bruce Peebles and Co., Ltd., £4 469 10s., and Ateliers de Constructions Electriques de Charleroi, £3 000.

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—Standard Telephones and Cables, Ltd., 1 760 yards twin round conductor, paper insulated, lead covered, jute served, double steel tape armoured and compounded l.t. cable, £79 per 1 000 yards; 1 760 yards 0·01 sq. in. twin ditto, £105 per 1 000 yards; 1 760 yards 0·02 sq. in. twin-shaped conductor ditto, £152 per 1 000 yards; 880 yards 0·075 sq. in. single conductor ditto, £132 per 1 000 yards; 880 yards 0·25 sq. in. single ditto, £278 per 1 000 yards.

GLASGOW CORPORATION.—One year's supply of electrical fittings and accessories, for Watching and Lighting Department: W. McGeoch and Co., Ltd., Simplex Conduits, Ltd., T. Land and Son, Chalmers and Mitchell, Edison Swan Electric Co., Ltd., Enfield Cable Works, Ltd., W. Brown and Co. (Engineers), Ltd., Credenda Conduits, Ltd., and Bayliss, March and Newey, Ltd.—Supplies to Tramways Department: R. Johnson and Nephew and Siemens Bros. and Co., Ltd., double concentric wire.—One year's supplies to Electricity Department: Callender's Cable and Construction Co., Ltd., and Enfield Cable Works, Ltd., l.t. cables; Callender's Cable and Construction Co., Ltd., and W. T. Glover and Co., Ltd., h.t. cables; Craigpark Electric Cable Co., Ltd., indiarubber cables and flexibles; Chamberlain and Hookham, Ltd., Edison Swan Electric Co., Ltd., Elkay Electrical Manufacturing Co., Ltd., Ferranti, Ltd., Measurements, Ltd., and Metropolitan-Vickers Electrical Co., Ltd., meters; General Electric Co., Ltd., arc lamp carbons; Carron Co., Ltd., Falkirk Iron Co., Ltd., M'Dowall, Steven and Co., Ltd., and R. Taylor, c.i. boxes, pillars etc.

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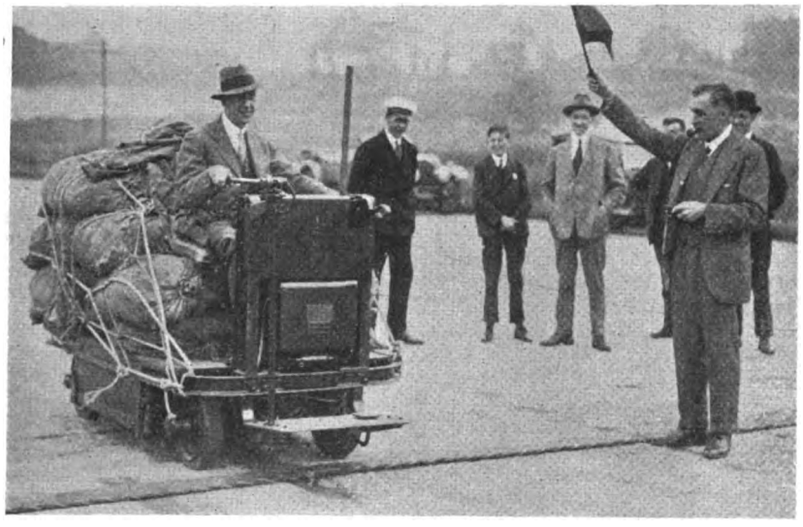
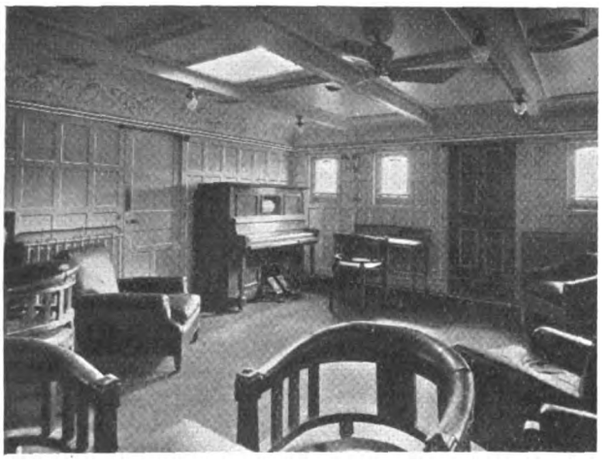
ELECTRICAL NEWS IN PICTURES

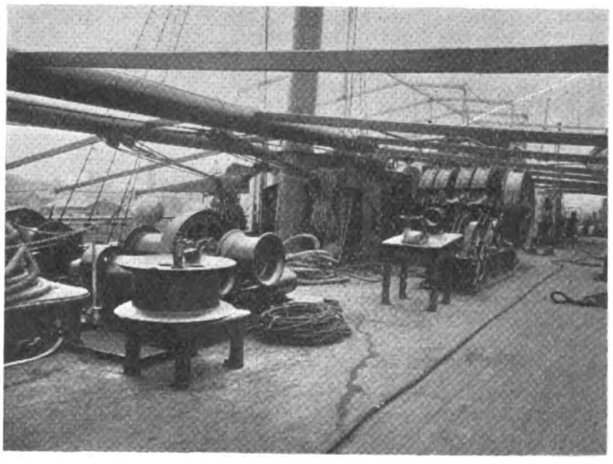


Brooklands saw a novel version of the "hare *v.* tortoise" race when Mr. R. M. Halon, driving a Greenbat electric lorry loaded with 2 tons, won an 8-mile race against two well-known racing motorists. The electric truck was given a start of 1 hour and 31 minutes.

Mr. J. H. Parker, West Hartlepool's borough electrical engineer, who was on Monday appointed to the additional post of tramways manager (following the resignation of Mr. T. G. Richardson) for an experimental period of twelve months (see page 102).



A view in the comfortable saloon of the Telegraph Construction and Maintenance Co.'s new c.s. "Dominia," which will sail in the late summer or early autumn on an expedition to lay a duplicate cable between Vancouver and Fanning Island for the Pacific Cable Board.



The paying-out gear of the c.s. "Dominia" is shown in this photo taken on the awning deck looking aft. With a length of 500 ft., a beam of 59 ft. and a deadweight capacity of 12 000 tons, she is the largest cable layer afloat. Her four cable tanks have a coiling capacity of 180 000 cub. ft.

Industry and Trade.

Sir Ernest Benn's Evidence on State Interference with Commerce.

GIVING evidence before the Committee on Industry and Trade, on Wednesday, Sir Ernest Benn dealt with the differences between this country and America. He claimed that England was as well, or better, provided with scientific and mechanical knowledge and equipment, but the prevailing social and political ideas in the two countries differed so widely as to produce totally different commercial and industrial conditions. It was wrong to suppose that we wanted anything from America, except some of her ideas on such subjects as work and machinery.

Dealing with the functions of the State in regard to industry and trade, Sir Ernest said the habit of relying upon public authority had developed in this country so considerably as to weaken individual initiative and reduce the volume of trade. The standard of living in Great Britain would be higher to-day than the standard of living in the United States if we had the same reliance upon the individual, and the same freedom for him to function. Those trades where Government interference was most active had gone from bad to worse, as was shown by the present condition of mining and housing—two big industries which, for nearly half a century, had been subjected to constant meddling on the part of politicians. Those industries, on the other hand, such as food and clothing, which had been left free to function in their own way, had never failed to achieve ever greater prosperity and render ever greater service to the community.

The burden of taxation was dealt with by the witness, who claimed that there were two related but distinct ideas at the back of British taxation on its present intolerable scale—firstly, the false belief that the State could make good use of money, and secondly, the desire to punish success. Sir Ernest claimed that Government authorities and public institutions were necessarily, from their nature, the most inefficient and expensive agencies for performing any given function. He further argued that taxation on its present scale turned potential capital into income, and thus we were committing the worst of financial crimes and laying up increasing trouble for the future.

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ELECTRICITY SUPPLY.

Wimbledon's £5 000 Loan for Wiring Consumers' Premises—Proposed Inquiry into Weymouth Cooker Loan Application—Lichfield Supply Inaugurated.

KIRKCALDY T.C. is having a grit-arresting plant erected at the generating station.

The promoters of the Grampian Electricity scheme announce that the project is to be proceeded with in the near future.

Inverness T.C. has decided to sign a mortgage for the loan of £80 000 for the purchase of the local electricity undertaking.

Lincoln Corporation has decided to supply electricity for shop window lighting after closing hours at a flat rate of 2½d. per kWh.

Walton-le-Dale U.D.C. has applied for a loan of £260 for the conversion of the street lighting at Lostock Hall from gas to electricity.

New cables, to cost £21 000, are to be laid down in Leith Docks, to supply electrical power to the Dock Commission's grain warehouse extension.

Richmond (Yorks) T.C. proposes to borrow £11 500 for the electricity scheme. The charges are to be 8d. per kWh for lighting and 4d. for power.

Dawlish Electric Light and Power Co. has obtained the assent of Newton U.D.C. to the company's application for an Order to supply Dawlish West.

Hertford R.D.C. has decided to agree to proposals by the North Metropolitan Electric Power Supply Co. for the development of its undertaking at Tewin.

Cowes Harbour Commissioners have assented to the placing of two pipes in the river Medina at Kingston by the Isle of Wight Electric Light and Power Co.

Whitby U.D.C. has received sanction to a loan of £1 000 for mains and services, and a further loan of £1 000, to include £495 overspent, has been applied for.

Col. T. C. Ekin will hold an inquiry on August 5th into the application of West Ham T.C. for a loan of £130 826 for the installation of a 10 000 kW set and auxiliary plant.

The Olympia Oil and Cake Co., of Selby, is to instal public electric lamps and supply electricity in New Barlby. The P.C. is borrowing £800 to defray the cost of the scheme.

Herne Bay Scheme.

Herne Bay U.D.C. has been informed that the Electricity Commissioners will dispense, with the consent of the Council, to the granting of an electric lighting Order for the town.

Sales of energy for the first quarter since North Berwick T.C. took over the electricity works from the company have increased 3 000 kWh, and the revenue is expected to cover capital charges as well as working costs.

Councillor Hulme has suggested that Macclesfield Corporation should approach the Electricity Company of Macclesfield with regard to terms on which the Corporation might acquire the local electricity undertaking before 1931.

Felixstowe U.D.C. has declined an offer by the East Anglian Electric Supply Co. to purchase the electricity undertaking for £50 000. The company is now working the undertaking for the Council under an agreement which will expire in 1929.

Blackpool General Purposes Committee has rejected the proposal that the electricity and transport departments should have separate managers in future. By 23 votes to 19 it has been resolved that Mr. C. Furness shall continue to manage both departments.

Sunderland Electricity Committee has purchased 1 000 tons of Belgian coal, which will keep the undertaking going until the third week in August. The price, delivered into the works, including freightage, etc., was 48s. a ton—about three times the normal price.

Wimbledon T.C. has applied for a loan of £100 000 for prospective expenditure on mains, house services, and transformer substations, and excess expenditure over a previous loan of £45 000 for similar purposes, and for a loan of £5 000 for wiring consumers' premises.

Bromley (Kent) Borough Council has adopted the Electric Light Committee's proposal to engage Mr. A. H. Dykes to advise on various matters in connection with the question of the resumption of the ownership of the local electricity undertaking by the Council during the current year.

The North Wales Power Co. has informed Alsager U.D.C. that the arrangements for the supply of electricity in the district are expected to be completed before Christmas. The company is to supply the Council with particulars of cost of conversion of street lamps, maintenance costs, etc.

The Irish Free State Ministry of Industry and Commerce has informed Waterford Corporation that the erection of a generating station at Waterford can now be dispensed with, as arrangements have now been made to supply current from an outside source, pending a supply from the Shannon scheme.

The Chairmen of the Electricity and Gas Committees of Bradford Corporation have been appointed on the new sub-committee on street lighting. The Electricity Committee has recommended the sub-committee to consider the advisability of substituting electric light for gas in the main roads at present equipped as tramway and trackless trolley vehicle routes.

Charges at Swinton.

Swinton and Pendlebury U.D.C. offers to supply consumers for domestic use at an alternative fixed annual charge amounting to 20 per cent. of the rateable value, plus ¾d. per kWh. The engineer (Mr. H. C. Busbridge) has been instructed to prepare a scheme for a supply of electricity to the Swinton sewage works and to property to be erected on the Holme Farm Estate.

At a recent meeting of Barrow-in-Furness T.C. Alderman Whinnerah moved that the guarantee charge payable by electricity consumers be 2s. 6d. in future, instead of 6s. 8d., and added that in the summer when the consumption was low the present cost worked out at 3s. or 4s. per kWh. An amendment to refer the whole matter to the committee for further consideration was carried.

Wimborne U.D.C. has informed the Bournemouth and Poole Electricity Supply Co. that if the Council does not hear anything definite within the next three months with respect to carrying out the Wimborne Electricity Order the sanction of the Council will be withdrawn. The company has informed the Council that the delay is due to the protracted negotiations with Bournemouth Corporation for extension of the company's tenure.

The Electricity Supply Corporation has informed Chelmsford T.C. that while the company is unable to agree to a reduction in the present statutory maximum charge it has been decided to make a voluntary reduction in the lighting rate of 1½d. per kWh to 9d., less ½d. discount. The T.C. considers the reduction offered inadequate, and proposes, unless a further reduction is made, to consider the question of applying to the Commissioners for a revision.

Weymouth T.C., having applied for a loan of £2 500 for the purchase of electric cookers, the Gas Co. has asked the Electricity Commissioners to withhold sanction to the loan until a local inquiry has been held. The Council has forwarded to the Commissioners a statement showing that during the past year 54 electric cookers were out on hire, there are now applications for 30, and it is anticipated that during the next three years the demand will have risen to 200.

Progress in North Wales.

The North Wales and South Cheshire Joint Electricity Authority has approved the application of Criccieth U.D.C. for an Order to supply the town and district. An extension of the Crewe special supply area to include parts of Nantwich rural district has also been agreed to. It has been reported to the Authority that the North Wales Power Co.'s dam at Maentwrog has reached a height of 632 ft. The Maentwrog generating station is expected to be working by the end of the year.

The Lichfield electricity supply was formally switched on by the Mayor (Coun. F. Garratt) on July 14th. The inaugural ceremony took place at substation No. 2, on the London Road, from which energy received from Walsall is supplied to Whittington Barracks. The equipment includes three e.h.t. switch cubicles, and provision has been made for adding transformers and switchgear to serve the immediate neighbourhood. Current is received at 11 000 V and transformed down to 400 V for power and 230 V for lighting. Councillor W. Morrison, who thanked Major R. A. Dyott for the gift of the site of the substation, mentioned that W. T. Henley's Telegraph Works Co. had laid 17¾ miles of cables in connection with the scheme in five weeks.

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WIRELESS NEWS.

The Postmaster-General Discusses the Future of Broadcasting.

ON the Post Office Vote, in the House of Commons on July 10th, Sir W. Mitchell-Thomson, Postmaster-General, said there were now 2 076 000 broadcast receiving licences in force, compared with 1 387 000 a year ago. His figures did not corroborate the idea that the rate of increase in licensed listeners was falling off. The number of licences issued in June this year was 57 512, compared with 31 311 in June, 1925.

With regard to the future of broadcasting, the Postmaster-General recapitulated the recommendations of the Crawford Committee, which, he said, the Government had accepted in general. The new broadcasting authority, which would take the place of the B.B.C., would probably be called the British Broadcasting Corporation. It was proposed to secure for it a Royal Charter, allowing it to work under licence from the Postmaster-General.

The actual regulation of the finance of that body would have to be done by the House of Commons, either by legislation in the autumn or by way of Supplementary Estimates. Whichever method was adopted, it would afford a proper opportunity for discussion on the broad question of the powers of that body and its constitution. He thought it would be the autumn before he could say anything definite regarding the constitution of that body. The new body would take over the present business of the B.B.C. as a going concern, with all its assets, and he had financial arrangements in hand under which, he hoped, it would be possible for the new body to start with an absolutely clean sheet—clear of all debts, liabilities, and so on.

Continuing, Sir William said the completion of the beam system by the Marconi Co. had been delayed through causes beyond the control of the contractors, but the stations at Bodmin and Bridgwater for communication with Canada and South Africa were now practically finished. The station for South Africa would be completed a little later, about mid-August. The stations at Grimsby and Skegness, for communication with Australia and India, would probably be ready in October.

In the debate which followed, Capt. Fraser said there was ground for the fear that the Government was not giving the broadcasting service enough money. The Treasury should retain nothing of the funds contributed by listeners until adequate provision had been made for the development of better programmes.

Lt.-Commander Kenworthy said he was very sorry that the Government was going to accept the Broadcasting Committee's report. To-day there was a wireless monopoly, and they were going to rivet it on the country for another ten years. The whole thing would tend to be controlled by the Civil Service. Why should they not leave things as they were, renew the B.B.C. licence for, say, another three years, and see that Government interference was kept out of it as much as possible ?

Wireless News in Brief.

The Great Northern Telegraph Co. announces that normal telegraph communication with Peking and Tientsin has been restored.

An invention by Prof. Enthoven, which is expected to reduce atmospherics to a minimum and thus expedite wireless communication, is being tested by means of experiments between Holland and the Netherlands Indies.

The City of London Guardians have decided to instal three electric lifts at their Bow institution, at a cost of £1 650, plus £700 for structural and other incidental alterations, and £122 per annum for the maintenance of the lifts.

After satisfactory preliminary tests, an unattended fog signal has been permanently established at Roseneath Beacon, in the Firth of Clyde. It is operated by wireless equipment supplied by the Marconi Co. The transmitter is at Gourock Pier, 1¼ miles from Roseneath Beacon.

Exports of radio products from the United States during the four years 1922 to 1925, inclusive, were valued at about £5 570 250. Of these, Canada imported about £1 927 250 worth, or 35 per cent., while markets in the southern hemisphere took about 25 per cent., the principal purchasers being : Argentina, 11 per cent. ; and Australia, 8 per cent. The value of radio materials manufactured in the United States during 1925 was about £25 000 000.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

THE work of extending the Nottingham tramways to Wollaton Park is to be begun shortly.

London United Tramways, Ltd., has now 22 of its improved type of tramcars in use and a further 18 are under construction.

It is proposed to continue the Manchester tramcar service from Middleton to Hopwood, to connect with the Heywood system there.

South Shields Corporation has appointed a sub-committee to facilitate the construction of the Kearney tube railway under the Tyne from North to South Shields.

The permanent way of the new five-mile tube railway from Clapham to Morden is laid, the cables have been installed, the Morden terminus is finished, and most of the cars have been delivered. It is hoped that the line will be open in a few weeks, enabling through journeys to be made not only to the City of London, but to Edgware, a distance of 21½ miles.

The report of London County Council Highways Committee shows that the net deficiency on the L.C.C. tramways was £114 629 during 1925-6, compared with £278 441 for the previous year. Passengers carried were 690 222 969, against 682 595 733, and car-miles run 68 530 795, against 68 068 216. The committee does not favour the introduction of season tickets or halfpenny fares.

Metal and Chemical Prices.

TUESDAY, July 20th.

		Price.	Inc.	Dec.
Copper—				
Best Selected ..	per ton	£63 15 0	10s.	—
Electro Wirebars ..	,,	£66 0 0	—	—
H.C. Wire, basis ..	per lb.	9 1/16d.	—	—
Sheet	,,	9 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 1 3/16d.	—	—
Brass 60/40—				
Rod, basis	per lb.	7½d.	—	—
Sheet, basis ..	,,	9¼d.	—	—
Wire, basis ..	,,	9⅞d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£4 10 0	6s.	—
Galvanised Steel Wire, basis 8 S.W.G. ..	,,	£13 10 0	—	—
Lead Pig—				
English	,,	£33 5 0	15s.	—
Foreign or Colonial	,,	£32 2 6	17s. 6d.	—
Tin—				
Ingot	,,	£282 15 0	£5 7 6	—
Wire, basis	per lb.	3s. 7d.	⅛d.	—
Aluminium Ingots ..	per ton	£120 0 0	—	—
Spelter	,,	£33 17 6	—	£1
Mercury	per bottle	£15 10 0	—	—

Sulphur (Flowers)—Ton £11 10 0 *Sodium Chlorate*—Per lb. 3d.
,, (Roll-Brimstone)—,, £10 5 0 *Sulphuric Acid* (Pyrites, 68°)
Copper Sulphate— ,, £25 to £25 10 0 per ton, £6 15 0
Boric Acid (Crystals) ,, £37 *Sodium Bichromate*—Per lb. 3¼d.
Rubber—Para fine, 1s. 7⅛d. ; plantation 1st latex, 1s. 8¼d.

The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

The Lead Market.

Lead Consumption Remains Slack in the Cable Making Industry.

A FIRM market with prices advancing daily is reported by James Forster and Co.—in their latest report on lead market conditions—who attribute this rising to continental buying for early shipment. Home consumers have also bought for early delivery. Arrivals, on the other hand, are short, only about 9 000 tons of lead having been imported up to the middle of the month.

Consumption is quite good, except in the cable trade, where business continues to be slack. This, perhaps, is fortunate in view of the position of supplies, for had that trade been busy, an acute shortage of lead would have developed before now. As it is, there is an increasing scarcity of lead available for consumption, which is accurately registered in the market prices, the backwardation now standing at 3s. 9d. per ton.

On July 17th the close was firm at £32 for July, £31 18s. 9d. for August, £31 17s. 6d. for September, and £31 16s. 3d. for October.

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COMPANY NEWS.

Electrical Share Market Remains Quiet with Few Features of Interest—Big Improvement in Edison Swan Ordinary Shares—The Burndept Meeting.

QUIETNESS still characterises the market for electrical shares, which during the past week has presented few features of interest, save in the telegraph section. In this department there was considerable selling of Marconi's wireless shares, the result being a set-back of half-a crown in the quotation, which is back at par. Marconi's International Marine shares are also down to par, falling 1s. 3d. Eastern Telegraph ordinary stock rose 6 points to 191½, and Eastern Extension shares improved 7s. 6d. Western shares also rose ¼. English Electric and Siemens are both lower, 1s. 3d. and 1s. 10½d. respectively. Metropolitan-Vickers have eased 7½d., and General Electrics 6d. Edison Swan 4s. shares have leapt up 1s. 3d., to 11s. 3d.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
	Electricity Supply.				
10	Brompton & Kensington Ord.	31/10½	31/10½	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	90	90	100	67
15	Charing Cross Elec. Ord. (£1) ..	45/7½	45/7½	60/-	10/-
4½	,, 4½% C.P. (£1) ..	17/-	17/-	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	48/1½	48/1½	52/6	20/3
6	,, ,, 6% C.P. ..	22/6	22/6	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	59/4½	59/4½	61/3	14/6
6	,, ,, 6% C.P. ..	22/6	22/6	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	13½	13½	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	32/6	32/6	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	36/10½	36/10½	41/6	8/-
4½	,, ,, 4½% C.P...	17/-	17/-	18/6	9/6
7	N'castle & Dist. Supp. Ord. ..	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/10½	21/10½	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	21/10½	21/10½	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord (£5) ..	16½	16½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	43/1½	43/1½	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/-	17/-	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
6	,, ,, 6% C.P...	22/-	22/-	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	137½	140	183	24
6	,, 6% Pf. Stk.	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	70	69	89½	40½
4	,, ,, 4% Deb. ..	79*	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	78½	78½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	52½	52½	73½	10
4	,, ,, 4% Pf. Stk. ..	73½	73½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	77	77	89	65
4	Lon. Un. Trams. 1st Deb. ..	47	47	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	64½	64½	101½	49
5	,, ,, 5% Deb. ..	68½	68½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	63½	64	84½	19
3½	,, 3½ Pf. Stk.	64½	64½	88½	40½
3½	,, 3½% Deb.	60½*	60½*	92½	51
3½	Met. Dis. Rly. Ord. Stk. ..	52½	53	58	12½
4½	,, ,, 4½% 1st Pref. ..	78½	78½	91	45
6	,, ,, 6% Perp. Deb. ..	112½	112½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb.	65	65	73½	48½
—	Underground Elec. Rlys. Ord. (£10)	3½	3½	5½	2/3
5	Yorks. (W.R.) Trams. Ord. ..	11/6	11/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
†3½	Brit. Elec. Transformer 7% C.P.	18/9	18/9	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	67/6	67/6	62/-	26/6
6	,, ,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	23/-	23/-	23/4	19/7½
7	,, ,, ,, 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	25/-	25/-	29/-	10/-
‡15	Callender's Cable Ord.	65/-	65/-	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref...	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)..	11/3	10/-	28/9½	1/11
7½	,, ,, 1st Pref...	22/6	22/6	26/-	3/-
10	Elec. Construction Ord. ..	31/10½	31/10½	30/4	6/7½
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	13/9	15/-	29/3	7/3
6	,, ,, 6% C.P... ..	19/-	19/-	21/3	10/6
6	Ericsson Telephones 6% C.P...	22/6	22/6	21/-	12/7½
6	Ferranti 6% Pref.	17/9	17/9	18/6	16/9
7	,, 7% 2nd Pref... ..	18/-	18/-	19/-	13/9
5	,, 1st Mort. Deb. Stock..	91½	91½	96½	80½
7½	General Elec. Ord.	30/-	30/9	59/-	13/6
20	W. T. Henley's Ord.	77/6	77/6	86/6	23/3
17	Johnson & Phillips Ord. ..	63/1½	63/1½	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	24/4½	25/-	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	50/-	50/-	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	26/3	28/1½	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	28½	28½	56/2/6	19½
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb ..	74½	74½	87½	60
10	Eastern Ord. Stk.	191½	185½	213½	113/2/6
3½	,, 3½% Pref. Stk.	63½	63½	84/17/6	49
4	,, 4% Deb. ..	79½	79½	103½	62
10	Eastern Extension Ord. (£10)..	1·½	18½	21½	10/12/6
4	,, ,, 4% Deb. ..	79½	79½	97½	60
22	Gt. Northern Telegraph (£10)..	27	27	42/12/6	19
‡10	Indo-European (£25)	46½	46½	59½	25
15	Marconi's Wireless T. Ord. ..	20/-	22/6	9/16/3	20/9
7½	,, Int. Mar.	20/-	21/3	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	18½	18½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	79½	79½	10	60/2/6

For half year to June, 1925 * Ex dividend. ‡ Ex share bonus.
¶ Plus 3 p.c. in respect of 1921. † Including bonus.

SMITHFIELD MARKETS ELECTRIC SUPPLY CO., LTD.—Intm. div. 3 p.c., less tax.

DUBLIN UNITED TRAMWAYS CO., LTD.—Intm. div. at rate of 4 p.c. p.a., less tax.

CHELSEA ELECTRICITY SUPPLY CO., LTD.—Ord. div. for half yr. at rate of 9 p.c. p.a., less tax, payable Sept. 15th.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—Intm. div. 5 p.c., less tax, on ord. shs., payable September 15th.

MONTREAL LIGHT, HEAT AND POWER CONSOLIDATED.—Div. of $2 p. sh. on common shs. for qr. ending July 31st.

ANGLO-AMERICAN TELEGRAPH CO., LTD.—Intm. div. for qr. ended June 30th, 15s. p.c. on ord. and £1 10s. p.c. on pfd.

SOUTH METROPOLITAN ELECTRIC LIGHT AND POWER CO., LTD.—Intm. div. 5 p.c., less tax, on ord, shs., payable August 31st.

SOUTH LONDON ELECTRIC SUPPLY CORPORATION, LTD.—Intm. div. 5 p.c., less tax, on ord. shs., payable September 15th.

MIRRLEES, BICKERTON AND DAY, LTD.—Net pft. £17 732, plus £7 033 brt. in. Fin. div. to be paid on pref. shs.; fwd., £21 245.

HERBERT MORRIS, LTD.—Div. for half-yr. to July 31st, on 6 p.c., and 5 p.c. cum. pref. shs., the former less tax and the latter tax free.

VICTORIA FALLS AND TRANSVAAL POWER CO., LTD.—Net pfts. in 1925, £363 940, plus £117 657 brt. in. Fin. div. on ord. shs., 11 p.c., making 14 p.c. for year, and max. div. on pref. shs. (10 p.c.). To res., £50 000; fwd., £126 661.

SOUTH EASTERN POWER AND LIGHT CO.—Gross earnings of coy. and operating subsidiaries for 1925, $17 796 847, increase $7 986 017. Consolidated net operating income, after pmt. of exes., maintce. and taxes, and providing for renewals, etc., $8 627 714, agst. $4 665 471.

PACIFIC GAS AND ELECTRIC CO.—Operating rev. for 1925 $47 729 079 (inc. $3 277 493), total net income $19 168 185 (inc. $2 436 598). After providing for bond int., depreciation, etc., and paying prefd. div., div. of 8 p.c. on common stk. to be paid, leaving blce. $961 586, agst. $743 618.

SOUTH AFRICAN LIGHTING ASSOCIATION, LTD.—Pft. for 1925, £4 387, including £3 543 brt. in. With view to conserving cash resources, directors have decided not recommend div. An offer of debs. is to be made with a view to providing funds to meet cost of overhaul of Port Elizabeth undertaking.

WINNIPEG ELECTRIC CO.—Earnings for 1925 $2 067 365, inc. $752; operating excs., $3 301 903, dec. $77 592; net income $821 604, inc. $1 244. Depreciation, $173 000, prfd. divs. (7 p.c.), $210 000, common divs. (2 p.c.), $220 000; and, after deducting sinking fund and deferred and undistributed charges, surplus was $380 287, agst. $556 241.

AGRICULTURAL AND GENERAL ENGINEERS, LTD.—Trading of associated coys. shows encouraging improvement. After expre. of £70 858 on maintce., etc., 10 firms made profits amtg. to £188 632, while 2 made losses totalling £15 393. Deprecn. absorbed £75 156, taxn. £7 885, and divs. to outside shareholders, deb. int., etc., £14 077. A credit rev. blce. of £52 471 is shown in parent coy.'s accts., and this is carried fwd.

NEW GENERAL TRACTION CO., LTD.—Rev. for year to March 31st, £12 805; pft. £10 425 agst. £9 887, plus £3 695 brt. in. To gen. res. £3 000; div. 4½ p.c.; fwd. £1 689. Net pft. of Norwich Electric Tramway Co., £20 916, plus £1 248 brt. in; placed to res., £10 000; div. 4 p.c.; forward £1 605. Douglas Southern Electric Tramways, net pft., £2 517, against £1 913; no div., in view of expiration of concession; plant, etc., taken over by owners of freehold at £6 000.

ANGLO-ARGENTINE TRAMWAYS CO., LTD.—Receipts for 1925, £4 657 079, plus interest on investments and amt. brt. in, £58 330. Working exes and res., £3 588 402. Annuity to City of Buenos Ayres Tramways Co., £70 660; deb. stk. interest and sinking funds, £587 821; sinking fund for redemption of sh. cap., £8 875. Div. on 5½ p.c. pref. shs. for yr., £176 000; div. on 6 p.c. pref. shs. for yr., £183 000; to contingencies fund, £50 000; writing down investments, £10 000; fwd., £40 650. Report adopted at mtg. on July 1st.

SCARBOROUGH ELECTRIC SUPPLY CO., LTD.—Rept. recalls that in July, 1925, directors agreed to sell Scarborough Cor-

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poration the company's undertaking as at December 31st, 1925, and it was handed over on January 1st, 1926. Arbitrators for the valuation of the undertaking awarded £173 484, in addition to small sums for interest and of exes. Intm. div. 6 p.c., tax free, already paid; final div. for 1925, 5 p.c., less tax. Directors calculate that, after payment exes., return will be made to shareholders of not less than 25s. for every £1 share.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Gross earnings of subsidiary companies for 1925, $31 243 759, agst. $26 936 767; net earnings $17 489 445, agst. $16 643 472, and mis. rev. $38 061, agst $76 301, total charges of subsidiaries, $9 199 067, agst. $8 948 633; blce. to Brazilian T.L. and P. Co., $8 328 439, agst. $7 771 140, plus int. on investments, $520 155, agst. $478 381; amortisation, $300 000; net. rev. $8 255 286, agst. $7 638 917. Divs. on pref. shs. required $600 000 and four quarterly divs. on ord. shs. at 1 p.c., $4 263 266; surplus, with amt. brt. fwd., $9 075 908. To gen. res. $3 000 000; fwd., $6 075 908.

GREAT NORTHERN TELEGRAPH CO., LTD., OF DENMARK.—Report for 1925 states, in regard to company's concession in respect of Iceland cable, expiring in 1926, that negotiations with Danish and Icelandic Governments have resulted in agreement granting prolongation until end of 1934, unless previously terminated by notice by either party. By agreement with the British Post Office the marking of the cable between Scotland and Norway acquired from the company in 1911 and a duplicate cable laid by the two Governments in same year has, so far, remained in hands of company, but, as remuneration has gradually become insufficient, the company has been compelled to terminate arrangement as from middle of May, 1926. Total receipts £1 378 769, brt. in £313 670, div. and bonus 20 p.c. less tax, to res. £19 444, directors' remuneration, £3 056, fwd., £244 438.

Company Meetings.

PETTERS, LTD.—At the annual mtg. last week Sir Ernest W. Petter, said the past year's trading showed continued improvement, which was particularly gratifying in view of the cloud of trade depression which had overhung the country, and especially the engineering industry. The fact that they could regard their position in the industry as second to none was due to ceaseless striving and a willingness to adopt improvements, even at some sacrifice of immediate gain. The net profit was £28 516, and the disposable balance £47 048. A half-year's preference dividend to March last and a dividend of 5 per cent. on the ordinary shares, both less tax, were recommended, and £10 000 was being placed to special reserve.

GREENWOOD AND BATLEY, LTD.—Col. O. C. Armstrong, at the annual mtg., said an analysis of the company's orders showed that the shrinkage in foreign orders closely followed the curve of unrest. The immediate outlook was not promising. In the year under review the general impression of unstable labour conditions all served to restrict orders or to deflect them to other countries. This seriously affected their output and profit. Although there were many inquiries there was a marked disinclination to place orders pending a settlement of our domestic troubles. The reserves and surplus of profit and loss account totalled over £200 000 or 57 per cent. of the paid up ordinary capital. The liquid assets continued to make the balance sheet a favourable one, the total being £371 372. Dividends making 7 per cent. on the preference and a dividend of 5 per cent. on the ordinary shares were approved.

BURNDEPT WIRELESS, LTD.—Sir C. George C. Hamilton, at the annual meeting last Friday, said the board regretted that the first directors' report made such a poor showing. It was impossible to foresee that during last winter there would be a world-wide slump in the domestic wireless trade. They purchased further machinery, enlarged their factories, and, in fact, did everything to ensure greater production and a more efficient selling of their output. In spite of all efforts, the turnover for the nine months ended December, 1925, was only £210 297, against their predecessor's £266 656, in spite of the fact that the company had opened 3 164 new accounts. The executive and staff were hard at work to retrieve the position, and they had every reason to expect that they would pull through and put the company in such a state that it would be able to pay its shareholders at the end of the season at least the dividend which they were missing at the moment. In reply to remarks by shareholders, the chairman said the directors had voluntarily agreed to accept half fees while the company was in such a bad position. The big thing they had tried for had not come off, but, with the shareholders' confidence, they would pull through. The management expenses had been reorganised, and a saving of £15 000 per annum should result. A committee, consisting of Mr. R. A. Handyn, Mr. Norman Hart and Mr. P. F. Heybourn, was appointed to co-operate with the board in finding two new directors.

New Companies.

FRASER AND BORTHWICK, LTD.—Cap., £20 000. Electrical engineers, etc. Reg. office: 59, Pitt Street, Glasgow.

A. JOHNSON AND SON (HULL), LTD.—Cap., £1 000. Electrical engineers., etc. Reg. office: 265, Hessle Road, Hull.

D.M., LTD.—Cap., £7 500. Wireless telegraph, telephone and general engineers, etc. Reg. office: 125, Rosebery Avenue, London, E.C.1.

TAMWORTH PARK CONSTRUCTION CO., LTD.—Cap., £2 000. Electric light fitters and repairers, etc. Reg. office: 54, Tamworth Road, Mitcham, Surrey.

DAVID ALLEN SCRIPTOGRAPH CO., LTD.—Cap., £3 600. Advertising agents, proprietors of electrical and other signs, etc. Reg. office: 1, Wardour Street, London, W.1.

UNEEDA SUPPLIES CO., LTD.—Cap., £1 000. Electrical and motor appliance supply merchants, etc. Reg. office: 606/7, Bank Chambers, High Holborn, London, W.C.1.

EL BE UTILITIES, LTD.—Cap., £500. Manufacturers of and dealers in wireless and electrical goods and accessories, etc. Reg. office: 306A, St. Paul's Road, Finsbury Park, London, N.

HUDSON'S BAY CO., LTD.—Cap., £100. Constructors of railroads and tramways, manufacturers and suppliers of electricity, etc. Solicitors: Freshfields, Leese and Munns, 31, Old Jewry, London, E.C.

ELMESAN (LONDON), LTD.—Cap., £5 000. Electrical engineers and contractors, manufacturers of and dealers in electrical and wireless goods, etc. Reg. office: 66, Victoria Street, London, S.W.1.

C. H. REES AND CO., LTD.—Cap., £3 000. To adopt agreement with L. Jacobs (London), Ltd., and carry on business of agents for electrical supplies, etc. Reg. office: 6, Dyers Buildings, Holborn, London, E.C.1.

COWAN AND LINTON, LTD.—Cap., £3 000. To acquire business of electrical engineers carried on in Greenholm and Glainsnock Street, Cumnock, as Cowan and Linton. Reg. office: 54, Ayr Road, Cumnock.

C. B. JACKSON AND CO., LTD.—Cap., £3 000. To carry on business of heating engineers formerly carried on by C. B. Jackson, at 7, Hobart Place, and that of electricians, manufacturers of and dealers in heating appliances, etc.

RETROSONIC, LTD.—Cap., £5 000. To acquire from J. Wilcockson the trade mark "Retrosonic," and to carry on the business of electrical, mechanical and radio engineers, etc. Solicitor: H. Bedford, 30, Bank Street, Sheffield.

YORKSHIRE IGNITION CO., LTD.—Cap., £1 000. Battery and magneto manufacturers, manufacturers of and dealers in electrical ignition apparatus, wireless instruments, etc. Solicitor; R. B. Grayson, 10, Figtree Lane, Sheffield.

SHERINGHAM DAYLIGHT CO., LTD.—Cap., £4 050. To acquire business of artificial daylight lamp manufacturers carried on by H. Philipson as the Sheringham Daylight Co. Solicitors: Ford Lloyd and Co., 53, Russell Square, London, W.C.1.

S. T., LTD.—Cap., £100. Manufacturers and repairers of and dealers in apparatus, valves and accessories for wireless telephony, wireless telegraphy, submarine signalling, wireless broadcasting, etc. Reg. office: Orient House, 42/45, New Broad Street, London, E.C.2.

ERA PRECISION INSTRUMENT CO., LTD.—Cap., £1 000. Inventors, designers and manufacturers of and dealers in electrometers, galvanometers and any other kinds of recorders, electrical, wireless engineering and other appliances, etc. A first director: R. J. Colley, Down Hall Mills, Kingston-on-Thames.

BRADWELL ELECTRIC WIRE AND ENGINEERING CO., LTD.—Cap., £2 000. Manufacturers of and dealers in drawn wire, electric cabling and electric lamps and all articles made from tungsten, molybdenum and other metal, etc. Reg. office: 9 and 10, Balfour House, Finsbury Pavement, London, E.C.2.

MIDLAND TUBE CO., LTD.—Cap., £1 000. To acquire branch of the business of Midland Tube and Forging Co., Ltd., relating to manufacture of tubes, and to carry on business of manufacturers of and dealers in metal tubes, conduit tubes for electric wiring, etc. Solicitors: Pinsent and Co., 6, Bennetts Hill, Birmingham.

ELECTRO-CHEMICAL DEVELOPMENT SYNDICATE, LTD.—Cap., £2 500. To take an assignment of an agreement between the Ammonia Cassale S.A., and the Power Securities Corporation, Ltd., to carry on the business of manufacturers of and dealers in electrical apparatus and materials, etc. Solicitors: Kenneth Brown, Baker, Baker, Lennox House, Norfolk Street, London, W.C.2.

MCWHIRR, PATERSON AND CO., LTD.—Cap., £1 000. To acquire the stock, etc., of the business of McWhirr and Paterson, carried on by Mrs. J. D. Andrews, at 20, Keen's Yard, St. Paul's Road, Highbury Corner, London, N.1., and the business of George Paterson and Son carried on by G. G. Paterson at 107, Clerkenwell Road, London, E.C., and to carry on the business of manufacturers of and dealers in wireless parts, components, accessories and sets. Reg. office: 7 and 8, Keen's Yard, St. Paul's Road, Highbury Corner, London, N.1.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

KINZETT, F. E., AND SON, 54, Fielding Road, W., wireless factors. £14 13s. 2d. June 7th.

MOSELEY ELECTRICAL CO., 553, Moseley Road, Birmingham, electrical engineers. £11 2s. June 9th.

SERVICE BATTERY CO., 28, Clipstone Street, Great Portland Street, W., wireless dealers. £16 1s. June 3rd.

WIRELESS INSTRUMENT MANUFACTURING CO., Avenue Road, Willesden Junction. £10 9s. 4d. June 4th.

Receiverships.

KIRBY (WIMBLEDON), LTD. W. T. Flower, of 12, Hill Road, Wimbledon, was appointed receiver and manager on July 8th, 1926, under powers contained in debenture dated November 23rd, 1925. W. T. Greenland, of 8, Dunmore Road, Wimbledon, ceased to act as receiver or manager on the above first-mentioned date.

WIN-SUM ELECTRIC DIFFUSERS, LTD. P. E. Slack, of 44, Bedford Row, W.C.1, was appointed receiver and manager on July 9th, 1926, under powers contained in first mortgage debentures dated February 2nd, 1926, in lieu of G. A. Siday, whose appointment has been revoked.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

ELECTROLUX, LTD., London, W., electricians.—Registered July 9th, debenture to Bank; charged on Omnia Works, Leagrave, etc., also general charge. *£25 000 Bank. October 24th, 1925.

WORTEX MANUFACTURING CO., LTD., London, W., manufacturers of electrical apparatus. Registered July 1st, £1 000 1st debenture, to C. A. Seabridge, 24, Beauval Road, East Dulwich; general charge. *Nil. February 19th, 1926.

Satisfactions.

ELECTROLUX, LTD., London, W., electricians.—Satisfaction registered July 9th, all moneys, etc., registered October 10th, 1924.

ENGLISH ELECTRIC CO., LTD., London, W.C.—Satisfaction registered July 8th, £32 800, part of amount registered October 3rd, 1919.

TEES POWER STATION CO., LTD., Newcastle-on-Tyne.—Satisfaction registered July 13th, £20 100, part of amount registered May 24th, 1918.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Bankruptcy Information.

MUNDAY, Edison Douglas Stuart, 272, Lake Road, Portsmouth, electrical engineer. First meeting, July 29th, 12 noon, Official Receiver's office, 87, High Street, Portsmouth. Public examination, August 9th, 11.30 a.m., Court House, 87, St. Thomas's Street, Portsmouth.

PATTERSON, Sam, 55, Aberdeen Walk, Scarborough, electrician, First meeting, August 4th, 3 p.m., Official Receiver's office, 48, Westborough, Scarborough. Public examination, August 17th, 12 noon, Court House, Castle Road, Scarborough.

WOODHEAD, Laurence Arthur, trading as L. WOODHEAD, 25A, Charles Street, Bradford, wireless dealer. Receiving order, July 17th. Debtor's petition.

Notices of Dividends.

ARMITAGE, Fred Howard (described in the Receiving Order as F. H. Armitage), 9, Occupation Lane, Pudsey, Yorks, electrical engineer. First and final dividend, 3s. 0½d. per £, payable, July 28th, Official Receiver's office, 12, Duke Street, Bradford.

PARKER, Charles Elliott Fowlds, "Greendale," Privett Road, Gosport, Hants, electrical engineer. First dividend, 15s. per £, payable July 30th, Official Receiver's Offices, 87, High Street, Portsmouth.

RAPSON, Stanley Charles, BURRILL, Claude Leslie, and HEFFER, Alfred John, trading as THE SUBURBAN ELECTRICAL AND MAINTENANCE CO., 2, Plough Yard, Shoreditch, London, electricians. First and final dividend, 2s. 10½d. per £, payable August 3rd, at the offices of Corfield and Cripwell, Balfour House, Finsbury Pavement, London, E.C.2.

Partnerships Dissolved.

D.S.F. CO. (Joseph FOXCROFT, William DUGDALE and Harry SUTCLIFFE), wireless and electrical dealers, 82A, Manchester Road, Burnley, by mutual consent as from March 6th, 1926, so far as concerns H. Sutcliffe, who has retired from the firm. Debts received and paid by J. Foxcroft and W. Dugdale, who will continue the business.

RADIO REPAIR AND ACCUMULATOR SERVICE (William Charles ADAMS and Frederick William GOODWIN), radio repairers, etc., 5, Carshalton Grove, Sutton, Surrey, by mutual consent as from May 4th, 1926. Debts received or paid by W. C. Adams and W. S. Hawkins, of "Claremont," Carshalton Road, Sutton, Surrey. The business will be carried on in the future by W. C. Adams and W. S. Hawkins.

R. WRIGHT AND CO. (Robert John WRIGHT and John Edward CONNELL), Electrical Engineers, Tyson Street, Cheetham Hill, Manchester. By mutual consent as from May 31st, 1926. Debts received and paid by R. J. Wright, who will carry on the business.

Bankruptcy Proceedings.

PYE, Ernest Arden, 4, Oxford Mews, Edgware Road, London, W. The public examination of this debtor, who has been engaged in the electrical trade, was held in the London Bankruptcy Court on Tuesday of last week, his statement of affairs showing liabilities £1 825, expected to rank against estimated assets £636 net. It appeared that the debtor was apprenticed to the motor engineering trade in which he was employed until 1915 when he joined the Forces. He was demobilised in 1919 and in November of the following year he began business as an electrical engineer and dealer in electric lamps and signs under the name of PRYCE AND CO., the business being transferred in October 1922 to a limited company, which was formed for the purpose of acquiring it. The company carried on business until April 5th, 1923, when a receiver was appointed at the instance of the debenture holder, followed by a compulsory winding-up order. The company's liabilities amounted to £3 042 and no dividend had been paid to its creditors. In September 1923 the debtor began to trade on his own account again under the style of ELECTRO-FACTORS from 8, Hyde Park Square Mews, W. In the following March he was joined in partnership by another person who paid £250 for a half share in the business, but the partnership was dissolved in September last, the business being left with him (debtor). He agreed to pay his partner £275, of which sum, however, £225 was still outstanding. The debtor then received sums of money amounting to £332 from a person with whom it was his contention that he entered into a verbal partnership agreement. The business was conducted under the same style of Electro-Factors from premises at 4, Oxford Mews. It was the debtor's allegation that stock and cash to the value of £638 were improperly removed from the business, with the result that he was not in a position to continue the trading. In the middle of January the business was closed. The debtor attributed his failure and insolvency to this cause, the £632 of stock and cash having been removed without his knowledge or consent, and to losses in trading since September last.

STRODE, Douglas M., 44-50, Osnaburgh Street, N.W., and 6 and 7, Creed Lane, E.C., engineer. The debtor carried on business as an electrical and heating engineer and contractor. He filed his petition on July 1st and the statutory first meeting of his creditors was held on July 19th at Bankruptcy Buildings, Carey Street, W.C. It appears from statements that have been made by the debtor in the course of preliminary examination that before the war he acted as a director of Strode and Co., Ltd. In 1914 he joined up and served throughout the war, being demobilised with the rank of captain and receiving a gratuity of £100. He then returned to his former employment and acted as a director of Strode and Co., Ltd., until it went into voluntary liquidation two years ago. He bought the goodwill, tools, and office furniture from the liquidator for some £300. For the first six months the business proved fairly successful, but it has since fallen away considerably, and after the sheriff some ten days ago levied execution he was advised by his solicitor to file his petition. The debtor attributes his insolvency to bad trade, to heavy overhead charges, and to lack of working capital. He roughly estimates his liabilities at £4,000, due to 40 creditors, and values his assets at £1,000. The meeting passed a resolution for the appointment of Mr. E. H. Hawkins, I.A., 4, Charterhouse Square, E.C., as trustee of the debtor's estate. The following are creditors:—Credenda Conduits, Co., Ltd., £101; Baxter and Caunter, Ltd., £92; Tucker and Edgar, £94; General Electric Co., Ltd., £135; Westminster Bank, Ltd., £2 082; Piggott Electrical Co., Ltd., £42; Lumbys, Ltd., £214; Wansey Stammers and Co., £215; Sanders Wm., and Co., £46; Boulting, J., and Sons, Ltd., £55; Nalder Bros. and Thompson, Ltd., £11; Norton and Gregory, Ltd., £14.

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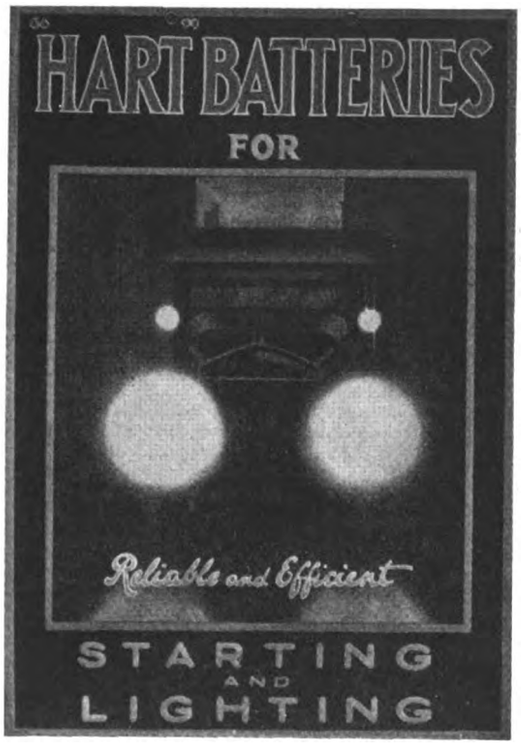
PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

239 663 R. S. Elven. Means of supplying thermionic valves from alternating current mains. (30/7/24.) (Cognate application 1 328/25.)
239 670 W. J. Mellersh-Jackson (A. Taylor). Radio telegraphic systems. (5/8/24.)
239 674 F. H. Alston. Electric inductance coils. (12/8/24.)
239 679 H. A. Yoward. Holders for electromagnetically coupled coils. (21/8/24.)
239 680 G. A. Mitchell. Holding means for inductance coils for use in wireless systems. (21/8/24.)
239 687 W. J. Polyblank and H. A. Watts. Electric terminals or other screw couplings. (26/8/24.)
239 702 C. A. Collins. Rheostats. (10/7/24.)
239 705 English Electric Co., Ltd., and E. R. Briggs. Cooling arrangements for use with dynamo electric machines. (17/9/24.)
223 896 Hecla Electrics Proprietary, Ltd. Electrically heated kettles and like vessels or utensils. (22/10/23.)
239 724 H. H. Berry. Electric fires or radiators. (10/10/24.) (Cognate application, 2/132/25.)
239 725 English Electric Co., Ltd., and F. D. H. Bremner. Electric motor control gear. (16/10/24.)
239 736 General Electric Co., Ltd., A. C. Bartlett, R. Le Rossignol, and H. W. B. Gardiner. Electric discharge tubes. (30/10/24.)



A striking coloured showcard dealing with car starting and lighting batteries, which is now available for the trade.

226 784 H. J. J. M. de Regnauld de Bellescize. Electrical apparatus for the elimination of aperiodic disturbances. (28/12/23.)
239 741 Calor Elektrizitats-Ges., and O. Dreyer. Devices for protecting electrical circuits from overheating. (1/12/24.)
239 743 M. J. Railing and E. L. Randall. Means for adjusting electric lamps. (2/12/24.)
239 749 H. Robinson. Apparatus for heating liquids by electricity. (9/12/24.)
239 751 H. R. Hodgson and C. Millar. Variable electrical condensers. (11/12/24.)
239 754 Chloride Electrical Storage Co., Ltd., and B. Heap. Electric accumulators. (15/12/24.)
239 755 British Thomson-Houston Co., Ltd. (General Electric Co.). Induction furnaces. (16/12/24.)
227 821 Det Norske Aktieselskab for Elektrokemisk Industri Norsk Industri-Hypotekbank. Electrodes for electric furnaces. (17/1/24.)
227 454 Westinghouse Electric and Manufacturing Co. Vacuum electric tubes. (8/1/24.)
239 771 Callender's Cable and Construction Co., Ltd., and E. Warbrick. Electric junction boxes and the like. (22/1/25.)
239 787 British Thomson-Houston Co., Ltd. (International General Electric Co., Inc.). Method of producing cores of powdered and compressed magnetic material for induction coils and the like. (12/3/25.)
235 840 General Electric Co., Ltd. Tungsten arc lamps. (21/6/24.)

Applications for Patents.

July 5th.

16 767 British Insulated Cables, Ltd., and G. H. Nisbett. Electric cables.
16 808 A. F. Bulgin. Electric coupling.
16 775 F. B. Cox. Electric switchgear.
16 856 Edison Swan Electric Co., Ltd., and G. E. Webster. Electrical couplings.
16 790 B. Jirotka. Telephone receivers, etc.
16 843 E. Mate. Electrical plug boxes. (4/7/25, Austria.)
16 810 C. Pressland. Rheostats.
16 822 J. Rezelman. Synchronised asynchronous electric motors.
16 798 Silica Gel Corporation. Dry charged battery plates. (13/7/25, U.S.)

July 6th.

16 823 A. Baer. Crankshafts. (6/7/25, Germany.)
16 860 H. J. Creffield. Apparatus for transmission, etc., of electrical signals.
16 883 M. Frischke, K. Schiffmann, Telephon-Apparat-Fabrik, and E. Zwietusch and Co. Ges. Telephone systems.
16 941 General Motors Corporation. Electrolytic deposition of chromium. (6/7/25, U.S.)
16 949 Gramophone Co., Ltd. Thermionic tube circuits.
16 912 A. Mathisen. Thermionic valve holders.
16 922 W. G. Patterson and Siemens Bros. and Co., Ltd. Automatic telephone systems.
16 898 Studien-Ges. fur Wirtschaft u. Industrie. Electric furnaces. (27/2/25, Germany.)

July 7th.

17 053 W. A. Appleton and J. Joseph. Crystal detectors, etc.
16 980 J. H. Ashman. Electric accumulator.
17 034 P. S. D. Barker. Electric connectors.
17 069 R. H. Billingsley and P. L. Wostear. Thermionic valve circuits.
16 988 A. M. Bridger. Electric switches, etc.
17 030 British Thomson-Houston Co., Ltd., and H. S. Petch. Electric regulating devices.
17 031 British Thomson-Houston Co., Ltd. Electrode structures for thermionic devices. (8/7/25, U.S.)
16 957 R. S. Bunting and E. A. Taylor. Control switch for wireless apparatus.
17 019 Burgess Laboratories, Inc., C.F. Galvanic cells. (7/7/25, U.S.)
17 020 and 17021 J. M. Burnett and W. Haddon. Electric accumulator plates.
16 982 B. A. Butt. Electrical loud-speaking telephone.
17 061 A. E. Clarke, H. H. Jaques, and L. R. Lester. Electrical integrating apparatus.
17 032 International General Electric Co., Inc. Brush gear for electric meters, etc. (7/7/25, Germany.)
17 042 F. W. Leake and Tyer and Co., Ltd. Time switches for electric circuits.
16 968 W. D. Meagher. Electric signalling devices for motor cars.
17 046 and 17 047 Metropolitan-Vickers Electrical Co., Ltd., and E. Y. Robinson. Thermionic cathodes.
17 002 Pirelli and Co. High tension electric cables. (1/9/25, U.S.)
17 005 Pirelli and Co. High tension electric cables. (2/9/25, U.S.)
17 045 Standard Telephones and Cables, Ltd. Electro-magnetic devices. (25/7/25.)
16 977 Standard Telephones and Cables, Ltd. Radio receiving systems.

July 8th.

17 161 J. Barrett and R. F. Wright. Electrical heating.
17 098 R. E. Beswick. Containers for electric accumulators.
17 138 British Thomson-Houston Co., Ltd. Electric remote control systems. (22/7/25, U.S.)
16 926 L. Burn. Electric heaters, etc.
17 134 E. J. Dickins and R. S. Bartlett. Crystal detectors.
17 126 A. T. Dowdell. Wireless receiving apparatus.
17 179 Edison Swan Electric Co., Ltd., and G. E. Webster. Preparation of electric accumulator plates.
17 171 Ferranti, Ltd., and A. Hall. Variable electric condensers.
17 178 A. J. Garrod. Thermionic valves.
17 099 T. Gladdy. Electric switches.
17 137 N. F. S. Hecht and G. Morton. Wireless transmitting systems.
17 076 W. F. Lesson. Electric light generator for vehicles.
17 124 A. A. Linsell. Electric terminals, etc.
17 087 D. Macfarlane. Means for electrically welding sheet-metal seams.
17 177 E. T. Peice. Electric switches.
17 072 F. M. T. Reilly. Loud speakers.
17 104 T. W. Simpson. Electric lighting arrangements for vehicle headlights.
17 109 R. E. Worsley. Sound amplifiers for wireless telephony.

July 9th.

17 259 N. Blades and Sterling Telephone and Electric Co., Ltd. Telephone transmitters.
17 234 British Thomson-Houston Co., Ltd. Electron discharge devices. (26/7/25, U.S.)
17 233 British Thomson-Houston Co., Ltd. High frequency induction apparatus.
17 287 F. C. Curtis and Curtis Manufacturing Co., Ltd. Electrical heaters.
17 269 Ferranti, Ltd., and S. Z. de Ferranti. Loud speaking telephones.
17 231 T. F. B. Hall and M-O Valve Co., Ltd. Thermionic valves.
17 235 International General Electric Co., Inc. Electron discharge devices. (13/7/25, Germany.)
17 214 A. E. Knowles. Electrolytic cells.
17 257 G. Wilshire. Electromagnetic belts.
17 194 C. R. Yates. Electrical insulation of railway rails.

July 10th.

17 324 H. Aron Elektrizitatszahler-fabrik Ges. Electric time switches. (11/7/25, Germany.)
17 346 E. C. Choat and G. Ellison. Couplings for electric cables.
17 344 Compagnie pour la Fabrication des Compteurs Soc. dite l'Action a Distance. Electric control at a distance. (10/7/25, France.)
17 319 H. J. Garnett, J. A. Holden and W. S. Smith. Alloys and manufacture of electrical conductors.
17 320 H. J. Garnett, J. A. Holden, and W. S. Smith. Continuously loaded submarine cables.
17 327 J. A. M. Hawadier. Valves for wireless telegraphy. (10/7/25, France.)
17 342 W. G. Patterson and Siemens Bros. and Co., Ltd. Automatic, etc., telephone systems.
17 323 J. S. Peress. Resistances for wireless apparatus.
17 348 C. A. Vandervell and Co., Ltd., and H. G. White. Loud speakers.
17 325 Western Electric Co., Inc. Electromechanical translating device. (3/11/25, U.S.)
17 313 R. Woods. Grid leaks, etc., for wireless telephony, etc.

Dating of Patents.

Board of Trade Committee Invites Suggestions from All Interests Concerned.

As previously announced, a Committee has been appointed by the Board of Trade to consider whether any—and, if so, what—change is desirable in the practice of (a) dating patents, applied for under Section 91 of the Patents Acts, as of the date of application in the foreign state; and (b) dating patents granted upon ordinary applications as of the date of application in the United Kingdom.

The main question which the Committee has to examine is whether this practice should be continued, or whether patents granted upon applications made under Section 91 should bear some later date, such as the date of application in this country, or the date of grant of the patent, while still giving the applicant the priority as regards inventorship, which must be given to him under international arrangements.

The Committee will be glad to receive suggestions or representations upon the matters covered by their terms of reference. In considering the questions involved, the Committee desires that due regard should be paid to all the interests involved—i.e., the interests of inventors, manufacturers, consumers and the public generally. Communications should be addressed to Mr. B. G. Crewe, the Patent Office, 25, Southampton Buildings, London, W.C.2.

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THE ELECTRICIAN

ESTABLISHED 1861.

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The Electrician.

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MARINE PROGRESS

THE continued stagnation which has been a noticeable feature of the British shipbuilding industry since the war, has shown little signs of improvement since the last Annual Marine Issue of THE ELECTRICIAN was published twelve months ago. It remains to be seen whether the position will change before long, as we all hope it will. Until it does the reaction which any improvement may cause on the electrical industry must largely remain a matter of speculation. Even now, however, two things are clear, one unsatisfactory and one satisfactory. The first is that British shipbuilders and more British marine engineers are still uneducated in the advantages of electric ship propulsion, and the other that electricity is being more and more employed for auxiliary purposes on ship board, in which term may be included such uses as heating and cooking and, above all, communication. Without undue optimism, therefore, it may be hoped that when trade does at last revive, electric propulsion may receive that attention which its merits undoubtedly deserve. For it is not an incorrect deduction that what electricity can do in small things it can also do in great.

On another page of this issue Mr. CHARLES RETTIE gives a short review of the present position of electric propulsion for ships. As our readers will remember, the United States Government have already laid down that all ships, before they qualify for the auxiliary cruiser subsidy, must be electrically propelled. This in itself is a striking tribute to this form of drive. Unfortunately, even in the States, prejudice is so great as sometimes to counteract this advantage, and ships, though suitable for the purpose mentioned, are still being equipped with steam engines. In France some small progress is being made, but little elsewhere. That this should be the position in this country is, as Mr. RETTIE rightly points out, a pity, as British engineers, notably MAVOR, were the first to take up the idea of electric propulsion. It is the more unfortunate as the partial failure that there has been with this class of plant, especially in the early days, was more due to defects in the driving machinery and bad design of the auxiliary plant than to any defect in the electrical equipment itself.

While electrical propulsion stagnates, great progress is being made in the equipment of ships with internal combustion engines, notably those of the Diesel type. Probably over half the tonnage now being built is equipped in this way. These engines, after a period of difficulty, which was only overcome by the exercise of great ingenuity and enterprise, now possess great advantages both technically and economically. Their use is likely to increase. This is a form of development which is of direct interest to the electrical industry. A Diesel engine requires no boilers, but it does need a not inappreciable quantity of auxiliary plant for starting, fuel supply and scavenging purposes. It is both economic and convenient to provide this electrically. The result is that the electrical industry is called upon to supply large electrically driven blowers and other similar plant, such as that manufactured by the British Thomson-Houston Co., which we describe elsewhere in this issue.

In addition, on a Diesel engined ship it is again both economic and convenient that the auxiliary equipment such as pumps, fans, hoists, winches, capstans, and so on, should be driven electrically. The result is that every motor ship, to adopt a convenient phrase, is at least a semi-electric ship as well; in fact the proportion of electrically driven plant installed may reach as high a figure as 80 per cent. It is, therefore, obvious that there is a field here which is worth cultivating by electrical engineers, the more so as the problems that arise are not difficult to solve and may be summed up in the two words: protection and robustness. One exception to this rule is provided by the steering gear. This offers a great chance for ingenuity so that the movements of the rudder may be controlled accurately from the bridge by electrical means. A number of ingenious methods of doing this are already available.

The applications of electricity on shipboard do not however stop at power. They include heating and cooking, of which, we are glad to say, increasing use is being made. Nearly all modern liners, notably the R.M.S.P. "Asturias" and the Union-Castle liner, the "Carnarvon Castle," are generously equipped not only with modern systems of lighting, but with ventilating fans both large and small, with radiators and with an increasing proportion of cooking equipment. That this should be so is not strange. If there is one place more than another where the convenience of employing electricity for these purposes are evident it is on board ship. And it is thus surprising that the progress has not been more rapid than it has been. A survey of present conditions therefore indicates that though the all-electric ship is still to seek, the era of the

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"coalless" ship, especially for certain classes of work, is rapidly approaching.

Last, but not least, there is the field of communication, and here electricity holds undisputed sway. It is no exaggeration to say that the installation of wireless telegraphy on ships has been the means of saving thousands of lives. So far, however, it has done so by enabling nearby vessels to be rushed to the scene of a disaster. Now a step forward is being made. By the installation of direction finding apparatus such as is dealt with by Commander J. SLEE and Mr. A. BAINBRIDGE BELL in articles which we publish elsewhere in this issue, it is possible for a ship to ascertain its exact position. The importance of this in coastal waters and during foggy weather can hardly be exaggerated. In addition the range of the receiving sets has been much increased so that it is possible to obtain weather reports from long distances, while calling up devices ensure a greater reliability of service than was always possible.

It is obvious from the foregoing that greater responsibilities are placed on the marine electrician. This important question is interestingly dealt with by Mr. A. C. HARDY. The modern ship of any size not only carries a small power station but a large amount of driven plant, and the marine electrician has to undertake a variety of duties which on shore would be performed by several persons. He therefore rightly demands an increased status, and especially that the Board of Trade should revise its curious opinion that electricians are not necessary for the safety of the ship. The manufacturer on his side, too, has a grievance. The satisfactory operation of the electrical machinery depends on care and maintenance. If the ship is understaffed and the personnel is unskilled it will not receive those attentions. As Mr. HARDY says, "Marine engineering is becoming more and more a profession which demands a high and thorough scientific knowledge and successful operation depends upon a recognition of this." It is a significant commentary on the attitude of the Admiralty to such matters that they should recently have reduced the status of the naval engineers. Warfare of the future will be a warfare of engineers no less on sea than on land. It would be well for our Government officials to bear that constantly in mind.

On the whole, however, the outlook is not discouraging and that the demand for electrical machinery from the shipbuilding industry will increase cannot be doubted.

Current Topics.

The "Steel Electrician"

A SHIP in which for two reasons we take a more than usual interest has recently started its voyages on the Great Lakes. It is known as the "Steel Electrician," so that in a way we are a sort of godparent to it. It is also the first lake freighter to be equipped with the Diesel-electric drive. One reason for the adoption of this system, according to our contemporary the "Motor Ship," is that on the Great Lakes and when passing through the rivers and canals the flexibility provided by the electric system is of great advantage. Low speed is needed, and though on similar ships which are fitted with the straight Diesel drive attempts have been made to effect this by only using some of the cylinders, the result has not been altogether satisfactory. On the "Steel Electrician" the propeller speed can be controlled from 135 to 3 revs. per min. in 50 steps. This is done from the pilot house by varying the dynamo field current, the necessary flexibility being obtained by using three separate direct current dynamos, to all of which field control is fitted. The propellor motor has a full load output of 750 B.H.P. when supplied with current at the maximum voltage of 690 V. The generators are connected in series and are fitted with potentiometer control for varying the field excitation. The motor field is kept constant. An automatic power limit control on each dynamo maintains the output at a predetermined value to prevent overload. The "Steel Electrician" is said to be the first ship fitted with such an arrangement. It may be added that the power for operating the auxiliary machinery is obtained from the main generators, though there is also a 15 kW set which can be used as a reserve and in port.

Electrical Refrigeration.

A CONVERSATION we had recently with Mr. A. H. Goss confirms us in the opinion expressed last week that the British electrical industry should pay more attention to the subject of electrical refrigeration. Mr. Goss is connected with three of the largest concerns manufacturing this class of plant in the United States, and the figures he gave regarding both the actualities and the possibilities of this market were more than a little startling. Development has been steady since the war, and last year the turnover of the three firms mentioned amounted to $36 000 000. A large proportion of this was for the smaller refrigerator, such as might be installed in the houses and flats of this country. As Mr. Goss pointed out, a refrigerator extracts heat rather than supplies cold. In the earlier patterns this extraction was, of course, effected by blocks of ice. In the newer patterns it is effected by compressing a gas, which in turn is allowed to expand and flow through the pipe work of the refrigerator. The compressor which forms the machine part of the equipment is, of course, electrically driven, the motor being shut down or started up automatically by a thermostat so that the temperature in the refrigerator is always within the limits of a small range. Mr. Goss had several interesting things to say on technical matters. Up to now ammonia gas has mainly been used as the refrigerant, especially in the larger plant. It has many undoubted advantages, but there is the grave disadvantage that it is very difficult to prevent it leaking, and some attendance is therefore necessary. Sulphur dioxide, which does not suffer under this disability, has therefore been adopted as a substitute, and though chiefly applicable to the smaller equipment is gradually being used on larger and larger plant. The size of the motor used, of course, varies with the size of the refrigerator, but the load factor is about 25 to 30 per cent., and the revenue that may be expected from the smaller sizes with electricity at 5 cents per kWh is of the order of 30 dollars a month. The equipment requires no attendance and no replacements. Here, then, is another field of electrical propaganda which will be no less fruitful than those on which we are at present engaged.

The Closing of "Finsbury."

READERS of THE ELECTRICIAN will hear with regret that after an existence of nearly half a century and after vigorous efforts to maintain its activities Finsbury Technical College has now been closed. Its history may fairly be described as glorious, though the object with which it set out—that of specifically training students in the principles of science as applied to industry, untrammelled by examination—gave it the defects of its qualities and eventually brought about its dissolution. But if the teaching which was available there be disregarded altogether, Finsbury will always be famous for its men. Its students are to be found the world over in positions of responsibility, and its professors, though the list is short, were of a quality that it would be difficult to find elsewhere. Such names as AYRTON, PERRY, ARMSTRONG, SILVANUS THOMPSON, MELDOLA, DALBY and ECCLES are sufficient proof of this. Nine of the professors were Fellows of the Royal Society, and all three of the men who presided over the electrical engineering department during its existence occupied the presidential chair of the Institution of Electrical Engineers. Why then has such a useful institute closed? First, for financial reasons. It was largely maintained by the City Companies, and these bodies found it impossible after the war to maintain their contributions.

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But as long ago as 1910 there was a falling off in the number of students, largely due to the fact that no degree course was available. In 1920 it was therefore decided that the college should be closed, and, though the London County Council provided assistance for five years, that decision has now been given effect to. It is a great pity. But Finsbury will hold always a high place in the annals of technical education.

The Electricity Bill.

On Thursday in last week, after sitting for twenty-eight days, the Standing Committee completed its consideration of the Electricity (Supply) Bill, 1926. Peace will now descend on this much tortured measure until the autumn, when we hope its further ordeals of the Report Stage, Third Reading and examination by the Lords will be speedily accomplished. Looking back on the Committee's proceedings it is surprising how little change there has been in the fundamentals of the Bill. There have been a few improvements and clarifications, but most of the time has been taken up by a few obstructionists who do not want the Bill, and are now, we are informed, trying to persuade the Upper House that no one else wants it. The Government are not, however, unduly anxious about its fate; forewarned is forearmed. We hope, nevertheless, that work on the measure will be started directly the session re-opens, so that any rush at the last moment, and the ills that may arise therefrom, will be avoided. Perhaps the principal change that has been made is that matters involving possible financial hardship to electricity undertakings will now be referred to an independent arbitrator or be settled by Special Order, which will require confirmation by Parliament. This is not only a change, it is an improvement. The Commissioners retain their judicial position, and their jurisdiction will be extended. They will also prepare the scheme, and the Board will consider it instead of the other way round. Stations which become uneconomical owing to the reduction in price of electricity, made possible by the Board's activities, will now be closed, not simply allowed to "fade out" as originally intended. The measure is, therefore, one which should assist in the development of electricity in this country. Unfortunately there are a number of other questions to be decided, notably the municipal selling problem, so that we may expect yet another Electricity Bill when this is out of the way.

Walthamstow Again.

Three weeks ago we noted that the Walthamstow Urban District Council had been refused a charter of incorporation, owing to their laxity during the General Strike. One of the counts was that they had not put forward their best efforts to maintain a supply of electricity, and to emphasise this they were summoned by five firms in the district last week for contravening certain provisions of the Electric Light (Clauses) Act. The manager of one of the complainant firms stated that on May 5th two workmen came to the premises and wanted to cut off the power. When he refused admission the supply was switched off from a neighbouring sub-station, and the firm's work was brought to a standstill. In his evidence Mr. Gilbert Spurr, the electrical engineer, said that the power was cut off at the instance of the Electricity Committee, who were informed that unless such action was taken the whole of the men would be withdrawn. Similar threats were, of course, made and even carried out at other places, but the Electricity Committees concerned showed less pusillanimity and made other arrangements. Mr. Blanco-White, who represented the council, did not make matters better by suggesting that what was done was only done to prevent the town being plunged in darkness. Here again other places managed somehow, and managed successfully. We feel sorry for Walthamstow, and especially for its officials, but they will know better next time.

"The Then Value" in Operation.

Scarborough has had the distinction of providing the first case in which "the then value" of an electricity undertaking under the Electric Lighting Act of 1888 has been determined by arbitration. As is well known, Section 2 of that Act lays down the conditions under which an electricity undertaking belonging to a private company may be compulsorily purchased by a local authority. The procedure has been subjected to much criticism, for while the actual price paid might be determined by arbitration, the arbitrator in giving his award was precluded from allowing anything for goodwill, compulsory purchase or profits. The war and its financial consequences have, however, brought a stroke of fortune to the Scarborough Electric Lighting Co. and others in a similar case. Values have appreciated and as "the then value" is taken to be the amount that it would cost to construct and establish the undertaking (depreciation being allowed for) the balance is in favour of the company. The Corporation appointed Mr. Spencer Hawes and the company Mr. A. R. Hoare as arbitrators, respectively, while it was agreed that Mr. J. S. Highfield should act as umpire. A sum of £173 484 has been awarded to the company by these gentlemen. The plant capacity in the Scarborough station is now 7 140 kW. The result is that the shareholders are receiving rather more than they put into the company, a state of things which it may be said without injustice was never intended by those who framed the Act.

The Selling Powers Clause—A Secret History.

The interesting article by Mr. Walter Finlay, the honorary secretary of the Electrical Contractors' Association of Scotland, which we publish on another page of this issue, will do much to dispel the mystery that has surrounded the rejection of the new clause conferring selling powers on municipal electrical authorities, which it was suggested should be included in the Electricity Bill. The clause had, it was understood, been agreed between all the parties concerned, but Mr. Finlay shows that this view was incorrect. The Electrical Contractors' Association of Scotland objected to the clause because they felt that it would not prevent municipal authorities doing wiring work by direct labour. They therefore drafted another clause, which Mr. Finlay sets out in his article, providing that this work should be done only through a contractor. On the suggestion of the Attorney-General this clause was, however, withdrawn when the matter came to be considered in Committee, and in the event the clause giving full selling and wiring powers was also defeated. Mr. Finlay complains with justice that the attitude of the E.C.A. of Scotland to this rejected measure was misunderstood. He does not say what the attitude of those concerned was to the clause he sponsored, though he implied that the I.M.E.A. are still more stiff-necked than we believe them to be. Fortunately negotiations are still proceeding and we hope that between now and the report stage something will be done which will enable this important question to be settled once and for all. Given goodwill that should not be impossible.

Diesel Electric Traction.

As the contents of this issue amply indicate, the Diesel electric system is making great strides in the marine industries. In certain countries other than our own it is making good progress for traction work. Where there are branch lines on which the traffic is light, or where there are long stretches of main lines passing through sparsely inhabited country, a good service of the stopping trains to the less important stations can often be maintained in this way. It is not electric traction as we should like to see it, or as supply engineers would like to see it, but it does form the thin end of the wedge and is therefore worth consideration.

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ELECTRIC PROPULSION OF SHIPS.

Some Notes on Recent Progress—Details of French Ship Equipment—Overcoming Prejudices.

By CHAS. RETTIE.

A CONTRACT has recently been placed with a shipbuilding firm in America for an 18 knot 22 000 ton "turbo electric driven passenger ship" for the International Marine Steamship Co. This is to be followed by two more ships of the same size and class. Only recently a similar proposal for a large Matson liner was turned down, not on account of the fear that the electric drive proposed would not be a success, but that it would have cost 25 per cent. more than the geared direct drive which was eventually chosen. It seems, according to the naval authorities of the United States, that all ships subsidised by the American Government and eventually utilisable as auxiliary cruisers must be electrically driven. But on the grounds that the Matson liner, though it would be subsidised, is essentially a passenger ship designed for commercial purposes, it was thought unreasonable to expect a private company to bear the extra expense that would have been incurred if the electric drive had been adopted. The new electric ships, basing their estimates on the Matson liner, will cost over $6 000 000, so that the entire outlay for the three ships will be over $18 000 000, the actual estimate being about $21 000 000. In the case of the "Maholo," the name of the Matson liner, synchronous motors were to have been installed and the motors for the other liners will probably be the same. As all the ships referred to are what might be termed fair weather boats, the Matson liner sailing on the Pacific and the International Marine electric ships sailing round the coast through the Panama Canal to San Francisco no doubt the synchronous type of motor will be the best for the service required. It is still maintained that for the North Atlantic routes, if the electric drive is adopted, the induction type of motor with phase advancers will prove to be the most suitable.

On a voyage the author made from Liverpool to Montreal as electrician on one of our passenger steamships, we were 14 days going out on an 8-day trip, encountering bad weather, fog and ice all the way. When going through the Belle Isle Straits we were caught in an ice pack, and went dead slow all the time, stopping and starting frequently. Under such conditions the induction motor would show up better than the synchronous type, if not putting the latter out of court altogether. As a matter of fact it is the flexibility of the electric drive which is going to show up to advantage in such dangerous waters as regards speed regulation, reversing, and better control. No other system can give this in the same degree, whether it be the steam reciprocating engine, steam turbine and internal combustion engine, direct driving on to the propeller.

From a commercial point of view it is a pity that this country is so far behind. Other countries may have been before us in the actual application of the electric drive to marine propulsion, but this country was the first to employ the principles of controlling a.c. motors which has enabled America to be so successful, particularly in the control of the motors used on their battleships and cruisers and airplane carriers, which are electrically driven. Special reference may be made to the pioneer work of Mavor of Glasgow, and his original inventions, such as pole changing in an induction motor to get two or more speeds and the provision of different fixed periodicities for use in one motor. In the development of electric propulsion in this country we have been very unfortunate, commencing with the "Tynemouth," a vessel built for service on the great lakes of Canada. This ship was a failure, not on account of any defect in the electrical equipment, but on account of the fact that in the design of the prime mover (which was a Diesel engine) no provision was made for the extra power required for starting the induction motors that were installed. The result was that the owners lost confidence and the whole installation was replaced by a steam reciprocating plant.

Then in the case of the "Wulsty Castle," it was found necessary to install an extra boiler. The electrical equipment in this case also gave every satisfaction, but the gearing of the motors in my opinion was a mistake. One of the advantages of the electric drive is the elimination of gearing, so that if it is used on an electrically driven ship, one of the advantages of the electric drive over the geared steam turbine is gone.

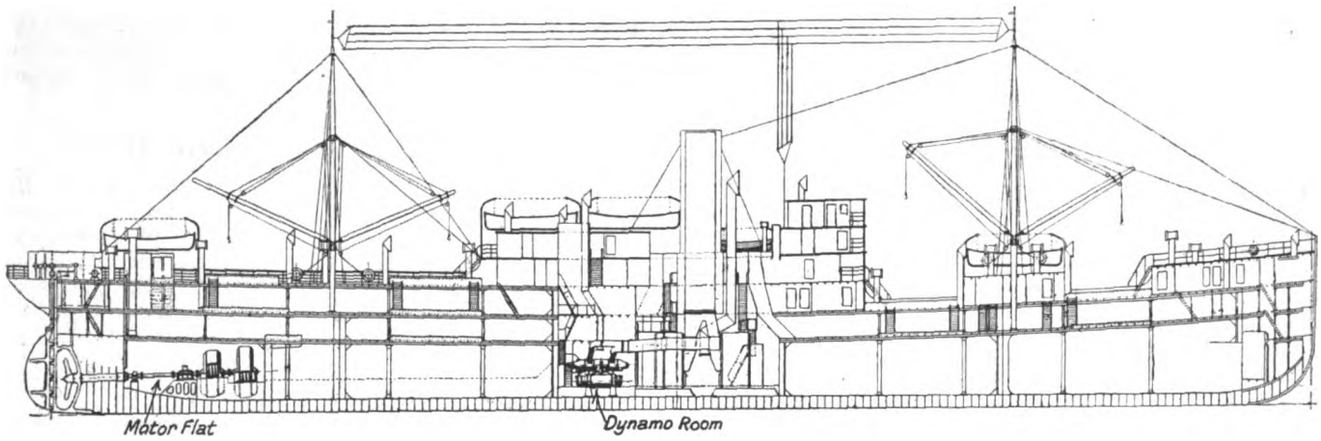

Fig 1.—Longitudinal section of the French electrically-propelled ships "Guaruja" and "Ipanema."

There have been two ships built in France, the "Guaruja" and "Ipanema," both of which are equipped with Ljungström turbines for running the generators which supply the propeller motors. This is practically the same system as is used on the "Wulsty Castle," except that in the French ships there is no gearing on the motors, which are fitted up right aft, whereas the motors on former are in the main engine room amidships. There is no reason, therefore, why gearing should be at used all, the only point being that when gearing is not used the motors have to be somewhat larger to allow a greater number of poles to be fixed on the motor to get the desired reduction in the most economic and efficient speed of the propeller.

Fig. 1 is a section of the two French ships mentioned showing the arrangement of the machinery and Fig. 2 illustrates the relative size of motors to ships hull.†

The Ljungström turbines installed on the "Wulsty Castle"‡ run about at 4 000 revs. per min., so that probably on that account the designers decided to introduce gearing on the motors. The French engineers have evidently got over the difficulty, as no gearing is used on their electric driven ships; the speed of the turbines being about 3 000 revs. per min. There are two motors on each ship, one with 48 poles for slow speeds, and the other with 36 poles for high speeds.

Coming down to more recent times I may refer in particular to the three Diesel-electric ships fitted up on the Mersey. Two of the ships are running and are giving satisfaction but the fact remains that in one of the three ships built the machinery space has been gutted and the electrical drive replaced by a steam reciprocating plant.

(*Concluded on page* 132.)

* See ELECTRICIAN October 17th, 1913.

† From a paper read by Mr. M. A. Foillard, Ingénieur-en-Chef aux Anciens Établissements Sauthers Harlé, Paris, before La Société des Ingénieurs Civils de Paris.

‡ A full description of the "Wulsty Castle" is given in "Engineering," vol. cv and cvi, 1918.

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THE MARINE ELECTRICIAN.

A Note on an Important Status Problem—Increasing Use of Electrical Equipment on Ship Board and a Grievance—Conservatism of the Board of Trade.

By A. C. HARDY, B.Sc., A.M.I.Mar.E. (Author of "Motorships," etc.).

THE marine engineering world at the present moment is vitally concerned with the progress which the internal combustion engine is making. Motorships under construction in all countries of the world occupy slightly over 50 per cent. of the total tonnage building. In Great Britain and Ireland the motorship tonnage building for the quarter ended December 31st—299 481 tons—amounted to 51·6 of the steam tonnage under construction, while on the same date the total motorship tonnage under construction in Denmark, Germany, Holland and Italy collectively exceeded the total steamer tonnage by some 392 982 tons.* During the year 1925, 51 motorships of some 267 217 tons were launched, 34 of which were of 5 000 tons and upwards, the largest being the Royal Mail Steam Packet Co.'s "Asturias" of 22 137 gross. With this increase of motor tonnage has come an increase in the amount of electrical machinery used in ships. Early motorships were "motor" only in so far as the main propelling prime mover was concerned, and the only electric machinery on board was a Diesel—sometimes steam—driven generator for supplying electric light and for wireless telegraphy. This can be taken as correct generally, though not individually, since by one firm of motorship builders in particular the potentialities of electricity on ship board were recognised from the beginning. Other builders and owners felt that they were risking sufficient by trying out a new departure for their main engine to justify a reversion to the older method in the auxiliary machinery. Contemporary opinion, however, is different, and the motorship of the present day is 80 per cent. an electric ship. By this is meant that all the machinery on board other than the main prime mover, which is of Diesel type, is electrically controlled. This on an up-to-date passenger and mail liner includes such details as fuel transfer pumps, piston and cylinder cooling water pumps, oil cooling pumps, bilge, sanitary, and wash deck pumps, fuel and lubricating oil centrifugal separators, fuel oil transfer pumps, winches, windlass, fans, galley equipment, steering gear, lighting and gyro compass. The 90 per cent. electric ship is one in which, in addition to this, the main propellers are propelled by electric motors; the 10 per cent. non-electric part of the ship being the Diesel, or in some cases steam, prime mover operating the main generators. The only 100 per cent. electric ship, or ship on which everything is controlled by electricity, is, it is interesting to note, the submerged submarine. The following table gives some idea of the electric power plant portion of large modern 80 per cent. electric ships, and takes no account of the large number of auxiliaries which the electric motors operate.

Table Showing Electric Power Plant on large Electric Ships.

Service. *Gross tonnage.*	Main Engines. *Power and Type.*	*Generating Sets.*
S. American, 22 137	2–4 str. double acting 10 000 I.H.P. each at 115 r.p.m.	Four 400 kW 220 V 180 r.p.m 4 dynamo panels } on switch- 12 feeder panels } board.
S. American, 23 500	2–4 str. double acting 10 000 B.H.P. each at 125 r.p.m.	Two 900 kW } Diesel generators. Three 450 kW }

It is obvious from the above that the electrician is playing an increasingly important part in marine engineering; so much so, in fact, that many people are beginning to think that, in order that a full recognition of his importance may be obtained, a revision of status may be necessary.

Events in the marine engineering world are moving with such rapidity nowadays that it is a little difficult even for those in governmental authority to keep fully abreast with all requirements that alterations of circumstance cause. Briefly, there are two questions which will require solution very soon; the first is the actual status of the marine engineer himself. Will he in time increase in importance to such an extent that he ultimately usurps the position and duties of the navigator, and will the electrician increase in importance to such an extent that he, in turn, ultimately usurps the position of the marine engineer? These two questions are questions which require the utmost delicacy in handling, but, for this reason, it is neither correct nor just that they should be shelved. It is with the status of the electrician that we are primarily concerned here, who just came into being as a seagoing man in the 'eighties of last century when, in the form of electric light, electricity began just to be adopted on shipboard. Then the duties assigned to him were solely the running and maintenance of a small steam driven generating set, and the rôle of electrician and third engineer were generally combined. This was quite in order, but it seems scarcely fair that at the present day, with ships carrying power plants of the order mentioned in the attached table, no electrician should be permitted to rank higher than a third engineer. Furthermore, it seems rather an anomaly, too, that the Board of Trade should consider electricians as not necessary to the safety of the ship. In this matter there is no doubt that the electrician has a genuine grievance.*

In another matter the maker of electric auxiliary machinery has a legitimate grievance, and this is the number of the electrician personnel on board. The success of electric machinery on board ship, and particularly of electric deck machinery—winches, windlass, etc., depends upon care and maintenance, and this in turn depends upon the number of men who can be spared to work upon repairs and overhauls. Where personnel is low, repair work is inevitably neglected, and when winches, etc., break down, owing possibly to faulty contactors, etc., electric deck machinery is immediately condemned upon grounds of unreliability. One particular ship, in which the whole of the auxiliary deck and engine-room machinery is electrically driven, has one chief electrician, one apprentice electrician, and four watchkeepers on duty at the switchboard and in charge of the many pump motors, steering gear, etc. This leaves the chief and one apprentice to carry out routine and emergency repairs throughout the whole of the ship, while there are no less than five non-watchkeeping day workers on the pure engineering side. It is patent, therefore, that considerable readjustments will require to be made in the near future. Marine engineering is becoming more and more a profession which demands a high and a thorough scientific knowledge, and successful operation depends upon a recognition of this.

* Vide Lloyd's Register Shipbuilding Returns for quarter ended December 31st, 1925.

* See the author's letter to "The Times," December 31st, 1925; also to "The Liverpool Journal of Commerce" for the same date.

Pulverised Fuel at Barking.

Details of Steam Raising Plant for New Extensions.

AN interesting point about the new extensions at the Barking generating station which constitute the second section of 100 000 kW is that pulverised fuel firing is to be adopted. Feed-water economisers are also to be used.

The order for the complete steam generation equipment for this extension has been placed with International Combustion, Ltd., at a cost of approximately £750 000 and it is to be completed in three years. It is understood that the steam-raising plant will consist of 10 "Babcock and Wilcox" water tube boilers of 16 500 sq. ft. heating surface each, which will be fitted with 10 "Usco" multiple plate air heaters of 18 600 sq. ft. heating surface per boiler. There will also be "Lopulco" pulverised fuel equipment, including 10 super "Raymond" pulverising mills with a capacity of 15 tons of coal per hour each with its own exhauster and cyclone separator; "Murray" water-cooled fin tube walls corresponding to a total of 65 000 sq. ft. heating surface on the whole installation; feed-water economisers of 6 100 sq. ft. heating surface; a superheater of 6 500 sq. ft. per boiler, and a complete equipment of accessories including feed pumps, with 20 induced draught and 10 forced draught electric-driven fans. Further, it is stated that each of the combustion chambers will have a volume of 10 800 cub. ft., and will be fitted with "Murray" tubes, "Lopulco" water screens, and "Detrick-Usco" suspended firebrick arches together with 11 pulverised fuel burners on the latest fish-tail principle. In addition the installation will include five steel chimneys, one for each two boilers, and a very full equipment of "Bailey" boiler house control instruments.

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BLOWERS FOR MARINE DIESEL ENGINES.

Electric Motor and Steam Turbine-driven Scavenging and Supercharging Sets—Centrifugal versus Reciprocating Blowers.

THERE are many advantages in the modern system of effecting the scavenging and supercharging of marine Diesel engines by means of independently driven centrifugal blowers of special design; the air flow is free from pulsation, the consumption of lubricating oil is small, no parts are liable to wear, both pressure and quantity regulation of the air over a wide range is possible, whilst when starting up or manœuvring a readily controlled and ample supply of air is always available.

As the operating staff has complete control of the actual quantity of scavenging air that is being passed through the engine, the necessary quantity of air to ensure perfect combustion at any load can be supplied at all times, irrespective of the temperature of the air or state of the barometer. Moreover, the use of two-cycle Diesel engines for ship propulsion, where every effort has been made to keep down the weight and dimensions of the machinery, has permitted the provision in whatever positions be most convenient of two centrifugal blowers—one set being kept as a standby. This results in a valuable saving in weight and space as compared with the older practice of using reciprocating scavenging pumps built integral with the main engines.

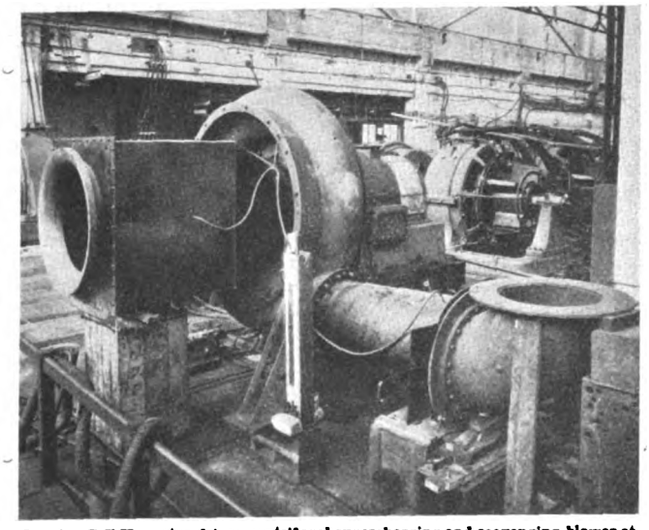

Fig. 1.—B.T.H. motor-driven centrifugal supercharging and scavenging blower at Rugby works. This is one of the largest motor driven blowers yet constructed.

Further, the slow running speed of these reciprocating pumps necessitates that they be of large diameter, and, therefore, of considerable weight, thus increasing also the overall length of the engines. Control of the volume of scavenging air supplied can be adjusted to correspond with the prevailing load only by throttling, while when starting up the engine no scavenging air is available. At the same time more supervision is required than is the case with centrifugal blowers.

It is a matter for congratulation that the largest motor-driven supercharging and scavenging blowers have been built in Great Britain, at the Rugby Works of the British Thomson-Houston Co. These blowers, which are driven each by a B.T.H. direct current motor of 460 H.P., are required for vessels of the Bibby Line, now under construction by the Fairfield Shipbuilding and Engineering Co., and one of four of these equipments, in the works at Rugby, is illustrated in Fig. 1.

The maximum capacity of this set is 39 600 cub. ft. of free air per min., delivered against a pressure of 2 lb. per sq. in. gauge, the normal rating being 36 000 cub. ft. of free air per min. against the same delivery pressure. Tests have shown that these blowers not only maintain all requirements for which they were designed but, in addition, have an ample margin. The chief characteristics are shown by the curves reproduced in Fig. 2.

The motors have each a maximum continuous rating of 460 H.P. with a speed range of 2 400 to 3 200 revs. per min. by shunt field control, the speed regulator being integral with the motor startor, as fully described later. One of these motors is shown in Fig. 3, and is one size in a standard range of 220 V d.c. machines designed for direct coupled high speed drives without the use of speed increasing or reducing gears. The British Thomson-Houston Co. has considerable experience in this class of work, and has supplied a large number of sets as generators for marine work, where minimum weight and

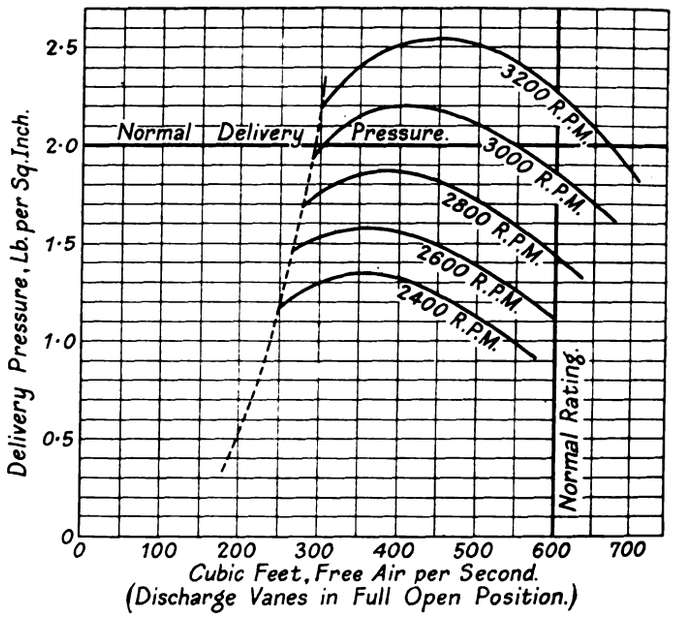

Fig. 2.—Characteristic curves of B.T.H. motor-driven supercharging and scavenging blower.

space are important considerations. This range of machines covers all requirements from 50 H.P. to 600 H.P. at speeds from 4 000 to 3 000 revs. per min., and the success which has been achieved is due to a number of special features in the design.

The armature windings, field coils and brush gear are insulated from earth by mica, suitably reinforced to give the necessary mechanical strength. Sparkless commutation is assured by the use of B.T.H. duplex brushgear, the commutator itself being of massive shrink-ring construction, with provision for ample cooling. The use of this special brushgear is an important feature, as without it continuous contact between the brushes and the commutator could be obtained only by so reducing the inertia of the brushes that the radial

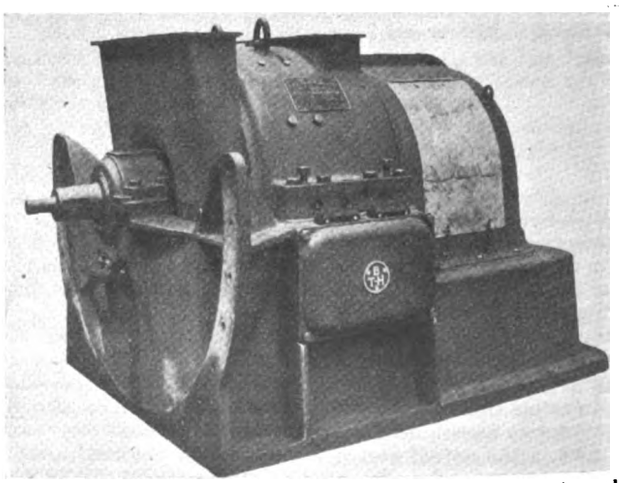

Fig. 3.—460 h.p. direct current motor for 39 600 cub. ft. supercharging and scavenging motor.

wearing length would become very small. The duplex brushgear permits the use of brushes of full radial wearing length, and the brush, being in two parts with independent springs, secures continuous contact with the commutator even under the worst conditions.

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Double axial ventilation is employed, the method being an adaptation of the system which is widely used on traction motors. By this means a sound mechanical construction is obtained and the effect of dust and dirt is minimised, as the ventilating air does not pass through the armature windings. The air intake and discharge openings are situated on the top of the machine in a convenient position for attachment to air trunking.

The field system is designed to give the best commutating conditions, and, at the same time, to make replacement of field coils simple. Complete dismantling is easy, as both the magnet frame and the bearings are split horizontally. Oil under pressure from the main engine oiling system is supplied to the bearings, regulating cocks with flow gauges being provided. The baseplate is of substantial design and carries the blower casing.

The motor startor for each of these blower equipments is a compact and complete unit of the pillar type, all the necessary equipment being contained in a strong steel pillar with only the operating handles on the exterior. Views are given in Figs. 4 and 5. The equipment includes double pole circuit breakers of the contactor type; an overlaid relay with time lag dashpot; and starting contactors, which are notched in one at a time by means of a master switch. This is mounted in the pillar and has an external handwheel for the use of the operater. There is also a field rheostat to give the necessary speed variation, the handwheel of this rheostat being mechanically interlocked with the handwheel of the master switch so that the field rheostat must be in the position of full field, that is minimum speed, during starting. Adjacent to the starting handwheel is an ammeter, so that the operater can note the currents at all times during starting. All starting and regulating resistances are self-contained and are mounted in the pillar, which has hinged removable front doors and removable back covers.

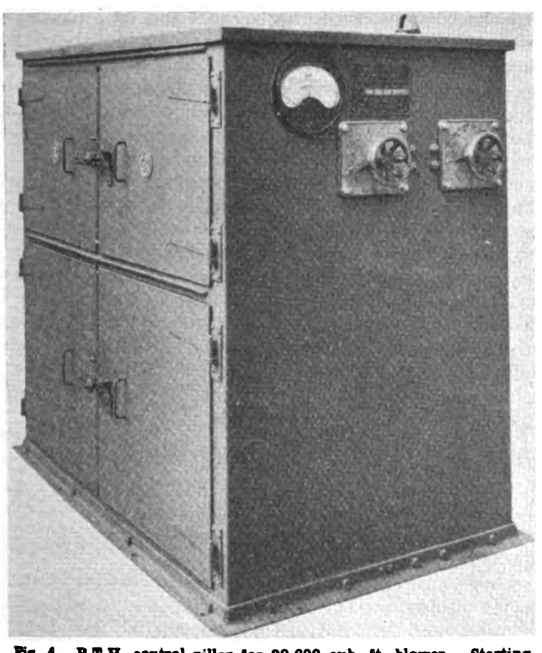

Fig. 4.—B.T.H. control pillar for 39 600 cub. ft. blower. Starting handwheel on left. Speed control wheel on right.

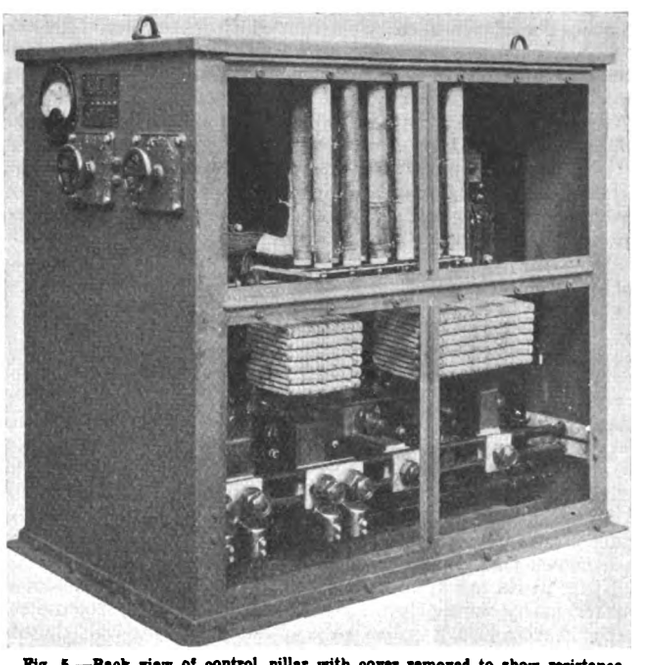

Fig. 5.—Back view of control pillar with cover removed to show resistance units, terminals, etc.

Notable features of the contactors include a very efficient and powerful blow-out arrangement, and the use of a magnet with a wrought iron frame and cast steel armature. This construction is very strong, and the magnet is lighter than if it were built entirely of cast iron or steel parts. Another important feature of these contactors is the large out-of-balance force, which prevents their being accidentally closed due to the rolling of the vessel in a sea way. The arc chutes are easily removable, thus allowing maximum accessibility for maintenance and renewal of worn parts. Ample barriers and arcing spaces preclude the possibility of arcs due to heavy overloads or short circuits reaching adjacent parts.

Interlocking arrangements are provided so that in the event of a shutdown occurring due to overload or other cause, while in a running position, the master switch must be returned to the starting position before a fresh start can be made, and the circuit breakers can only be reclosed when all the starting resistance is in circuit. The starting contactors are de-energised when in the running position, and only the running contactors, which also act as circuit breakers, are closed. Current limit acceleration is not provided, so that the rate of cutting out the starting resistance is entirely in the hands of the operater, with the exception that should the operater move too rapidly from the first point, the first starting contactor will not close and the motor will not start. It is necessary, therefore, that a definite pause be made on the first starting point. As the master switch is provided with a pawl and star wheel, definite contact is made on each point.

A short time ago large scavenging blowers, driven in this case by steam turbines, were built by the British Thomson-Houston Co. and installed in the M.S. "Upwey Grange" also by the Fairfield Shipbuilding and Engineering Company. The blowers are of the single stage design, the impellor being mounted on an extension of the turbine shaft, the whole rotor being of rugged construction and the bearing surfaces very liberal. Where the blower is driven by an electric motor the impellor is mounted directly on an extension of the motor shaft.

Movable discharge vanes of the British Thomson-Houston Co.'s improved design are used. These vanes permit a very much wider range of operation without pulsation than has been offered hitherto in this class of machinery, and at the same time they are easily manipulated from outside the casing of the blower, while the design permits of their being placed in the best position for efficient operation of the propelling machinery.

One of these steam turbine-driven blowers has a rating of 33 600 cub. ft. of free air per min. at 14·7 lb. per sq. in. absolute and 60 deg. F., delivered at a pressure of 1·8 lb. per sq. in. gauge. The same quantity of air can be delivered at 2·1 lb. per sq. in. gauge, and 36 500 cub. ft. at 14·7 lb. per sq. in. absolute and 105 deg. F., can be delivered against a pressure of 2·1 lb. per sq. in. gauge.

The oil supply of the main engines is used to lubricate the bearings of the set by gravity, and is also employed to operate the air pressure control. This is effected by a servo-motor which adjusts the throttle valve in the steam supply to the turbine, the delivery air pressure from the blower acting on a spring loaded piston which controls the movement of a pilot valve supplying oil to the servo-motor.

The firm has also received an order for six electric motor-driven centrifugal blowers, which will be the largest so far manufactured in this country. They will be used on two motor ships which John Brown & Co. are building for the New Zealand Shipping Co. Each blower will have a capacity of 42 500 cub. ft. of free air per min. against a pressure of 2·17 lb. per sq. in. gauge. The electric driving motor for each blower unit is rated at 600 H.P.

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WIRELESS AT SEA.

Some Recent Developments in Apparatus Employed on Board Merchant Ships—The Necessity for More Work on Short Wave Transmission.

By JOHN A. SLEE.

THE history of progress made in recent years in the wireless apparatus employed on merchant ships can best be divided into four parts, which can be classified as follows :—

(1) Improvements in the arrangements for furthering the safety of life at sea.
(2) Improvements in navigational facilities.
(3) Improvements in telegraphic facilities.
(4) Reduction of interference caused by ship services to the general reception of broadcast concerts.

(1) The Safety of Life at Sea regulations, national and international, have for a long time demanded that ships above a certain tonnage (1 600 tons for Great Britain) shall carry wireless apparatus of sufficient power to achieve a range of 100 miles in large ships and 80 miles in small ships, and also some auxiliary arrangement whereby a reduced range (80 and 50 miles respectively) can be achieved after complete failure of the ship's main electricity supply. These regulations have now stood for some years and technical progress has for the most part taken the form of increased efficiency and reliability of the auxiliary outfit, technically known as the " emergency " apparatus. The latest practice in British vessels has been to improve this particular equipment far beyond the legal requirements mentioned above, and the tendency of present design is to improve it still more. The usual source of power is a secondary battery, the vast majority of which are of the lead type, slight variations of the commercial car starting batteries being found highly satisfactory for the purpose.

An Unworkable Rule.

The old legislation assessing the power of the transmitter in terms of range is now practically unworkable, as the range covered by any installation is so greatly dependent on the receiver. This is now being replaced gradually by a more workable though still arbitrary assessment, based on the product of the height of a ship's aerial above water and the aerial current. The units chosen are metres for height and, of course, amperes for current, and the product is called the " metre-amps." Though not scientifically accurate, experience shows that the measurement is easy to make and fair and just in its applications, and it can be roughly translated into ranges by saying that on a wavelength of 600 m. 100 metre-amps. represent 125 miles to a crystal receiver and double that distance to a normal type of marine valve receiver. For short distance the proportion of range to metre-amps. is improved.

Recent regulations have required that a proportion of the lifeboats carried by passenger ships shall be fitted with wireless apparatus, and for these small craft 15 metre-amps. are demanded. This is a very high standard and is based on the minimum which would give a good chance of covering a range of 50 miles to a ship fitted with a crystal receiver, the wavelength being 600 m. Occasional tests show that the sets have a fair margin of safety, and where it happens that valve receivers are in use very large ranges have been covered—five or six times the legal requirement.

It has been found quite impossible to fulfil the legal requirement by means of man-driven generators, and either large storage batteries or small independent engines are employed for the purpose, the latter being the more numerous.

The sets, though small and unobtrusive, mark a high level of technical design and have to be arranged with great care and forethought to comply with the onerous but necessary Board of Trade regulations, which are framed with a view to making certain that these sets shall be ready when and if they are wanted.

Calling Device Progress.

For the last five years experiments have been in progress with the object of finding some arrangement which will ensure that a ship in distress can attract the attention of other ships during periods when telegraphists are not available for watch-keeping. These experiments have now produced apparatus which appears to be of sufficient reliability, and its general introduction will probably commence in the near future. Any such device will, of course, be called upon to pass the most stringent government tests before it is allowed to be used.

(2) Improvements in navigational facilities have taken two forms. Firstly, in the rapid and steady growth of valve receivers, which has added enormously to the range at which time signals, weather reports, etc., can be received ; and, secondly, in the improvements in quality and increases in numbers of more scientific aids to navigation, such as direction finders and their corollaries, directional transmitting stations and submarine sound ranging.

Direction finders themselves are now fitted on most first class passenger vessels and a large and growing number of other vessels. As experience is gained confidence increases in the really remarkable accuracy and reliability of these instruments. As far as the dour practical economy of a merchant vessels is concerned seven years ago these instruments might almost have been regarded as freaks, and now they may be regarded as a normal instrument of navigation. Their growing use has called for a class of station known variously as beacons, radio fog signals and radiophares, whose duty it is to provide constant targets of which bearings may be taken. All ordinary coast stations can be used for this purpose, but in nearly all cases the details of their geographical situation is such that the arc in which reliable bearings of first class accuracy can be taken is very restricted, hence the demand for properly situated " beacon " stations.

The combination of wireless with submarine sound signalling allows a distance to be determined with considerable accuracy. The usual method of working may be described briefly as follows. The transmitting station delivers a simultaneous blast by wireless and sound signaller, and thereafter a series of dots by wireless so spaced in time as to represent miles in distance. An observer in a ship fitted with both wireless and submarine sound receivers counts the number of wireless dots heard before the submarine sound is heard, and thus determines the distance in miles. This scheme has been worked up to as great a distance as 30 miles.

Direction Finding Work.

Direction finders are also installed on land, and ships wishing to know their bearing call up the station and make a pre-arranged signal. The land station observes the bearing and signals it back to the ship.

The whole subject of directional transmitting stations is still in its infancy. The idea is that the sending station shall be arranged so that its emission shall be confined in a beam which sweeps round the horizon. The direction can be obtained either by timing the period between some arbitrary datum signal transmitted equally in all directions and the reception of the " beam," or by arranging that the beam itself shall transmit different pre-arranged letters as it sweeps over successive points of the compass. Perfectly successful demonstrations of the latter method have been given, the transmitter in use being adapted for very short waves of about seven metres, and the " beam " being produced by a reflector, the whole being small enough to be mounted on a turntable and rotated bodily.

(3) Improvements in telegraphic facilities have been effected in many ways, all working to the same end. Ships' receivers and transmitters have both been improved almost beyond recognition, and, in addition, a fair proportion of passenger vessels are now equipped with comparatively long wave continuous wave transmitters. Communication demands two stations, and in Great Britain and the United States good facilities exist for the exchange of ship and shore traffic by this means, to the great benefit of all. The extension of this method is at present held back by the lack of similar facilities in many other parts of the world. This point is of great importance in the development of wireless, as most ships range all over the world and it is absurd to equip them with apparatus which can only be used during a very small portion of their voyages, or to expect that they shall carry a double equipment. It must be recollected that in the vast majority of ships, the primary reason for carrying wireless is for the purpose of communicating in time of distress, and this purpose will not be fulfilled by a set which is not fully capable of communicating with all other ships and coast stations that may be in the neighbourhood wherever the ship may go.

A small number of experiments with the now fashionable

(*Concluded on page* 132.)

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MARINE DIRECTION FINDING.

Latest Developments Described—Details of the Radio Communication Company's Apparatus—Eliminating "Vertical Effect."

By L. BAINBRIDGE-BELL, B.A., A.M.E.E., A.M.I.R.E.

THE direction finder made by the Radio Communication Co., operates on the Robinson principle, which uses two coils fixed at right angles to each other, and capable of rotating about a vertical axis. The indication of the direction of an intermittent distant transmitter is obtained by equalising the strength of signal when the mutual connections of the two coils are reversed, in the manner described below.

The following is a general description of the direction finder, special attention being drawn to certain novel details. The coils are mounted on a tube (Fig. 1) which acts both as a shaft for rotating the coils and as a duct for the four leads from the coil to the tuning and switching devices. This tube rotates on ball bearings which are fixed in housings at the ends of a larger tube 10 ft. long. The large tube is fixed to the deck of the ship, and projects downwards 2 ft. into the room below, this projection carrying the tuning devices and means for rotating the coils and reading the bearings. The large tube

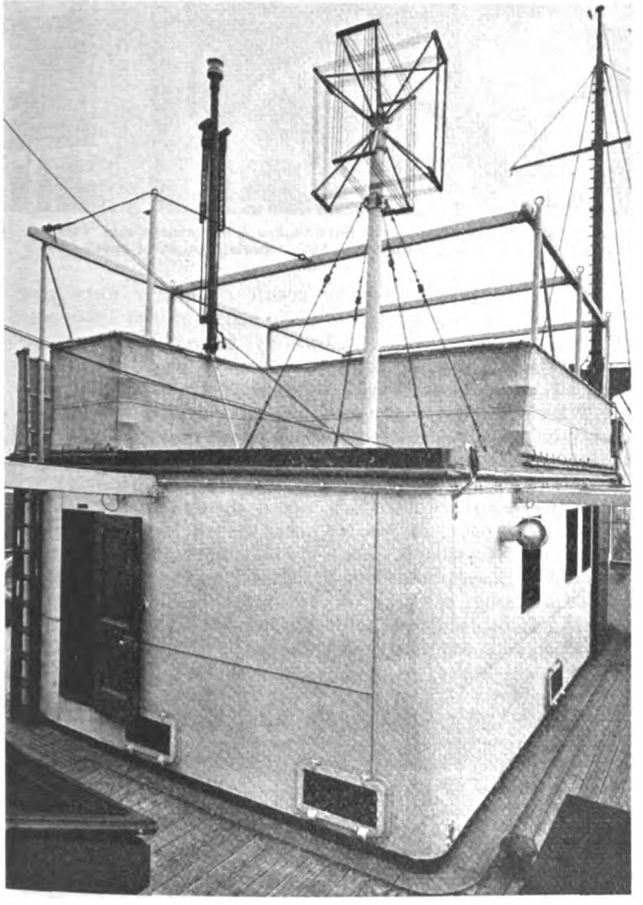

Fig. 1.—View of the aerial coils used in the Radio Communication Co.'s marine direction finding systems.

is held rigidly by a flange bolted to the deck and by four insulated stays, fitted with rigging screws for taking up any slack which may develop. In some cases it is more convenient to use brass stanchions instead of stays.

The coils are wound on a brass structure consisting of tubes radiating from a central hub and terminated by bakelite corner pieces. The large coil is wound with 18 turns and the small coil with six turns of 7/22 silicium bronze wire, each wire being under a tension of about 100 lb. This construction results in a light and exceedingly strong structure, the coils weighing less than 56 lb., and being easily capable of supporting without distortion the weight of a man standing on the wires. This rigidity is necessary as the coils may sometimes be called upon to withstand heavy seas. The coils are terminated by lead-in insulators on the hub and are connected to the tuner below by bare 12 s.w.g. copper wires held in tension and secured from vibration by bakelite spreaders at intervals down the tube. On the lower end of the tube supporting the coils are fitted the tuner unit, scale and sense indicator (Fig. 2).

The tuner unit is about 17 in. in diameter and allows a clear height of 4 ft. 6 in. below it, so that the set may be installed over a table or locker.

In earlier types of direction finder made by the Radio Communication Co., the coils were enclosed in an electrostatic earthed screen to avoid "vertical" effect, i.e., reception of signals by virtue of the elevated capacity of the coil system. In raising the coils 7 ft. above the deck (to avoid distorted electric field and interference from electrical machinery on board) the vertical effect became very pronounced, and three precautions were taken, in order to eliminate it.

(1) A transformer was inserted in between the rotating coil system and the amplifier. This avoids the assymmetry of the circuits consequent on the connection of one side of the coils to earth and the other side to the grid of the first valve of the amplifier. The primary of the transformer was connected in parallel with the tuning condenser and the coils.

(2) An earthed electrostatic screen was inserted between the primary and secondary of the transformer. This consisted of a "comb" of 38 s.w.g. wires, so arranged that no

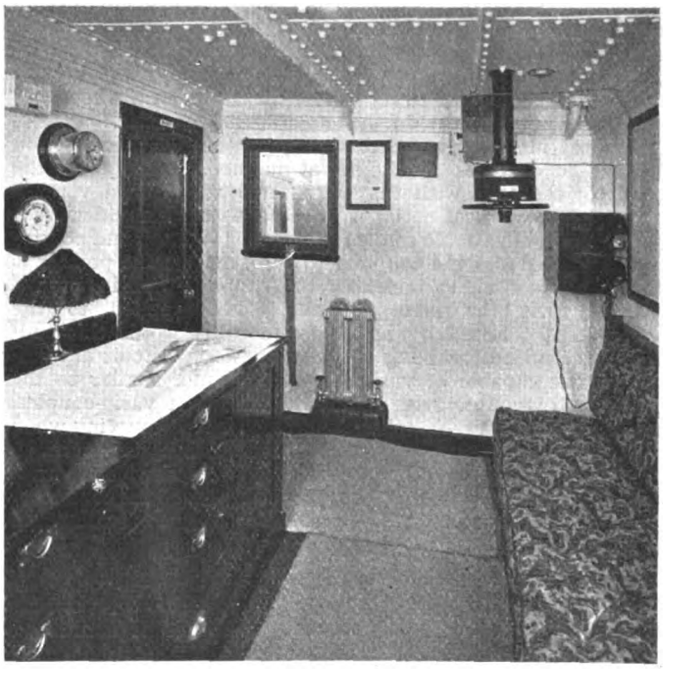

Fig. 2.—View showing d.f. set in chart room.

paths existed for the flow of eddy currents.* The use of the screen enables a very tight coupling to be used.

(3) The coils and reversing switch were arranged symmetrically and a method of adjustment arranged for the capacity to earth of the two sides of the circuit to be equalised during installation.

Precaution (3) above led to a complete rearrangement of the circuits. The normal series connections of the circuits is not conducive to symmetry, owing to the capacity of the leads from the large and small coils to the tube enclosing them. It was thought that symmetry might be attained by splitting the main coil into halves and connecting the auxiliary coils in between the two halves. This arrangement was, however, not successful. The only possible method remaining was the parallel connection. This was tried and finally adopted. An effect of this method of connection unforeseen, but on further consideration to be expected, is that the functions of the large and small coils are interchanged, i.e., the *large* coil becomes the *main* coil and vice versa, or to put it more clearly, at the moment of the accurate Robinson balance, the large coil is in the plane of the distant station.

* "Experimental Wireless," vol. 3, p. 282.

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It is found that the above precautions effectively prevent any current due to "vertical" effect reaching the amplifier.

The necessity for a preliminary operation for eliminating the 90 deg. error is avoidable by interconnecting the reversing switch and hand wheel in accordance with a method described by Major Binyon in his address to the Wireless Section of the I.E.E.† Shortly, the handwheel used to rotate the coils is not rigidly connected to the spindle on which the coils are mounted, but operates it through a pin engaging in a fork, there being a backlash of about 1 deg. between the pin and fork. This backlash is used to operate the reversing switch and the operator is enabled by the observance of a simple rule to bring the coils quickly to the correct position of balance *without* the usual preliminary observation of signals on one coil only or of the positions of minimum signal strength.

Novel Electrical Connections.

The electrical connection between the rotating and fixed parts of the circuits has been carried out in a novel manner. Since the reversing switch rotates with the coils it was decided to make the whole tuned circuit and the high frequency transformer rotate with them. This means that, as one connection from the h.f. transformer is earthed to the rotating metal structure only one connection at a high frequency potential between the rotating and fixed parts is necessary. The alternatives of flexible connections and slip rings were dismissed, the former involving the provision of stops on the rotating system to prevent the flexible lead being twisted too far, the latter forming a possible source of trouble due to wear and the accumulation of dirt. The connection is made through an air condenser (fixed in capacity) of which one plate rotates with the rotating system and one is fixed. The two plates are circular and parallel and the moving one rotates about an axis perpendicular to its plane; they thus form a coupling condenser between the d.f. system and the amplifier.

A sense indicator is fitted above the scale of the direction finder; it operates in the usual manner by combining the effect of the coils with that of a separate untuned vertical aerial. The vertical aerial is coupled to the amplifier by a special form of variable condenser which, as a knob and pointer is turned, reduces the coupling to zero, and as the pointer is turned further again increases the coupling but in such a manner that the phase of the e.m.f. applied to the amplifier is changed by 180 deg.—in other words this condenser supplies a coupling between the aerial circuit and the coil circuit capable of variation in a manner similar to the variation of coupling of plane when using a vario-coupler, giving a variation of coupling and a reversal of coupling when passing through zero and the same time allowing a much greater closeness of coupling than is obtained with a vario-coupler. The pointer attached to the spindle of the condenser moves over a plate engraved on one side "read top scale" and on the other side "read bottom scale."

Operating Methods.

A balance having been obtained in the usual way, a switch on the sense indicator is depressed, the knob is turned to the side giving the weaker signal and its indication (read "top" or "bottom scale") is noted. The direction finder scale is divided into 360 deg., and marked with two sets of figures one above the other differing at any point by 180 deg. (i.e., one point is marked 50 and 230). The figures indicated by the sense indicator are read and this is the apparent wireless bearing of the distant station. It will be noticed that after obtaining a balance the coils are not moved from the balance position to obtain the sense, so that until the sense has been obtained it is not necessary to read the scale.

It is necessary before any use can be made of the direction finder for navigation, to calibrate the installation with a view to ascertaining the quadrantal error. In the writer's opinion, the only way to do this satisfactorily is to circle the ship with a motor ship carrying a small power wireless transmitter and to take simultaneous visual and wireless bearings of the boat, the difference in bearings giving the error directly. In the past attempts have been made to calibrate the direction finder on a voyage, but there are so many difficulties and possible sources of error, such as the uncertainty of the ship's position, the uncertainty of the exact position of the land station, the possibility of coastal refraction and last, but not least, the possibility of making a mistake in working out the results, that this method of calibration is laborious and unsatisfactory.

† "Journal I.E.E.," vol. 64, p. 84; "Proceedings Wireless Section," vol. 1, p. 2; THE ELECTRICIAN, vol. xcv, p. 558.

MUSIC ON SHIP BOARD.

Details of Relaying Apparatus which Can Also be Put to Other Uses.

TRAVELLERS on the high seas are, of course, not deprived of musical programmes, and the latest luxury is the transmission of the music played by the ship's orchestra to various parts of the vessel. In the case of the "Carnarvon Castle," which has just been delivered to her owners, the Union-Castle Line, by Harland and Wolff, this is effected by a Graham band repeater equipment. This apparatus has recently been placed on the market by the well-known firm of Alfred Graham

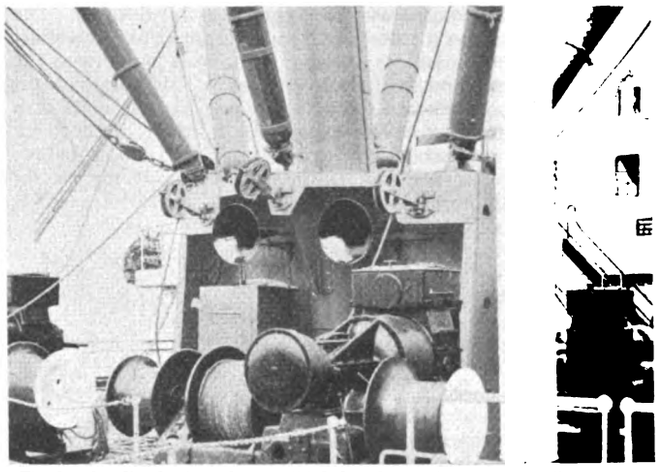

Fig. 1.—Amplion loud speakers on third class deck of the motor ship "Carnarvon Castle." This is part of the Graham band repeater equipment installed on the vessel.

and Co., and represents the result of nearly forty years' research on acoustic matters. The outfit on the "Carnarvon Castle" is known as the "Junior" type. The microphone is of a special electromagnetic type. It is particularly free from all extraneous noises though at the same time it is peculiarly sensitive to the music or voice which it is desired to reproduce. Two of these microphones have been installed on the first-class deck of the "Carnarvon Castle," one on the port side and one on the starboard side, in close proximity to the positions ordinarily occupied by the orchestra. They are very compact, and easily transferred from one position to another. In this instance arrangements have been made so that the microphone can be moved to the bridge position, whence, during docking operations, orders can be given. instead of by megaphone. The microphone amplifier has been designed expressly for use with the Amplion patent

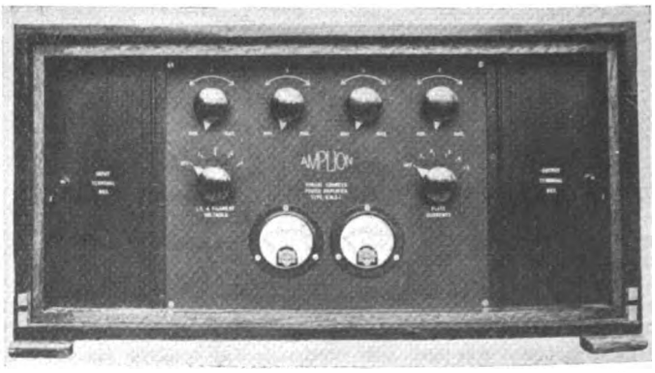

Fig. 2.—The senior power amplier of the Graham band repeater equipment on the "Carnarvon Castle."

microphone, and embodies four valves in four stages, as well as tone and volume controls. The final amplifier is of the eight valve four-stage type, with four outputs for leads to loud speakers. All this apparatus derives its power, both for valve filaments and amplifications or plate current, from accumulators which are supplied with special charging boards, so that at the conclusion of any performance it is only necessary to switch the lever across for them to be charged up. The loud speakers are special power Amplion models which can be controlled in respect of volume up to a very large output, with complete fidelity to reproduction. They are weather proof and of pleasing appearance.

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WIRELESS POSITION-FINDING ON SHIPS.

A Discussion of the Results of Recent Research—Some Theoretical Considerations—Relative Accuracy in the Day and at Night.

By L. B. TURNER, M.A., M.I.E.E.

THE location of wireless transmitting stations by the use of directional receiving apparatus underwent great development during the late war, the applications of the thermionic tube bringing in their train an immense extension and perfection of the means of carrying out the necessary receiving operations. Perhaps the most spectacular development, for inhabitants of this country, was the tracking out of raiding enemy airships as they crossed the North Sea and sought targets for their bombs. Since then, while development in connection with aircraft has continued, direction-finders have come into very widespread use on board ship, in aid of or in

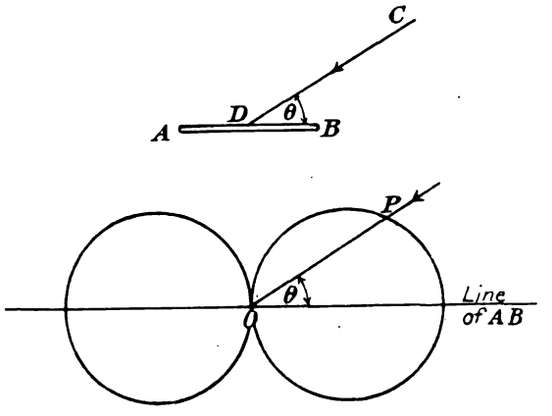

Fig. 1.

place of the optical methods which had previously alone to be relied upon. A great deal of research has been undertaken in the last few years, notably under the ægis of the Radio Research Board of the Department of Scientific and Industrial Research; and there has just been published the fourth of a series of Special Reports* describing the results of these investigations.

Before we attempt to describe something of the present condition of wireless direction-finding, as disclosed in this interesting report and its predecessors, it may interest those who are not very familiar with wireless technique if we outline the methods by which directional information is obtained.

An ordinary wireless aerial is sensibly non-directional. When the tyro asks (as he always does) in what direction he should lay out his aerial for broadcast, he ought to be told that it does not matter, and that he should tie it to the highest chimney or tree or pole he can lay hands on. Such a receiver, or an ordinary ship installation, is incapable of appreciating the direction of the wireless ray which carries the signal to it. Despite this, directive systems are extant in which such non-directive receivers are employed. In such systems, a fixed transmitting station (a "beacon station," a "radiophare") has a directive transmitting aerial which, actually or in effect, is maintained in continuous slow rotation, transmitting a different signal during each of a large number of fractions of a revolution, according to a published code. Thus, suppose the letter P is transmitted when the rotating aerial occupies a position in which the radiation is strongest in the direction NE (say). If the operator on the moving receiving station hears the signal P louder than its neighbours O and Q and any other of the code signals, he knows he is due NE of the fixed station. Such systems have so far found very limited application. Examples are the Marconi short-wave directional beam stations at Inchkeith and North Foreland.

A directional *receiver* is obtained on replacing an ordinary open receiving aerial by a closed loop antenna of one or more turns. In Fig. 1, AB is a plan view of such a loop antenna, and CD indicates a horizontal incident ray. The e.m.f. produced in the loop by the ray is proportional to cos θ. The intercept OP in the figure-of-eight polar curve of sensitivity thus measures the e.m.f. in the receiver due to any ray incident at an angle θ. If the loop is rotatable by the receiving operator about a vertical axis through O, he is clearly able to ascertain the direction (with an ambiguity of 180 deg.) of the ray conveying the signal to which he is listening, by merely noting the position of his loop when the signal is loudest—or, in practice, because of the much greater sharpness, when the signal vanishes.

This is the root principle of all directional receivers. Sometimes the actual loop antenna is rotated, in which case its size must be kept small for mechanical reasons. More often either the Bellini-Tosi or the Robinson elaboration is adopted. In the former, two large perpendicular fixed loop antennæ A_1, A_2 (Fig. 2) are connected to the two corresponding perpendicular field coils B_1, B_2 of a "goniometer" within which a secondary search coil C is rotatable. Electrically, the result is as before. In the Robinson arrangement, in order to avoid the inconvenience of making the determination at the vanishing point of the signals (θ = 90 deg. in Fig. 1), two rotatable loop antennæ A_1, A_2 (Fig. 3) are used, relatively fixed perpendicular to each other and electrically connected in series, but the larger loop A_1 with an easily worked reversing switch B interposed. When the loops are in such a position that operation of the switch produces no change in signal strength, clearly A_1 is perpendicular to the incident ray; hence the direction of the latter is found, while the signal is still audible owing to the e.m.f. produced in A_2. The arrangement gives a sharp minimum which is not zero.

Whichever direction-finding system is employed, it is of course necessary for the receiving station to make at least two observations of direction on two known sending stations in order to obtain a "fix"—i.e., to determine its position on the map. If the distance between sending station S and receiving station R is (say) 57 miles, an error of 1 deg. in the direction corresponds to a displacement of R of 1 mile in the direction perpendicular to the join SR. The accuracy with which a fix can be determined depends upon the accuracy of the two direction determinations, and upon the relative situations of the three stations. Even in the favourable case when they are in situations making S_1RS_2 an equilateral triangle (Fig. 4), the error RR^1 in the fix may be as much as 0·87 mile per 1 deg. error in directions and per 57 miles of side of triangle. It is evident, therefore, that a high degree of accuracy is desirable in the direction determinations.

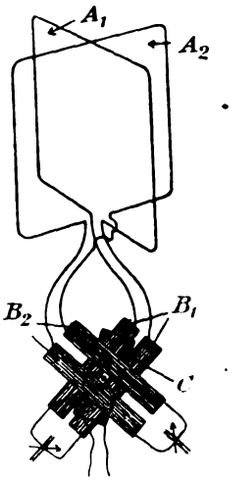

Fig. 2.

In all the directional receiving systems, great care is necessary in the design and the installation of the apparatus to avoid undesired stray e.m.fs. capable of giving an erroneous balance or of preventing any balance at all. But these practical points have now been very fully worked out, and it is possible to keep the instrumental errors, even on board ship where the rigging of the aerials may be difficult, to well below 1 deg. The Radio Research Board report just published, and already referred to, is concerned not with instrumental errors but with those much more serious, because uncontrollable, aberrations due to vagaries in the propagation between the two stations. For it is the experience of every direction-finding operator, whose apparatus is in order, that sometimes he gets very well defined sharp bearings (*i.e.*, well marked minima of signal strength as he swings his coil), and sometimes very ill defined, occasionally so ill defined as to suggest to him that the signal is arriving equally in all directions. These aberrations are vastly more frequent and intense by night than by day. A systematic experimental study of them is the subject of the report.

The work consisted in the main of a great number of organised direction observations, between November 1922 and March 1924, made at two receiving stations, one at Slough near London and the other at Orford on the East Coast. The sending stations observed were a few in England, and more lying on the west coast of Europe from Rochefort on the Bay of Biscay

* "Variations of Apparent Bearings of Radio Transmitting Stations. Part III," by Dr. R. L. Smith-Rose. H.M. Stationery Office, Adastral House, Kingsway, W.C.2. Price 2s. 6d. net.

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to Wilhelmshaven on the North Sea. These were nearly all fixed spark stations with wavelengths of 450 or 600 metres. In addition, some special spark and continuous wave transmissions were made from an experimental transmitter at Teddington. Further, a valuable series of observations was made on special signals sent out by the Great Eastern Railway boats at various points between Harwich and the Hook and between Harwich and Antwerp. The author has produced a remarkably clear and readable report—not an easy task, with material like this—which specialists in this branch will much appreciate.

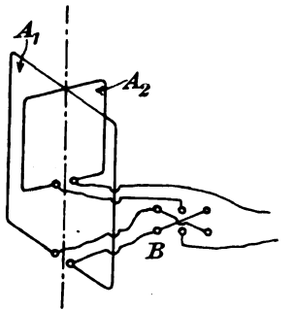


Fig. 3.

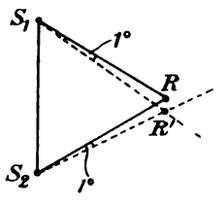


Fig. 4.

As regards daylight bearings, it appears that the relatively short waves here dealt with are not subject to larger errors than are the longer waves previously observed, but rather the contrary; that systematic errors may be caused by trees, streams and so on quite near to the receiver, but that if they are more than 100 yards away the effect may be expected to be negligible—and in any case, being steady from day to day, they may be allowed for; and that the error of the mean observed bearing may be as much as 3 deg. or 4 deg., but in most cases is much less, while the extreme variation never exceeds 7 deg.

By night, however, conditions are very much worse: extreme variations exceeding 30 deg. were quite common, and in many cases were much greater, reaching even such values as 100 deg. Again, during the day only a minute proportion of observations were missed owing to the absence of a defined minimum; whereas by night, on almost every station, large proportions such as 30 per cent., and reaching even 60 per cent., were missed owing to this curious "night effect." Night effect aberrations are larger over land than over sea; and land distances of 100 miles or so are somewhat worse than longer or shorter distances.

The lack of sharp minimum, while it would be produced by signals arriving by more than one route, can also—and much more probably—be attributed to an upset of the polarisation of the waves in the upper atmosphere by night. Near the transmitting station, and at the receiver, too, during the day, the electric field is wholly vertical and the magnetic field wholly horizontal. This disposition is assumed in deriving the sensitivity curve of Fig. 1; but it appears to be altered as the waves travel through the upper atmosphere at night. This is, of course, an intricate subject, on which recent propagation research and conjecture have a lot to say. It cannot be dealt with here, except to note that the experiments with various forms of aerial at the Teddington transmitter proved that the transmitter is not to be held responsible.

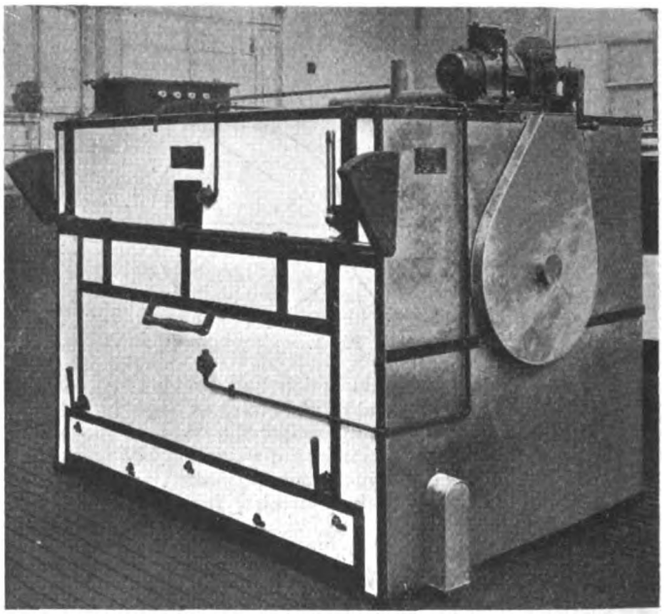
The rough practical conclusion to be drawn from the investigations is that by day bearings over land or sea can be obtained with a degree of certainty and accuracy quite high enough to be of great service to navigation; that the same holds by night over all-water distances up to about 80 miles; but that for land, and for longer sea distances, no useful results can be expected.

There remains the interesting question of spark *versus* C.W. (continuous wave) signals. It used to be suspected that the latter give much worse variations of bearing, and more ill defined minima, than the former. A possible explanation seemed to be that the effects depend critically on wavelength, and that as the waves from spark stations have no well defined single wavelength, they are not so acutely variable. The present investigations go far to prove that, on the contrary, there is no appreciable difference, as regards direction-finding qualities, between spark and C.W. (or interrupted C.W.) signals. This is a happy result, and should do much to hasten the day when spark transmitters, like smoking chimneys, shall be a relic of the barbarous past.

ELECTRIC OVENS FOR BATTLESHIPS.

THE correct choice of suitable baking equipment for use on ships depends on several features of special importance. The space occupied must be reduced to a minimum; operation must be simple and reliable, and must not be affected by draughts or rolling; and the heat loss from the ovens must be as low as possible, so that even under tropical conditions the temperature in the bakery will not become unbearable. The following description of the electric ovens recently installed by the Metropolitan-Vickers Electrical Co. on the battleships, H.M.S. "Rodney" and H.M.S. "Nelson," shows how these requirements have been met.

An illustration of one of the ovens is given herewith. The front is covered with white vitreous enamelled sheets, with heavily nickel plated fittings, while the outer casing of sides and back is of duralumin. The ovens are, therefore, of attractive appearance and easy to keep in that state of cleanliness which is traditional in the British navy. The casing is double



One of the Metro-Vick electric baking ovens used on H.M.S. "Rodney" and "Nelson."

throughout, inner steam-tight walls of sheet steel being separated from the outer casing by blocks of asbestos and packing of mineral wool. The construction is thus light and strong, while the heat insulation wall, which is 5 in. thick, reduces to a negligible amount the heat transmitted to the outer wall and thence to the bakery. An inspection window, situated just above the oven door and provided with a lamp which illuminates the interior of the oven, allows the progress of the bake to be inspected without loss of heat.

The heaters are of the open ribbon type, on robust porcelain insulators. They are contained in the bottom of the oven and are protected by a fine mesh expanded metal guard from anything which might inadvertently be dropped from the baking chamber. Movable baffles, controlled from the front of the oven, are fitted as a means of correcting any slight difference of temperature between the two sides of the oven.

In principle of operation the ovens are similar to the Metrovick conveyor-type ovens used in bakeries ashore, but in view of space limitations on board ship a special rotary type of conveyor mechanism has been developed. The arrangement, for which patent applications have been made, consists of six trays, each 16 in. by 72 in., supported by the steel rods on a reel which is driven by a ½ H.P. motor. By means of a worm reduction gear of ratio 125 to 1 and a chain reduction gear of ratio of about 11 to 1, a reel speed of approximately 1 rev. per min. is obtained. A simple device prevents any tray swinging independently of the others, keeps them steady for loading and unloading, and prevents them being tilted by any list of the ship up to 30 deg. from the vertical. The capacity of each oven is 300 lb. of bread.

For temperature control the heaters are arranged in two circuits, half the heater capacity of 42 kW being controlled

(Concluded on p. 131)

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LISTER DRIVE No. 3.

The Development of Electricity Supply in Liverpool—New Station to be Equipped with 25 000 kW Units—Concentrating the Switchgear.

A PUBLIC supply of electricity has been given in Liverpool since 1883, when the Liverpool Electric Supply Co. started operations on a direct-current system at 110 V which at first only covered the central portion of the city. Changes both in plant and system gradually took place, but the next milestone was the acquirement of the company's undertaking by the Corporation in 1896 and of the tramways in the following year. It was soon decided to replace the four existing stations by two, one at Pumpfields and the other at Lister Drive. In the latter case the site acquired was capable of considerable development as subsequent events have shown. As time went on, generation was gradually concentrated at Lister Drive, where in 1904 a second station (Lister Drive No. 2) with an ultimate capacity of 20 000 kW was begun. In 1911 the reconstruction of No. 1 station was commenced by replacing the original reciprocating plant by turbines, and when this was finished its total capacity had increased from 8 400 kW to 33 000 kW. By this time also, the whole of the generation was on the 6 600 V 50 cycle three-phase system. It was now Lister Drive No. 2's turn again. In 1919, the replacement of the four original 2 000 kW sets by two 12 500 kW sets was begun, with the result that the capacity of the station was raised to 37 000 kW, the total capacity of the two stations being at that date 70 000 kW instead of the original figure of 28 400 kW.

That was not enough, however. Electricity supply in Liverpool was developing so rapidly that it was obvious that more generating plant would soon be required. After considering various alternatives, therefore, it was decided to erect another station on the Lister Drive site, thus making No. 3. This station has now been completed and was formally opened by Lady Salvidge on Monday, July 26th. The following are some details of the plant installed in it:

Owing to the inland situation of Lister Drive, all coal is received into it by rail. Three years ago it was decided to purchase forty twenty-ton steel wagons of the hopper-bottom type for the Department's own use. These proved so satisfactory that the coal handling equipment for the new station was laid out to utilise this type of wagon, and a reinforced concrete silo, 225 ft. long and having a capacity of 1 000 tons was constructed. The hopper bottom wagons run over the silo and are emptied by opening the doors, so dispensing with the necessity of installing wagon tippers.

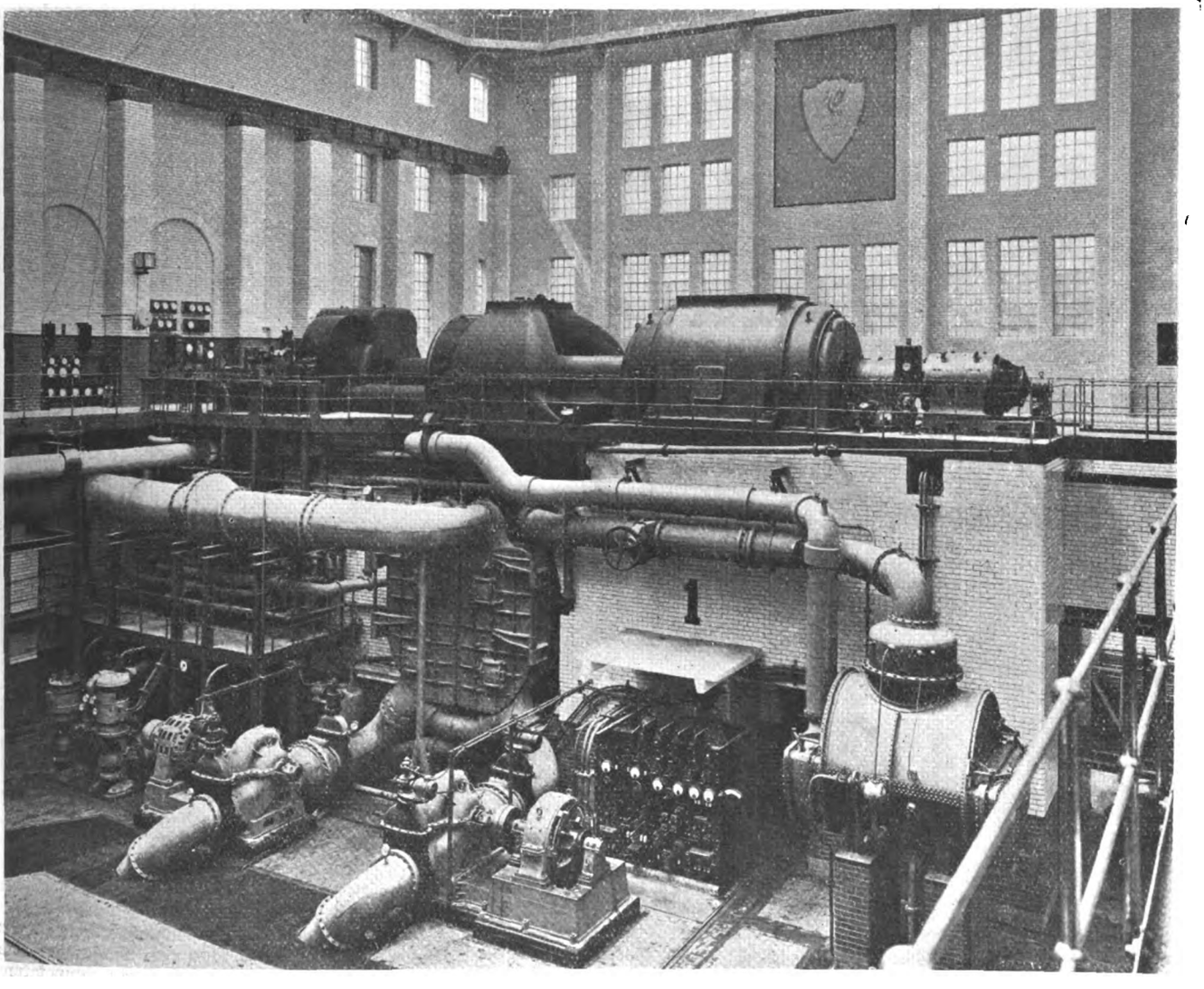

Fig. 1.—View in the turbine room at the Lister Drive No. 3 Station of the Liverpool Corporation showing the first 25 000 kW unit.

Coal is stored on the site between parallel rail lines, travelling steam cranes, fitted with Priestman grabs, being used for dealing with it.

Two parallel rubber conveyor belts run under the silo, the coal being fed on to these belts through doors operated by rack and pinion gear. These belts feed a system of other belts, and the coal is raised up an incline and discharged into the boiler-house bunkers, whence it is fed by gravity through shoots to the mechanical stokers. This boiler-house bunker has a capacity of 1 500 tons, and the conveyors have a capacity of 300 tons of coal per hour.

The boiler house contains six units, each capable of evaporating 60 000 lb. of steam per hour at a pressure of 285 lb.

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per sq. in., and a total temperature of 700 deg. F. Each unit consists of a water tube boiler with mechanical stokers and superheater, economiser, air heater, forced and induced draught fans, chimney and grit collector. Four of the units have Babcock and Wilcox boilers, and the other two Yarrow boilers. The boilers are also equipped for oil burning, and tanks are installed having a storage capacity of 150 tons.

The ashes are dumped from the ash hoppers at the rear of the stokers into open pits fitted with water sprayers to prevent the formation of large masses of clinker. From these pits the ashes are removed by dry scraper conveyors working in troughs, and delivering into skips which raise them into a reinforced concrete bunker, of 300 tons capacity. From this bunker the ashes can be loaded into either road or rail wagons. Provision is made for dealing with the combustible riddlings which fall through the chain grates, by means of hand wagons and a belt conveyor, returning them to the coal conveyor.

The present stage of the turbine house is 90 ft. span, 112 ft. high from the basement floor to the ridge of the roof, and 170 ft. long. One end is closed in by a temporary end, and the

The exhaust steam from the turbine is condensed in a Weir two-flow surface condenser. This has a cooling surface of 40 480 sq. ft. It is capable of maintaining a full load vacuum of 27·5 in. when supplied with 1 400 000 gal. of cooling water per hr. at a temperature of 83 deg. F., the barometer being at 30 in.

The condensing water is circulated by means of two centrifugal pumps, one driven by a direct coupled d.c. motor, and the other by a direct coupled a.c. motor. Both pumps will normally run, in order to ensure continuity of supply, but either pump alone will handle over 800 000 gall. of water per hour. The water extraction pumps are also in duplicate, these being of the vertical spindle type, and in this case also one pump is driven by a direct coupled d.c. motor, and the other by a direct coupled a.c. motor.

Air is extracted from the condenser by three sets of two stage steam jet ejectors, and the exhaust steam from these is led into surface heaters, through which passes the condensate on its way to the feed pumps. Two sets of ejectors will normally be required, the third being stand-by. The conden-

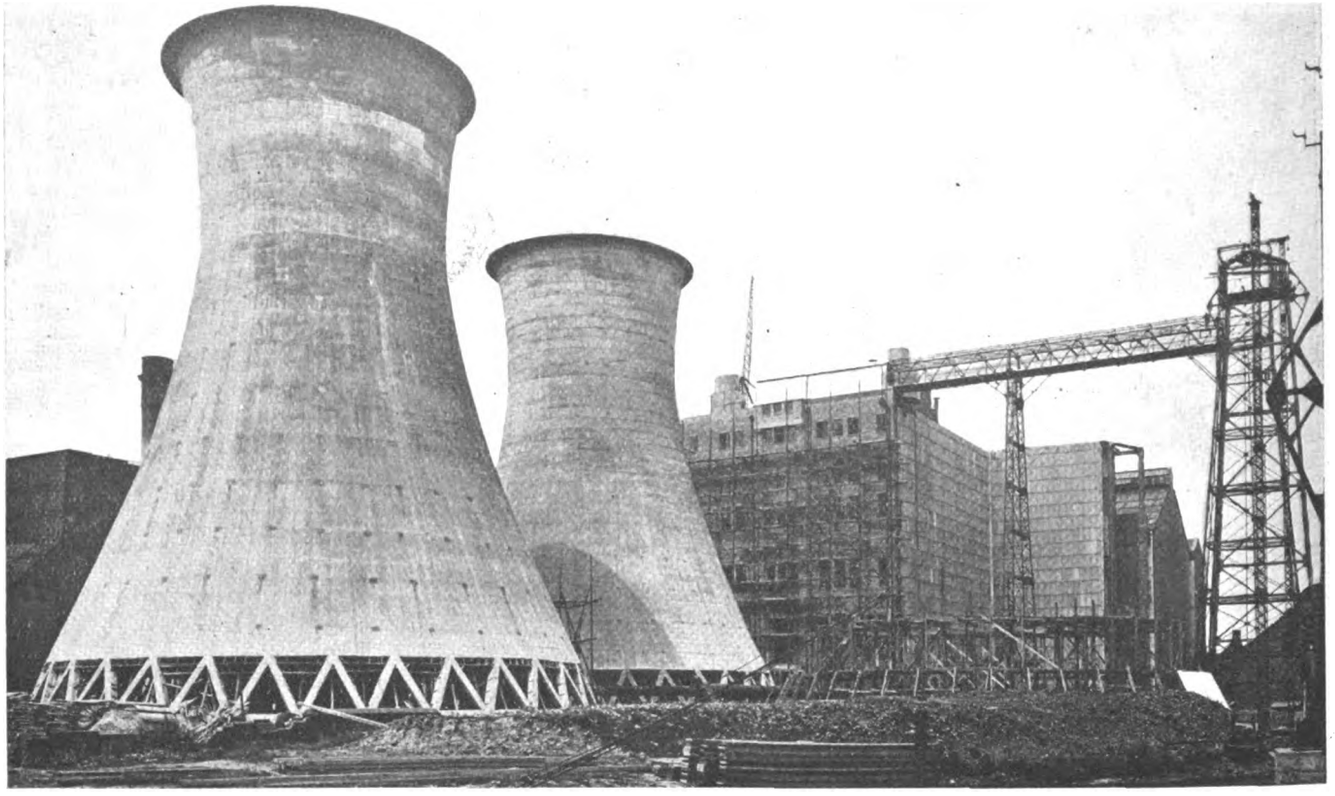

Fig. 2.—Two of the reinforced concrete cooling towers at Lister Drive No. 3. These are of Dutch design, and with the third, which is not shown, have a cooling capacity of 1 400 000 gall. per hr.

ength, when the station is completed will be about 400 ft., and will be capable of housing five sets of 25 000 kW each. A railway siding runs into one end of the turbine house, and as the travelling crane runs over this portion, it forms an unloading bay, and in addition is used as a workshop. The turbine house crane is of 90 ft. span, and has two independent hoists, the main one of 100 tons capacity, and the auxiliary of 15 tons.

The turbo-alternator unit consists of a two-cylinder turbine, of Metropolitan-Vickers manufacture, direct coupled to an alternator, also constructed by this firm, and exhausting into a condenser supplied by G. & J. Weir as sub-contractors to the turbo-builders. The alternator is wound for 6 600 V, three-phase, 50 periods, and runs at 1 500 revs. per min. It is designed for a continuous load of 25 000 kW, but will carry, as overload, 31 250 kW for a period of two hours. The turbine will drive the alternator at all loads. The exciter is direct coupled to the end of the alternator shaft, and in the same frame as the exciter is a 375 kW direct-current generator, supplying current for the d.c. condenser auxiliaries. The alternator is ventilated on the closed circuit system, and the town's water make-up supply to the cooling towers is utilised n the air coolers.

sate is also passed through a surface heater which obtains steam bled from a stage of the turbine near the low pressure end, and by means of the various heaters, the temperature is raised to about 150 deg. F. at the point of delivery to the feed pump suction.

The feed system is "closed," and a surge tank is provided to compensate for any variations between the quantity of water discharged by the extraction pumps and that required by the boiler feed pumps.

Normal steam conditions at the turbine stop valve are 275 lb. per sq. in., and 675 deg. F. total temperature, and the steam is supplied to the turbine by two 12 in. pipes from a steam receiver, the receiver being fed from the boilers by two mains, each of a bore gradually increasing to 12 in.

The feed pump room forms an annexe to the turbine house, and is on the turbine platform level, which is also the firing floor level of the boiler house. Four feed pumps are at present installed, two of the motor-driven centrifugal type, and two of the high speed steam turbo type. Of the motor-driven type, one is manufactured by Mather and Platt, of Manchester, and has a capacity of 13 500 gall. per hr., against full boiler pressure. It runs at 3 000 revs. per min., and is direct coupled to an a.c. motor. The other motor driven

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pump is by the Pulsometer Pump Co., and has a capacity of 27 000 gall. per hr., running at 1 500 revs. per min. It is also direct coupled to an a.c. motor.

The steam turbo feed pumps are each of 27 000 gall. per hour capacity, fitted with a surface heater on the discharge side so the heat of the exhaust steam may be utilised to heat the feed water.

The cooling towers are of a type new to this country, being of a design which originated in Holland. The shells are of reinforced concrete, and the internal stacks, over which the cooling water falls, are of timber. There are three towers in the present stage, each tower being 118 ft. high, 100 ft. diameter at the base, tapering to 42 ft. diameter, at about two-thirds height, and opening out to 53 ft. diameter at the top. The total cooling capacity of the three towers is 1 400 000 gall. per hr.

These towers are covered with 3 in. " Fibrent " asbestos-cement sheets, about 12 000 sq. yds. having been used for this purpose. This was the original purpose for which this material was employed and it is claimed that at the end of several years in operation it is harder than originally and shows no signs of disintegration. Naturally it does not rust so that it does not require painting and is indeed entirely impervious to atmospheric influences. It can easily be drilled and is fixed by either galvanised iron screws or hook bolts. In addition to the cooling towers at Lister Drive, " Fibrent " is also employed for covering the temporary end wall and gable and for enclosing the sides and roofs of the conveyor gantries, belt houses and towers.

When the two 12 500 kW turbo-alternators were installed at Lister Drive No. 2, it was realised that the capacity of generating plant on the system was up to the limit of rupturing capacity of the high tension switchgear in the event of a fault, and that when any additional generating plant was installed, it would be necessary to remodel the existing switchgear. Advantage was therefore taken of the building of No. 3 Station, to carry out this remodelling and a new switch house has been built in front of the new and existing stations. This switch house is at present 287 ft. long, 30 ft. span, and has six floors. The switchgear now installed provides for the control of the 25 000 kW turbo-alternator, the alternators in the Nos. 1 and 2 Stations, several new feeders, and all the existing feeders. The existing switches freed by the provision of the new gear will be utilised in the larger sub-stations in various parts of the distribution system.

The top floor of the switch house consists of the control room, from which all the high tension switches of the three stations are operated. A bay window is provided, looking out into the No. 3 Station turbine house. The floor below is utlised as a cable way for all the control cables.

The next floor contains the high tension busbars, which are of the open type, separated by concrete barriers and protected by sheet-iron doors. There are four sets of bars which can be coupled by means of reactors and a common tie-bar, so that full provision is made for the isolation of faulty feeders, also for laying off busbars for cleaning and inspection.

On the floor below the busbars are the main oil switches. These are all solenoid operated, through the intermediary of contactors, from the control room. All switching is carried out on the 6 600 V system, but several of the new feeders are installed to work at 33 000 V, step-up transformers being located in chambers below the switch floor. These transformers are oil immersed, with forced water cooling, the coolers and pumps being installed in a room below the transformer chambers. Below the switch room, and on the same level as the transformer chambers, is the works sub-station, from which a d.c. supply is obtained by motor generators.

All the work described above has been carried out to designs and specifications prepared by the City Electrical Engineer, with the able assistance of the Deputy City Electrical Engineer and staff, except for the building work, for which the City Surveyor and Land Steward has been responsible.

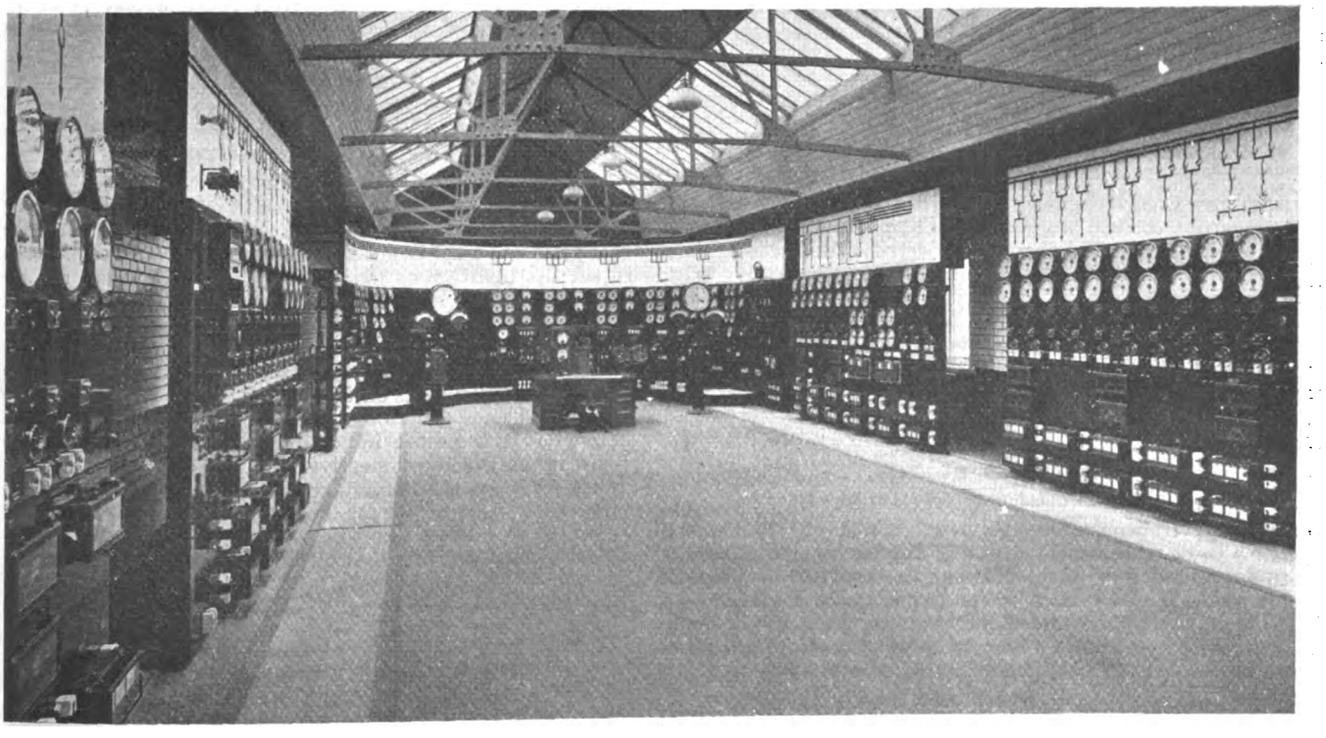

Fig. 3.—The new control room at Lister Drive No. 3. This controls the generating plant and feeders in all three stations.

Electric Ovens for Battleships.

(*Concluded from page* 128.)

by hand and half being controlled by a thermostat operating through a relay. The range of the thermostat is 100 deg. to 150 deg. F., and any temperature within this range can be automatically maintained within limits of plus or minus 5 deg. F. The oven is capable of heating up to 400 deg. F. in one hour, and its radiation loss at 350 deg. F. above the temperature of its environment is only 8 kW. The heating elements are rated at 6 W per sq. in., and their life is estimated at about five years. They are so mounted that anyone of them may be removed and replaced by a new element in about 15 minutes, even while the oven is at full baking temperature. Either group of heating elements, hand or automatically controlled, is capable of baking three-quarters of a full batch of bread, and a change-over switch is provided to disconnect the thermostat device should it be desired to place the whole of the heating capacity under hand control.

J. A. Crabtree and Co., Ltd., Lincoln Works, Walsall, have issued a new folder (No. 1 010) describing and illustrating their single-cord ceiling switch, which eliminates the live flexible from the ceiling to the push button, which is necessary in the case of pear switches.

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Electric Propulsion of Ships.

(*Concluded from page* 120.)

The causes of failure of the electric drive for ships built in this country in my opinion has been by not using suitable prime movers. If the electric drive on our ships is to be a success all vested interests will have to be sacrificed and only those appliances both as regards the mechanical and electrical equipment that have been thoroughly tried out on land or sea used.

In conclusion I would like to quote from a French technical journal, "La Vie Technique et Industrielle," the following

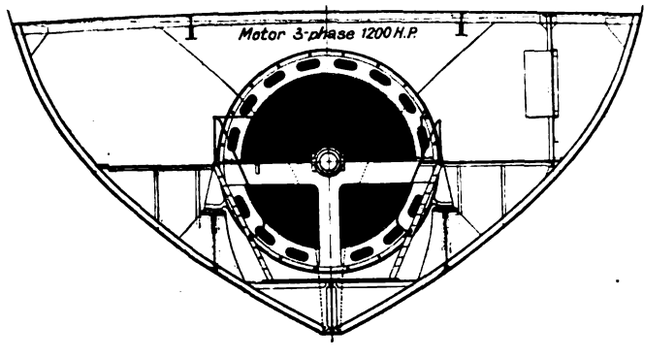

Fig. 2.—Diagram showing relative size of motors to hull on French ships illustrated in Fig. 1.

written by a French engineer in an article on the same subject: "As regards electrical propulsion, the same discussion is taking place of which electrical energy has been the subject ever since it was introduced into the domain of the steamship. With the first appearance of electrical traction analogous discussions took place, and we could apply in, a closely analogous way, the arguments of the partisans and of the adversaries of electrical traction at this time. It would be superfluous to renew this discussion at the present moment."

Wireless at Sea.

(*Concluded from page* 124.)

short wave transmitters have been carried out, but much remains to be done before anything approaching to a reliable both-ways service between ships and the land can be claimed. Short waves are very valuable for long-distance work between continents, and it may be found that the greatest good will accrue to the greatest number if short waves are, to some extent, reserved for this purpose and only used very sparingly in ships.

In addition to improvements in the range of transmitters and the sensitiveness and selectivity of receivers, a great deal has been done to improve telegraphic facilities, by improving the organisation of traffic. The greatest of these steps has been the introduction of a continuous wave service, which now carries the greater part of the messages sent by private persons on the large liners and forms about one-eighth of the volume of ship traffic. This proportion is increasing steadily. In addition to the above, a certain amount of work has been transferred from the 600 m. wave to other waves, but, so far, the improvement effected by this means has not been very marked, although steady progress is discernible.

(4) Since the reception of broadcast telephony programmes has become a national pastime there has been an unceasing complaint raised against the interference caused by ship working, the statement being freely made that ship transmitters of the "spark" type cause more interference to broadcast reception than is necessary. These complaints and statements are often grossly exaggerated, and the complainers do not seem to realise that perhaps they might avoid their troubles by the use of receivers which were possessed of a higher degree of selectivity. Also it must be realised that the primary object with which ships are fitted with wireless telegraphy is for use in case of sudden distress, and for this purpose the "spark" form of transmitter, which is most freely complained of, is undoubtedly the best.

For all that, there is no doubt that the natural development of wireless will gradually suppress all powerful spark installations. It is only the very powerful spark installation that causes interference with broadcast reception, unless it is in very bad adjustment. The close surveillance which the G.P.O. inspectors maintain over British shipping has long ago wiped out all those cases of bad adjustment which had survived the natural advance of the science, and so far as British shipping is concerned, it may be stated that the interference caused by them is now but slight. Interference with broadcasting is undoubtedly caused by ships with old-fashioned installations which do not come under British control, but it must be remembered that the state of adjustment has at least as much to do with the amount of interference caused as the age of the set. A highly efficient modern set can be made to be a great deal worse than an old set of the same nominal power, if only by reason of its greater efficiency.

The near future will probably see a fairly low limit to the permissible "metre-amps" of new spark installations, and the march of time will soon make the use of greater power by the older spark installations unnecessary. Complaints are always lodged against ships, but it must be remembered that ships go all over the world, and until all coast stations are prepared to change their means of communication, ships cannot do so.

But, in spite of the difficulties which surround the subject, a steady decrease is taking place in the volume of traffic which is transmitted by powerful spark apparatus in the neighbourhood of the coasts of Great Britain, and this is being done without reduction in the total volume.

CORRESPONDENCE.

ECONOMY—FUEL AND OTHERWISE.

[To the Editor.]

Sir,—Cannot something be done to reconcile the conflicting interests of the proposed Institution of Fuel Technology and the Institution of Fuel Economy Engineers? Here are proposals to set up Institutions dealing with practically one and the same object, viz., the economical utilisation of fuel, and yet it does not seem to have appealed to the promotors that the economy stops short at fuel and that they are embarking on extravagance and waste by setting up at one and the same time rival Institutions on the matter.

Many of us are anxious to support a proposal of this character, but it is almost impossible to decide which of the two Institutions will most effectively achieve the objects aimed at, and feel reluctant to be mulcted in a double subscription when one should be sufficient for the purpose.

Surely something could be done at this early stage by the prominent men in the industry to secure an amalgamation of the conflicting ideals so as to obtain one Institution, before the vested interests become too strong to bring about this desired end.—I am, etc.,

F. W. Purse.
Engineer and Manager,
West Ham Electricity Department.

West Ham.
July 24th, 1926.

G.E.C. Electric Locomotive.

Details of Passenger Locomotive Supplied to Great Indian Peninsular Railway.

The General Electric Co. has recently received an order for a high-speed electric passenger locomotive in connection with the electrification of the Great Indian Peninsular Railway. This locomotive is for service on the main lines from Bombay to Igatpuri, and Bombay to Poona, both of which lines pass over the Ghats.

The locomotive is of the 4-6-4 type, having three main driving axles arranged for individual drive and provided with a driving bogie at either end. Its maximum designed speed is 85 miles an hour, and it is rated at 2 250 H.P. on the one-hour rating. Each main axle is driven by a twin armatured motor through the intermediary of a flexible gear wheel, secured to a quill surrounding the axle. Torque is transmitted from the quill to the axle by means of a special type of flexible drive mechanism, which permits of relative motion between the axes of the axle and quill, thereby allowing the motor to be mounted rigidly in the locomotive frame, and reducing the hammer blow on the track to a minimum. The three twin armatured motors are each rated at 750 B.H.P. on the one-hour rating, and are arranged for forced ventilation, thus providing a high continuous rating. The control apparatus is of the electro-pneumatic type, comprising contactors and cam switches, the control system being arranged to give series, series-parallel and parallel groupings of the main motor armatures.

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MUNICIPAL TRADING.

The Scottish Point of View of the Attempt to Obtain Selling Powers—The History of the Negotiations—Analysis of the Courses Suggested—No Further Concessions.

By WALTER FINLAY.

WHILE the proceedings on the various private Bills which were recently before Parliament obtained considerable publicity in the electrical Press, very little has been heard of the negotiations which have taken place subsequent to these Bills in connection with the suggestion that municipal trading might be dealt with in the Electricity Supply Bill.

In certain quarters there was a feeling that an endeavour might be made to settle the controversy by agreement and an informal private conference of various trading associations was held, at which contractors' representatives formulated a scheme on which they would recommend that the Contractors' Associations should concur in trading powers being granted to municipalities. The main lines of the proposal were that local authorities should have power (1) to sell electrical appliances at retail prices; and (2) to contract for installation work, but that such installation work should be executed by a contractor independent of the municipality. These proposals would have enabled the local authorities to arrange for installation work and to charge for it either by immediate payment or by hire purchase agreements. At the same time, they would avoid the necessity of large municipal staffs for direct labour being set up.

Another informal conference of the same bodies along with representatives of the municipal engineers was held at a later date, when the contractors' proposals were formulated, but were absolutely rejected by the municipal engineeers, who insisted on complete powers, including installation powers by direct labour. Every possibility was explored and the suggestion was made that if authorities were granted full powers, their unreasonable exercise might be controlled by setting up a Joint Advisory Committee, who would advise the parties on the exercise of the powers. The municipal representatives forthwith tabled a draft clause containing the proposals. It was agreed that, without prejudice to their opinions, representatives should obtain the views of their associations on the proposals made, and that these views should be considered and discussed at a later meeting.

The Electrical Contractors' Association of Scotland duly considered these proposals, but unanimously came to the conclusion that it would be quite impossible for any Advisory Committee to restrain the unreasonable exercise of the definite powers proposed, if a local authority was determined to use its powers. They were further of the opinion that no case had ever been made out by municipalities for powers to carry out installation work by direct labour, and that they would be placing themselves in a false position if they acquiesced in any way in such powers being granted. In addition, they were satisfied that power for direct labour was not in the interest of the general body of ratepayers, as it might lead to the setting up of large municipal staffs, which might tend to increase the burden of local taxation. They therefore resolved to do all that was possible to oppose such powers being granted. Owing to the railway strike a Scottish representative could not attend the subsequent conference. The views of the Scottish Association were, however, clearly communicated to the conference by letter, in which it was intimated that they retained a free hand to represent and act as they thought right on the whole question.

It is understood that the general terms of the proposed clause on the lines suggested were approved by the other associations; but it is believed that an actual clause for submission to the Parliamentary Committee was never definitely agreed.

The Scottish Association gave the whole question detailed consideration, and they came to the conclusion that it was their duty to take steps to bring their views before various members of Parliament who were serving on the Committee dealing with the Electricity Supply Bill. It was decided that clauses containing the original proposals for powers as formulated at the initial conference should be submitted as an amendment to the Bill. Sir Philip Dawson and Mr. Hannon ultimately put down the following amendment, with the approval of the E.C.A. of Scotland.

It shall be lawful for the Council of any local authority, being authorised to supply and supplying electrical energy, to expend money upon the wiring and fitting, and to supply with wires, fittings, motors, and apparatus the premises of their consumers or their prospective consumers, and to sell such apparatus at full retail prices to such consumers, and to enter into and carry into effect agreements and arrangements with respect thereto, and to make such charges therefor as they may think fit.

Provided that the local authority shall not manufacture any materials or appliances, nor shall they sell any materials or appliances to the trade, save where there is a contractor of whom the consumer or prospective consumer, is a customer, or prospective customer, in which case they shall sell to the contractor at trade price or at such other price as may be mutually agreed. The local authority shall not themselves execute any wiring of private property or undertake the supply of materials therefor except between the main of the authority and the consumer's meter, but they may enter into contracts with an electrical contractor for the execution of such wiring of private property, including the supply of the necessary materials, provided that the contractor acts independently of the local authority in the execution of the contract.

Provided that:

(*a*) The local authority shall so adjust the charges to be made by them for any such fittings for the fixing, repairing, or removal thereof as to meet the sum properly chargeable for the costs and expenses incurred by them under the powers of this section in connection therewith (including interest upon moneys borrowed for those purposes and all sums applied to sinking funds for repayments of moneys so borrowed);

(*b*) The sums properly chargeable and received by the local authority in connection with the purposes in this section in each year (including interest and sinking fund) shall be separately shown in the published accounts of the electricity undertaking of the local authority for that year so as to show complete and proper trading and capital accounts.

On an examination of the various amendments as they were published, it was found that there were several dealing with the municipal trading problem. The first substantially consisted of the L.C.C. Clauses. This was followed by an amendment which suggested the deletion of the words "or sell" from Clause 23 of the 1919 Act. This would have had effect to giving Corporations power to sell and also to carry out installation work. Then came Sir Philip Dawson's amendment above recorded and ultimately an amendment, which it is understood was suggested by the Incorporated Municipal Electrical Association, which aimed to confer full trading powers including installation powers by direct labour and to permit of the setting up of a Joint Committee which, however, was to be nominated by the Minister of Transport and was to include local authorities, persons engaged in the business of making or selling electric fittings and consumers. This amendment has already been referred to in detail in other sections of the electrical press.

These amendments were all really of the nature of additions to the Bill and not amendments to its original clauses. When the last clause of the Bill was reached the Attorney General on behalf of the Government suggested that, to avoid delay, members responsible for additional amendments should withdraw them so as to enable the Bill to be passed this Session. In view of the Attorney-General's suggestion, Sir Philip Dawson withdrew his amendment, but when the later amendment was reached proposing full powers it was duly moved by its promoters and a debate and vote took place, and it was defeated by seventeen votes to eleven.

One very unsatisfactory feature of the debate on this clause was that it transpired that members of the Committee had been advised by letter by some of the promoters of the clause that the clause had been approved by all the associations interested, including the E.C.A. of S., and actually members were asked in the name of these associations to support the clause. There was absolutely no warrant for this, and it is felt that such action was far from fair propaganda.

Sir Philip Dawson requested that the various branches of the electrical industry should consider whether in view of the fact that his amendment proposed to confer on all municipalities a large proportion of the powers they desired, agreement could not be come to that such amendment might be adopted as an agreed policy.

A further conference was held on July 19th, but it was then ascertained that the municipal engineers were as determined as ever, despite their reverses, to try and obtain full trading powers. The E.C.A. of S., notwithstanding the fact that the Parliamentary Committee on the Bill had decided in their favour and that no powers were included in the Bill, are still willing that the modified powers should be included in order that a settlement of the controversy might be arrived at and they

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feel that it is only right that all those who are interested in the electrical trade should know that the contractors have made definite constructive proposals for a settlement that the Incorporated Municipal Electrical Association can obtain by agreement complete trading powers save power for direct labour and that they are not taking advantage of the opportunity offered. The suggestion has been made that the Scottish contractors will not concede anything. They feel that, in conceding sales powers for appliances and the right to make contracts for installation work, 75 per cent. of the municipal claims have been conceded and that if anyone is uncompromising in the matter it is the municipal engineers.

It would be an extraordinary thing for Parliament at the present time to be taking away from local authorities the power to spend money as they are doing now in connection with Boards of Guardians and at the same time throw at the heads of local authorities power to engage further large municipal staffs. The country is suffering to-day from the burden of the large staffs of civil servants which were set up during the war. It was easy enough for the Government of the day to engage these staffs, but it comes to be a very difficult matter when their reduction has to be dealt with. Similarly it would be very easy for municipalities to take on large installation staffs in view of the possible stimulus to the electrical trade the Electricity Bill may bring, but it will be a very different matter to reduce these staffs if it is found that the Bill does not fulfil all the promises which have been made for it.

In Scotland the contractors are not alone in the views they hold, as these views seem to be almost unanimously concurred in by the wholesale trade and manufacturers throughout Scotland. It has also been ascertained that there are municipal representatives and central station engineers who think it would have been wise for the Municipal Electrical Association to have taken advantage of the possible settlement which was within their grasp and not to have taken up such an uncompromising attitude.

Telephone Development

Half a Million Telephones Now in Use in the London Area

IN handing over to the chairman of the Press Gallery of the House of Commons, on July 16th, the 500 oooth telephone in the London area, Mr. W. A. Valentine, Controller of the London Telephone Service, said the London telephones had increased by more than 100 per cent. in the last ten years. About 1 750 000 calls were dealt with daily in the 107 London exchanges, which were linked by 25 000 junction lines, and the indications were that within nine years the present number of telephones in the area would be doubled. There were forty direct lines in operation between London and the Continent, which carried 900 000 calls last year. A new Anglo-Dutch cable had just been laid which would provide twelve direct circuits between London and the principal towns in Germany, and additional cables, each containing twenty-one circuits, were expected to be laid before the end of the year between England and France and England and Belgium.

NEWS IN BRIEF.

Electrical Brevities Received from Near and Far.

Over 500 British farmers now use electricity.

Cheadle and Gatley U.D.C. requires a technical assistant in its electricity department. Salary £200.

It is reported that the strike of tramway and other municipal employees at Oslo (Norway) has been settled, the men having agreed to a 15 per cent. reduction of wages.

Air Vice-Marshal Sir Philip Gane carried out the fourth annual passing out inspection and distribution of prizes at the R.A.F. Electrical and Wireless School, at Flower Hill, near Winchester, last week.

The British delegation at the sectional meeting of the World Power Conference at Bâle (Switzerland), which opens on August 31st, will include Mr. D. N. Dunlop, Sir John Snell, and Mr. W. H. Patchell.

The organisation of a separate showroom for electrical appliances is contemplated by Rochdale Gas and Electricity Committee. A sub-committee is visiting the electricity showrooms in other towns.

The Underground Railways Co. of London announces that oil-firing equipment has been obtained for a number of the largest boilers in the Lots Road power station. This will be put into use if the coal supply runs short.

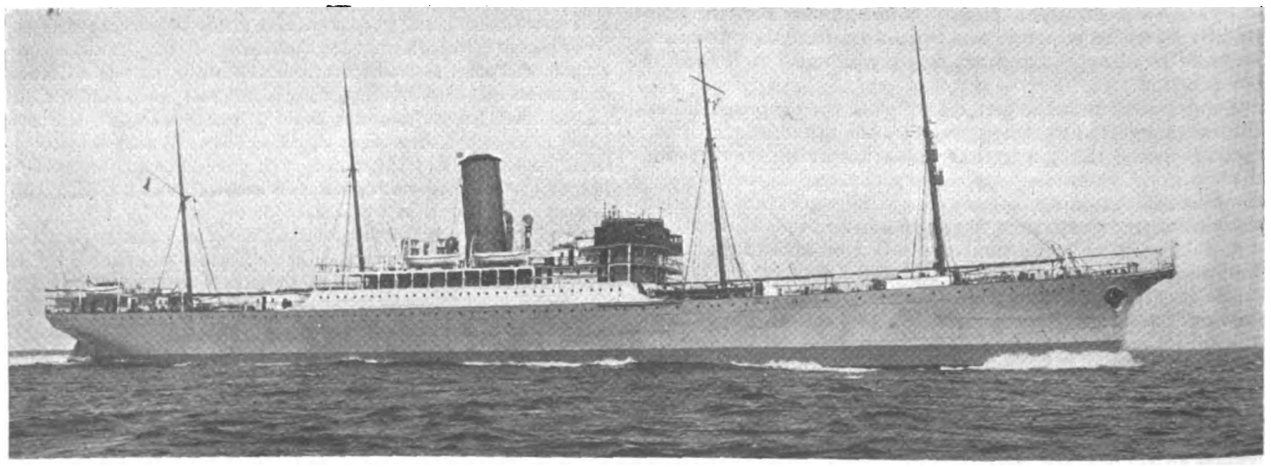
The Association of British Chambers of Commerce is urging the Government to appoint a Commission to work out and introduce a new system of Post Office administration, and to separate the postal service from the telegraphs and telephones.

The Royal Commission on Awards to Inventors has heard a claim by Prof. Langevin and Mr. Chilowsky for an award in respect of improvements in submarine signalling. Mr. R. Moritz, K.C., for the Admiralty, stated that it was admitted that Prof. Langevin should have an award. The hearing was partly in camera.

Hammersmith (London) Electricity Committee has reported that all the wiring contractors who originally submitted quotations have agreed to execute wiring work on the average price of the four lowest quotations. It has been agreed that orders shall be placed consecutively according to a rota of the contractors concerned.

The sport of coursing electrically propelled hares was commenced at Manchester last Saturday. The track used is a quarter of a mile round, and the hare, which is attached to a projecting bar operated from the outside edge of the track, can always be kept ahead of the hounds. One of the hounds covered the quarter mile in 26 seconds.

The Belgian Cabinet has had under consideration a project to establish a National Telephone and Telegraph Society to take over the administration of the telegraph and telephone services. The present capital of the department is 1 800 000 000 francs (about £8 000 000), and it is proposed that the Society shall issue bonds to the value of 1 500 000 000 francs, the State reserving to itself ordinary shares with a preponderating voting power.



THE Telegraph Construction and Cable Co.'s new Cable ship "Dominia," which, in the late summer or early autumn, will lay a duplicate cable between Vancouver and Fanning Island for the Pacific Cable Board.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given. Unless otherwise stated, particulars are to be had from the Department of Overseas Trade, 35, Old Queen Street, London, Westminster, S.W.1.

BATLEY EDUCATION COMMITTEE.—Electric wiring of Healey new school. Specification from the Director of Education, Batley.

CLACKMANNAN COUNTY COUNCIL.—Electrical installation works in connection with erection of new premises at Drysdale Street, Alloa. Schedules from J. Melvin and Son, architects, Mar Street, Alloa.

BELFAST CORPORATION, July 31st.—One 15 625 kW turbo-alternator, with condensing plant and auxiliaries, and, alternatively, one 18 750 kW turbo-alternator, with condensing plant and auxiliaries. Specifications (Nos. W48 and W48a) from Mr. Johnstone Wright, city electrical engineer and manager, East Bridge Street, Belfast; deposit £3 5s.

COVENTRY CORPORATION, July 31st.—Supply of 150 tons of B.S. No. 7 section Sandberg silicon sorbitic steel tramway rails, and 25 cwt. of fishplates. Specification, etc., from Mr. T. R. Whitehead, general manager and engineer, Tramways Department, Stoney Stanton Road, Coventry.

HORSHAM GUARDIANS, August 2nd.—Electric wiring of Poor Law Institution and Infirmary. Specification from Mr. J. Fraser Haddock, 9, Carfax, Horsham.

WORKSOP RURAL DISTRICT COUNCIL, August 3rd.—Electric light installation in 20 houses at Carlton. Specification from Mr. A. E. Hewitt, 66, Bridge Street, Worksop; deposit £1.

BELFAST MENTAL HOSPITAL, August 4th.—(*a*) Automatic telephone installation at Purdysburn Villa Colony, with switchboard, distribution frame, batteries, wall and table instruments, etc.; (*b*) 42 250 yards of underground telephone cables, ranging from two-wire to 20-wire, and 5 miles 16 S.W.G. bare overhead wire. Specification, etc., from the Secretary, Mental Hospital, Belfast.

GLASGOW CORPORATION, August 4th.—Electric light installation work in connection with Ballornock (2nd section) and Summertown Road lighting schemes. Specifications, etc., from Mr. R. B. Mitchell, 75, Waterloo Street, Glasgow.

MANCHESTER CORPORATION, August 4th.—Supply of electric cooking ranges during 12 months. Specification (No. 168) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

MANCHESTER CORPORATION, August 4th.—Twelve months' supply of quick-break switches and cut outs. Specification (No. 169), from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

WATERLOO AND TAUNTON LIBERAL CLUB, ASHTON-UNDER-LYNE, August 4th.—Electric light installation. Specifications from the Secretary after 7 p.m.

KILKEEL RURAL DISTRICT COUNCIL, August 5th.—(*a*) Cold-starting crude oil engine; (*b*) generator booster and switchboard; (*c*) storage battery; (*d*) pole erection work; (*e*) line erection work; and (*f*) erection of power house for electric lighting of Rostrevor. Specifications for each section (deposit £1 1s.) from Mr. P. T. White, 50, Queen Street, Newry.

BRIDLINGTON CORPORATION, August 6th.—(1) Surface condenser, with extraction plant and circulating pump, pipework and valves to work in conjunction with 600 kW turbine; and (2) one wooden cooling tower, with tank and foundations, to work in conjunction with 600 kW condensing plant. Specifications, on and after July 19th, from Kennedy and Donkin, 8, Broadway, Westminster, S.W.1; deposit £2 2s. for each specification.

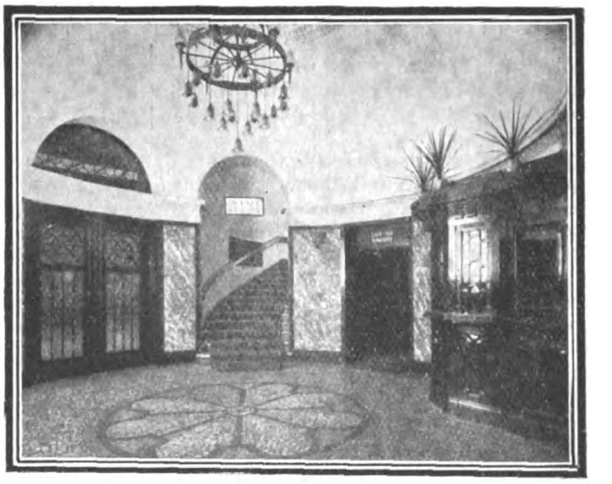
GERRARD'S CROSS PARISH COUNCIL, August 6th.—Maintenance and regulation of electric light standards fitted with time switches. Particulars from Mr. C. E. Colston, clerk of the Council, Grouville, Bulstrode Way, Gerrard's Cross.

ST. AUSTELL URBAN DISTRICT COUNCIL, August 6th.—Electric wiring of premises in Fore Street, recently occupied by the Liberal Club. Specifications from the Surveyor, Council Offices, St. Austell.

SKELMANTHORPE LIBERAL CLUB, NEAR HUDDERSFIELD, August 7th.—Electric light installation. Particulars from Mr. G. H. Ellis, Strike Lane.

WHARFEDALE RURAL DISTRICT COUNCIL, August 11th.—Electric wiring, etc., of 12 parlour and 14 non-parlour houses on Stockshill housing estate, Menston; deposit £1 1s.

NEWARK CORPORATION, August 12th.—One 200 kVA oil cooled static transformer (contract F.2); and e.h.p. 11 000 V switchgear cubicle (contract F.3). Specifications from the Electrical Engineer, Bank Chambers, Market Street, Newark; deposit £2 2s. for each contract.



AN interesting coloured lighting installation has been introduced at the new Cecil Theatre, Hull. The work was done by the City Electrical Co., of Hull, with fittings and lamps supplied by the G.E.C.

SITTINGBOURNE AND MILTON JOINT HOSPITAL BOARD, August 16th.—Complete electric lighting installation, for the hospital buildings at Keycol Hill, near Sittingbourne. Specifications, etc., after August 5th, from Mr. T. W. Ellis, 70, Victoria Street, London, S.W.1, or from the Clerk, 76, High Street, Sittingbourne.

SWANSEA CORPORATION, August 16th.—Electric lighting installations, etc., at new Isolation Hospital, Hill House, Sketty, Swansea. Specifications from Mr. E. E. Morgan, 3, Prospect Place, Swansea; deposit £3 3s.

INDIA STORE DEPARTMENT, August 17th.—Supply of three electrically driven metre-gauge rope inclines, with gears, ropes, cars and rollers, for Uhl river hydro-electric project. Specification (5s.) from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1.

DUNDEE CORPORATION, August 20th.—Supply and erection of six 200 kVA outdoor type transformers. Specification, etc., from Mr. D. H. Bishop, general manager and engineer, Electricity Supply Department, Dudhope Crescent Road, Dundee.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD., August 23rd.—Supply and erection of a central evaporating equipment at the company's Barking power station. Specifications, etc., from F. C. McQuown, joint manager and secretary, Moorgate Court, Moorgate Place, London, E.C.2; deposit £5 5s.

LIVERPOOL CORPORATION, August 31st.—Supply and installation of closed circuit code-signalling street fire alarm and telephone system. Specification from the Town Clerk.

COVENTRY CORPORATION, September 3rd.—Buildings, foundations and subways; eight 15 000 kW turbo-alternators condensing plant and economisers; eight water-tube boilers, complete with induced draught plant, and chimneys; coal and ash handling plant; switchgear; steam and water pipework; crane; and cooling towers. Specifications, etc., from Mr. Geo. Tough, engineer and manager, Electricity Department, Council House, Coventry; deposit £5 5s.

STOKE-ON-TRENT CORPORATION, September 7th.—Supply and erection of one 10 000 kW turbo-alternator and con

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densing plant (contract 2 614); one natural draught cooling tower (contract 2 615); and ironclad l.t. three-phase switchgear (contract 2 616). Specification, etc., from the City Electrical Engineer, St. George's Chambers, Wolfe Street, Stoke-on-Trent; deposit £2 in respect of each contract.

INDIA STORE DEPARTMENT, September 10th.—Supply of power station and switchgear and auxiliary plant, in connection with Great Indian Peninsular Railway electrification. Specification (£1) from the Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1.

Overseas.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

JOHANNESBURG MUNICIPAL COUNCIL, July 31st.—Supply and erection of electrically driven triplex plunger sewage pump.

EGYPTIAN MINISTRY OF THE INTERIOR, August 1st.—Installation of electric power station equipment at Keneh and Luxor for production of three-phase current, 3 300 V, 50 cycles. (Reference B.X. 2 627.)

DEPUTY POSTMASTER-GENERAL, MELBOURNE, August 3rd.—Supply of telephones and dials. (Reference B.X. 2 564.)

STATE ELECTRICITY WORKS, MONTEVIDEO, August 5th.—Porcelain insulators, etc. (Reference B.X. 2 618.)

INDIA STORE DEPARTMENT, August 6th.—Boiler house equipment with other plant and piping for power house, or, alternatively, complete boiler house installation, including pulverised fuel equipment, etc. Specification (£2) from the Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1.

INDIA STORE DEPARTMENT, August 9th.—Electrical generating plant for the Peshawar power station of the North Western Railway. (Reference B.X. 2 644.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, August 10th.—Dry cells. (Reference B.X. 2 649.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 10th.—Supply of telephone exchange indicators (schedule C. 99). (Reference B.X. 2 597.)

MELBOURNE CITY COUNCIL, August 11th.—Supply of high and low tension three-phase sub-station switchgear (specification No. 810). (Reference B.X. 2 565.)

SOUTH AFRICAN RAILWAYS AND HARBOURS ADMINISTRATION, August 12th.—Supply of cables and wires and bare copper wire during 1927 (tender No. 834). (Reference B.X. 2 639.)

AARHUS (DENMARK) LIGHTING DEPARTMENT, August 17th.—Steam turbo-generator and boiler plant, for new power station. (Reference A.X. 3 371.)

INDIA STORE DEPARTMENT, August 17th.—Transformers for power station in connection with G.I.P. Railway electrification. Specifications (10s.) from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1.

JOHANNESBURG MUNICIPALITY, August 19th.—Overhead tramway equipment, comprising double pull-offs, straight line hangers and insulator pins. (Reference B.X. 2 702.)

JOHANNESBURG MUNICIPALITY, August 19th.—Supply of h.t. switchgear. (Reference B.X. 2726.)

CHILIAN STATE RAILWAYS, August 20th.—Signals, telegraphs, telephones, etc. (group 36); electric materials for sub-stations, aerial lines and lighting, 1st-zone (group 37). (Reference C. 1 935.) Booklets (in Spanish) numbered to correspond with the group numbers, and giving further particulars will be loaned to British firms in the order of application.

JOHANNESBURG MUNICIPALITY, August 21st.—Street lighting material. (Reference B.X. 2728.)

JOHANNESBURG MUNICIPALITY, August 21st.—Reverse power relays (contract 668). (Reference B.X. 2725.)

VICTORIAN ELECTRICITY COMMISSIONERS, August 23rd.—Supply of 10 in. diameter disc suspension insulators, with cotton split pin or similar coupling device. (Reference B.X. 2 614.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 24th.—Synchronous condensers (section 18, Waikaremoana). (Reference B.X. 2 608.)

PRETORIA MUNICIPALITY, August 26th.—Equipment for five transformer stations. (Reference B.X. 2 721.)

SOUTH AFRICAN RAILWAYS AND HARBOURS ADMINISTRATION, August 26th.—Material for distribution system in connection with the Cape Town suburban electrification. (Reference B.X. 2 680.)

CITY ELECTRIC LIGHT CO., LTD., BRISBANE, August 27th.—Supply, delivery and erection of one 12 500 kW turbo-alternator. (Reference A.X. 3 085.)

NEW ZEALAND RAILWAYS DEPARTMENT, August 30th.—Supply of slip ring induction 400 V 50 cycle three-phase motors and starters. (Reference B.X. 2 561.)

DEPUTY-DIRECTOR OF POSTS AND TELEGRAPHS, MELBOURNE, August 31st.—Telegraph equipment (schedule C. 109). (Reference B.X. 2 653.)

PERNIK STATE COAL MINES, BULGARIA, September 1st.—Electricity generating plant, consisting of two 4 000 kW steam turbo-generator sets, buildings, etc.

VICTORIAN RAILWAY COMMISSIONERS. September 1st.—Equipment for automatic control of two rotary converters at Seaford sub-station.

VICTORIAN RAILWAY COMMISSIONERS, September 1st.—Automatic sub-station equipment (contract No. 39 287), for Elwood sub-station. (Reference B.X. 2 598.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 2nd.—Electro-pneumatic working of points and day colour light signalling, with alternative current track circuits, in connection with the electrification of the Cape Town suburban railways. Specifications, etc., from the Office of the High Commissioner for the Union of South Africa, Trafalgar Square, London, W.C.2, or from the Chief Railway Storekeeper, Park Station Chambers, Johannesburg; deposit £5 5s.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 7th.—Synchronous condenser for Arapuni power scheme, section 165. (Reference B.X. 2 665.)

DUNEDIN (N.Z.) CORPORATION, September 8th.—(i) Reaction water wheel for direct connection to a.c. generator; (ii) one 3 000 kW, 6 600 V, 50 cycle generator; (iii) four 1 000 kW 6 600/20 000 V, 50 cycle transformers; (iv) switchboards, oil-break switches, disconnecting switches, voltmeters, ammeters and wattmeters, current and potential transformers, etc. (Reference B.X. 2 654.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, September 14th.—Telephonists' telephones and handsets (Reference B.X. 2 696.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 15th.—Supply and installation of electricity distribution system for the town of Luxor, including 6 830 metres of h.t. and 1 210 metres of l.c. armoured cable, 6 transformer cabins, 12 transformers (from 10 to 50 kVA), copper cable, poles, cable boxes, cut-outs, insulators, lamps, etc. (Reference B. 2 737.*)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, September 21st.—Switchboard keys, and parts (schedule 26/720.) (Reference B.X. 2 699.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 28th.—Three motor-driven low lift pumps with control apparatus, for Taieri drainage scheme. (Reference A.X. 3 274.)

CHRISTCHURCH (N.Z.) DRAINAGE BOARD, October 19th.—Supply and erection of three sets of electric centrifugal pumping plants (contract 26 329). (Reference A.X. 3 215.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd,—Indoor control gear and switchgear for Waikaremoana electric power development (section 14). (Reference B.X. 2 675.)

Tenders Accepted.

BEDFORD EDUCATION COMMITTEE.—Goddard Bros., electricians' work in schools.

MARGATE CORPORATION.—E. A. Pinto, electric light installation at houses on Dane Valley estate, £5 8s. per house.

THAME URBAN DISTRICT COUNCIL.—Holland, Beechey and Co., wiring Town Hall for electric lighting, £50 4s. 9d.

HAWORTH URBAN DISTRICT COUNCIL.—G. A. Rix, motor-generator set and switchboard, for the electricity works.

ROTHWELL URBAN DISTRICT COUNCIL.—Horstman Gear Co., Ltd., 360 automatic clocks, for public lighting, 35s. each.

DUNDEE CORPORATION.—Buglass and Jamieson, Ltd., electrical work in the Gas Department's offices, £109 9s. 3d.

MIDDLESBROUGH CORPORATION.—General Electric Co., Ltd., erection and equipment of an electricity generating station, £131 800 (recommended).

READING CORPORATION.—Reading Electric Supply Co., Ltd., illuminating the new Caversham Bridge, £104 per annum (eight all-night 200 W, eight half-night 200 W, and four all-night 60 W lamps.)

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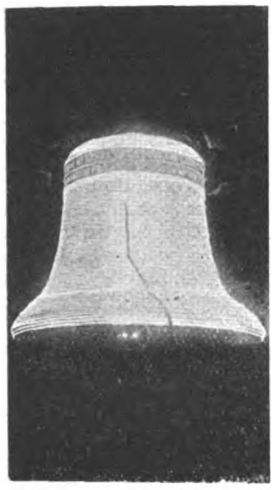
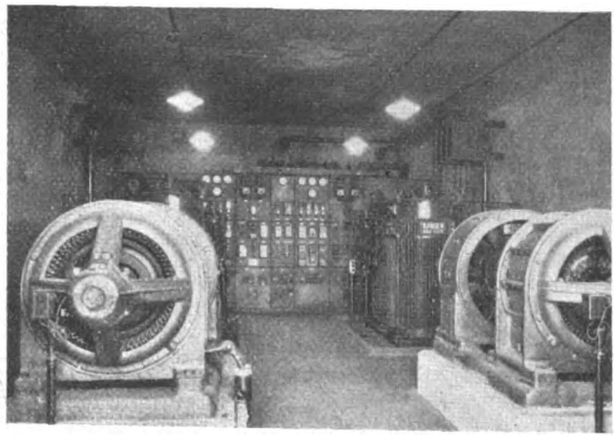
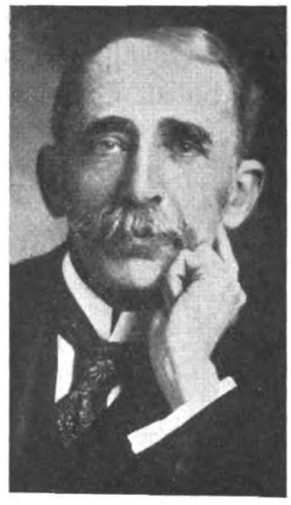
NEWS IN PICTURES



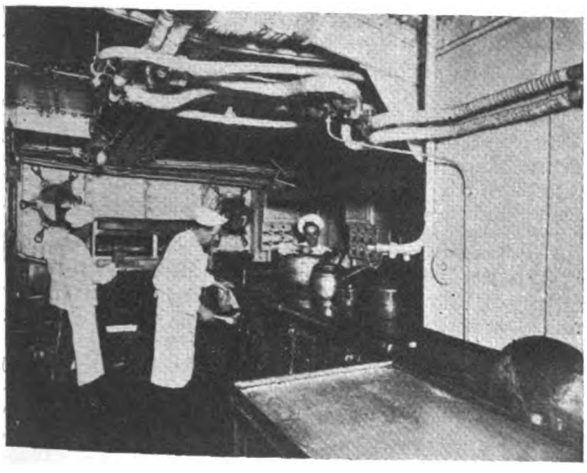
Huge illuminated replica of Liberty Bell, at Sesqui-Centennial Exhibition, Philadelphia, Pennsylvania. This model is lighted by 26 000 incandescent lamps.



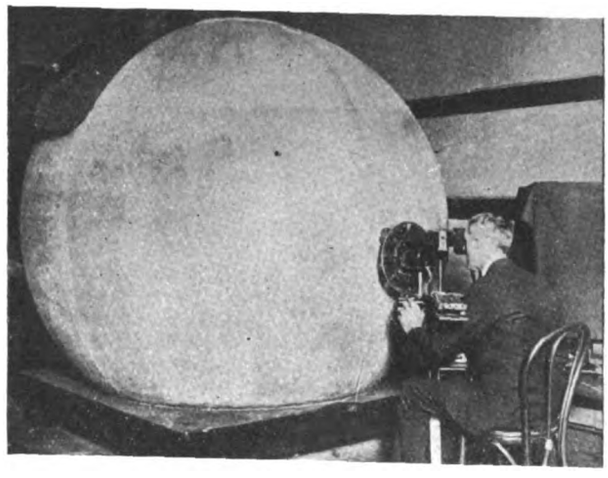
An automatic sub-station recently installed in the five-storey office building of a well-known steel company in the United States. This sub-station converts from alternating to direct current, and it can be put into operation or stopped by the housekeeper or tenants.



Dr. J. A. Fleming, who is retiring from the Chair of Engineering in the University of London. Dr. Fleming has been a professor at University College 42 years.



The cooking on board the night mail steamer "Malines," which runs between Harwich and Antwerp, is all performed by electricity. In this picture of the kitchen, the chef in the centre is engaged at the ovens, the one on the left is at the grill, and the assistant on the right attends to the hot-plates.

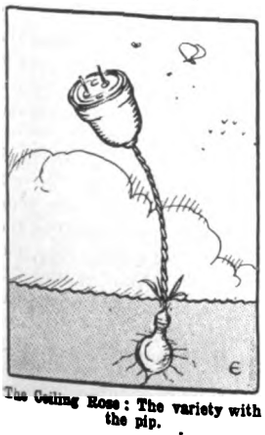


Mr. J. F. Skogland, of the U.S.A. Bureau of Standards, working at an 88-in. spherical photometer used to set standards of candle-power for electric lamps. The inner surface of the device reflects the light uniformly, and its brightness is taken as a measure of the light emitted from the source.

IN LIGHTER VEIN.

Random Comments and Reflections on Electrical Topics of the Week.

NOW that summer is here and the butterfly nut is on the wing, and everybody appears to be rushing into print with notes on how to raise everything except money, we must have a few gardening notes to brighten up things a little. The first spasm deals with the culture of that hardy plant, the Ceiling Rose.



The Ceiling Rose: The variety with the pip.

* * *

THE CEILING ROSE (*Roofus Lux*).—Now is the time to plant Ceiling Roses. Bulbs, which are generally pipless, should be kept in the shade. A rich soil is needed, and the bulbs thrive if planted deeply at various points and carefully controlled. Unlike most other hardy annuals, they flower in the winter seasons, requiring very little sunlight. The flower has a yellow centre and glossy white petals. The fruit is collected at the end of each month.

Summer in the air and gardening notes indicate a suitable opportunity for spraying a little poetry, so here is the first injection :—

Deep in the heart of a rose
I fashioned a contact true,
With flexes drooping,
Without uprooting,
All this I did for you.
But when my account I rendered,
I found that you would not part,
The radiance departed,
I left broken-hearted,
All through the heart of a rose.

* * *

A number of interesting developments in electro-farming are reported, this time more in connection with market gardening. Electro-plating is now being successfully used for coating strawberries with cream. Full details are not yet available, but it is understood that the electrolyte used is milk, as *creme-de-menthe* was found on test to give very erratic results and evaporation (!) was very high. Milk chocolate and cans are used as anodes.

* * *

A Burnley man has invented a "Wonder Ray" which, it is stated can, by electrical means, "turn steel into powder, or lump sugar into something resembling charcoal." These, we are relieved to learn, are only among its minor achievements.

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LAMPS FROSTED INSIDE.

New Gasfilled and Vacuum Lamps which Abolish Glare and Reduce Absorption.

SOME of the leading British electric lamp makers have put on the market, recently, lamps frosted on the inside, with the obvious advantages of minimising the collection of dust on the bulbs and simplifying the task of cleaning them.

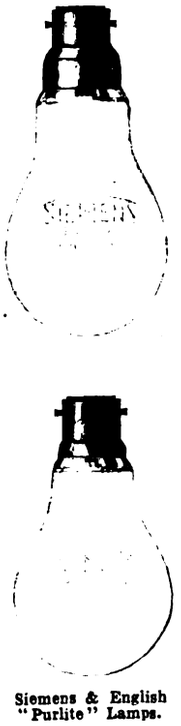
"Pearl" Mazda Lamp.

The first of the accompanying illustrations shows the "Pearl" Mazda lamp, made by the British Thomson-Houston Co. This is a standard gasfilled lamp frosted inside. The original drawn wire tungsten filament was invented and perfected in the Mazda research laboratories, as was also the first gasfilled lamp. White and colour-sprayed lamps were subsequently developed in the same laboratories. Recently, a method whereby the inside of the bulb can be frosted without weakening the glass has been discovered in the Mazda research laboratories, and its result is the "Pearl" Mazda lamp. This lamp reduces glare to a minimum and softens shadows, and the light absorption is less than 2 per cent. "Pearl" Mazda lamps are made in 40, 60 and 100 W sizes in all standard voltages.

The General Electric Co., is now selling the Osram "Pearl" internally frosted lamp. The G.E.C., through the medium of its research laboratories, which work in the closest co-operation with the Osram Lamp Works, is ever on the alert to improve the Osram lamp. Recent notable improvements have been the gasfilled lamp with its bright white light, the pipless bulb, and the white or colour-sprayed Osram, and the latest development is the Osram "Pearl" lamp frosted on the inside. The frosting of lamps on the inside was done many years ago, but at that time it made the bulbs liable to break very readily, the reason being that the process left the surface of the etched glass jagged. By the new treatment the jagged edges are rounded off and the bulb is rendered as strong as a clear one.

It is claimed that the Osram "Pearl" lamp will replace both clear and white-sprayed lamps, which will mean a reduction in the number of types of lamps carried by the re-seller, and that the light maintenance is extremely good throughout the life of the lamp.

When lamps are frosted on the outside the light absorption is about 4 to 5 per cent., but the inside frosted lamps absorb only 1 to 2 per cent. of the light, because by their use internal reflections in the bulb are practically eliminated. The pearl grey bulb takes on a delicate tint of the colour of its surroundings, and thus will harmonise with any colour scheme. Although the absorption is very low, the inside frosting effectively diffuses the light, protecting the eyes from glare and eliminating specular images.


Siemens & English "Purlite" Lamps.

The other illustrations represent the new Siemens "Purlite" lamps, vacuum and gasfilled, which have been placed on the market by the Siemens and English Electric Lamp Co. The bulbs of these new lamps have the inside surface frosted, so that the advantages of cleanliness and ease of cleaning apply also to these lamps. The gasfilled lamps are of standard construction, but the vacuum lamps have spiralised filaments and are in a distinctively shaped bulb. The bulbs effectively screen the high intensity light source from the eyes, with a minimum of light absorption. These lamps also take on by night the tint of the surrounding decorations.

LEGAL INTELLIGENCE.

Sheffield Tramways Manager wins Libel Actions arising out of the General Strike.

The libel action by Mr. A. R. Fearnley, general manager of the Sheffield Tramways, against four officials of the Sheffield Trades and Labour Council and the printer and publisher of the "Sheffield Forward," was tried at the West Riding Assizes last week. The libel complained of was a statement in the "Sheffield Forward" on May 12th, that in the ballot of the tramwaymen on strike the ballot papers were all numbered and that the registered number of each employee was on the envelope under the stamp, which the journal went on to describe as despicable tactics.

Mr. Fearnley said he gave the men permission to tear the numbers off the ballot papers.

The jury found for the plaintiff against all the defendants, and awarded plaintiff one farthing damages. Mr. Justice Finlay granted costs against all the defendants.

In an action by Mr. Fearnley against Mr. C. J. Mitchell, a Woodhouse schoolmaster, on similar grounds, judgment was given for plaintiff for £75 damages and costs.

Failure to Supply Electricity during Strike.

Walthamstow U.D.C. was fined £1, with 25 guineas costs, by the Stratford magistrates last week, for neglecting to supply a certain local firm with electricity from May 6th to 12th, during the General Strike. Several summonses had been issued to other firms, but these were withdrawn.

Electrical Co.'s Losses.

Mr. Justice Romer, in the Chancery Division on Tuesday, sanctioned a reduction of the capital of Mawdsleys, Ltd., from £30 000 to £13 333 13s. 4d.

Mr. Nesbit, for the company, said the company had suffered losses due to depression in the electrical engineering industry and depreciation in the value of stock. The company experienced losses in the years 1922–23–24, but in 1924–25 a profit was made, and the object of the petition was to cancel capital lost or unrepresented by available assets.

B.S.A. Co. as Electrical Engineers.

Mr. Justice Romer, in the Chancery Division on Tuesday, sanctioned a petition by the Birmingham Small Arms Co., Ltd., for extension of its objects.

Mr. W. F. Spens, K.C., for the company, said the company which during the war was almost exclusively engaged on munition making, now wished to extend its operations to electrical engineering and the manufacture of wireless apparatus, as well as motor and general engineering. It also desired to carry on these operations through subsidiary companies and to finance and guarantee these companies.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

Glasgow Corporation had received an offer from a London syndicate for advertising rights on the tramcars. The revenue offered to the Corporation from this source is said to be about £10 000 per annum, or about £10 per car.

London County Council has increased transfer facilities for passengers with 4d. workman's and 6d. ordinary return tickets to and from Central London points. Certain alternative routes may be used, and although there may be through cars to a passenger's destination he or she may take the first car and change at certain points.

At a recent meeting of Oldham Tramways Committee, the chairman, Ald. Cheetham, explained the position in regard to the four miles of tramway track used by the Oldham Corporation cars in the Royton district. When the lease was renewed last year the Corporation agreed to pay Royton £250 per route mile per annum, with a proviso that when new track was put in over a length of not less than 100 yards the rent should be reduced accordingly. The Tramways Committee is convinced of the necessity of renewing the track in the portion of Rochdale Road within the Royton boundary, but Royton Council will consent only on condition that a full service is run to the Summit boundary. The committee has decided to carry out the work, but to give only a 30-min. service on Sunday mornings and a 20-min. service at other times.

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IN PARLIAMENT.

Electricity (Supply) Bill Passes Committee Stage—Conditions in Swindon Corporation Bill Regarding Sale of Wiring, Plant and Apparatus—Irish Bill Dealing with British Patents.

Standing Committee C of the House of Commons concluded consideration of the Electricity Supply Bill on July 22nd, and the Bill was ordered to be reported to the House.

Major R. G. C. Glyn moved to add a proviso to schedule 5 to ensure the safety of the public when using the railways. The object of the proviso was to prevent the placing near railways of high-tension wires which might interfere with delicate means of communication, such as wireless communication between signal cabins and locomotives.

Lieut.-Col. Moore-Brabazon (Ministry of Transport) said he could not give a blank cheque in this matter. It might mean that high tension cables might have to be removed if a railway company wanted to instal apparatus for remote control of trains. If expert opinion was submitted to him, the matter would be considered before the report stage.

Major Glyn's amendment was withdrawn.

After some discussion on schedule 6, which deals with the position of water undertakings which might be called upon to give supplies of water to electricity undertakings, an amendment moved by the Minister of Transport was agreed to. It provides that in any order authorising the abstraction of water from any reservoir used by any statutory water undertaker there shall be inserted such provisions as the Minister of Health (or in the case of Scotland, the Scottish Board of Health) may consider proper for safeguarding the interests of the water consumers, and no such order shall be made without the consent of the owners thereof, which consent shall not be unreasonably refused ; any question as to the reasonableness of such refusal to be referred to an arbitrator.

Amendments, moved by Lieut.-Col. Moore-Brabazon, to bring schedule 7 into line with amendments made in the clauses of the Bill were agreed to. This schedule sets out rules for determining cost of production of electricity.

The proceedings closed with expressions of mutual admiration, the Chairman referring to the heroism of members who had attended every session during the five-and-a-half weeks' consideration of the Bill.

Progress of Bills.

The Unopposed Bills Committee of the House of Commons passed on July 15th the Mexborough and Swinton Tramways Bill, which proposes the running of railless trolley vehicles on several additional routes. The Bill was ordered to be reported for third reading.

The Bill to confirm a Provisional Order providing that a certain number of members of Bootle Corporation may sit on the Liverpool Electricity and Tramways Committee, in view of the fact that Bootle Corporation is supplied with electricity by Liverpool Corporation, has been passed for third reading by the Unopposed Bills Committee of the House of Commons.

The Bill to authorise a working arrangement between the Dublin United Tramways Co. and the Clontarf and Hill of Howth Tramways Co. has been allowed by a Committee of the House of Lords to proceed. The clauses in the Bill included all tramways in the county of Dublin, but under an agreement which has been arrived at, the Bill is to apply only to tramways in Clontarf, Drumcondra, Glasnevin and New Kilmainham.

During the discussion, by the House of Commons in Committee, of the Expiring Laws Continuance Bill, Captain Wedgwood Benn moved an amendment to the schedule to leave out from the Acts continued the Wireless Telegraphy Act, 1904. He asked whether if the amendment were not passed the Postmaster-General would undertake to introduce within the next 12 months new legislation bringing the law into harmony with modern needs. Viscount Wolmer, Assistant Postmaster-General, said the science of wireless telegraphy was still in it infancy. Knowledge of it was continually extending and experience was altering every year. Until wireless had attained stability, as steam and other more ancient inventions had, he thought it would be unwise to legislate in a permanent sense. The amendment was rejected without a division.

The Unopposed Committee of the House of Lords on July 21st ordered the Swindon Corporation Bill to be reported for third reading. There is no alteration in the clause relating to the sale of fittings since the Bill left the House of Commons. The clause relieves the Corporation from an obligation imposed by a previous Act to carry out wiring only through contractors. The local contractors deposited a petition in the House of Commons, but withdrew their opposition in consequence of an agreement with the Corporation to add to the clause a proviso relating to the prices of fittings. This provides that the Corporation shall not sell wiring and apparatus except at retail prices, and that they shall not sell plant to the trade, save where there is an electrical contractor of whom the consumer or prospective consumer is a customer or prospective customer, in which case they shall sell to the electrical contractor at trade price. On Tuesday, Lord Banbury moved to insert a clause to make the Corporation liable for any damage or loss sustained by consumers through failure, without reasonable excuse, to supply electricity. The Earl of Donoughmore (Chairman of Committees) said the law already provided against default. It was desirable that a matter of that kind should be dealt with by general legislation. Viscount Peel said the matter would be considered on the Electricity Bill. The amendment was withdrawn, and the Bill passed.

Replies to Questions.

The following are points from recent answers to questions in the House of Commons :—

A condition relating to entries in the Telephone Directory is that subscribers have no claim against the Post Office in respect to omissions or errors.

The Postmaster-General thinks it better to rely upon the penalties prescribed by the Wireless Telegraphy Act, 1904, than to refuse to issue wireless licences to persons who have attempted to evade the law.

The Minister of Transport has consented to the erection by the Rushden and District Electric Supply Co. of an overhead line along the main street of Sharnbrook, after having been satisfied that the Bedford R.D.C. had no objection to it.

The British Broadcasting Co. has been authorised to make alterations in the wavelengths of several of its stations, to meet the changing conditions caused by the extension of broadcasting in neighbouring countries.

The Irish Free State Government has stated that notice of appeal has been entered against the recent judgment in the High Court of the Irish Free State to the effect that British Patent rights were no longer valid in the Irish Free State, but it was doubtful whether the appeal could be heard before the autumn. A Bill has been introduced in the Irish Free State Parliament to declare valid patents registered in London before December 7th, 1921.

Business Items.

Hollings and Guest, Ltd., announce reduced prices for their Guest's all-metal hand-bundling presses.

The Credenda Conduits Co., Ltd., has removed to more commodious premises at Oldbury, Birmingham. Telegrams : Credenda Birmingham ; Telephone : " Oldbury 401."

C. F. Pardoe, registered electrical installation contractors, of Clarence Street, Hull, are about to double the size of their premises by building an extension on an adjoining site.

The offices of the Lorival Manufacturing Co. (1921), Ltd., have been moved to 117, Victoria Street, London, S.W.1. The new telephone number is Victoria 2 648, and the telegraphic address " Lorinsulor, Sowest, London."

The Bombay Electric Supply and Tramways Co., Ltd., is establishing a showroom in Bombay for the demonstration and exhibition of approved domestic electrical appliances, and will be glad to receive manufacturers' trade literature, which should be addressed to Post Box 192, Bombay, India.

Electric Heating and Hardware, Ltd., have appointed Harwell, Ltd., of 28, John Street, Theobald's Road, London, W.C.1, as their agents for " Komet " and " Glowincoal " electric heating appliances for the London area, and that in future 28, John Street, Theobald's Road, W.C.1, will also be the London address of Electric Heating and Hardware, Ltd.

The prosecution of the engineer operatives' claim for a wages increase of 20s. per week appears to be postponed indefinitely. Mr. J. T. Brownlie announced after a meeting of the A.E.U. executive and the London District Committee on Tuesday that the matter was in the hands of the Executive Council, and that a further meeting would be held when conditions were more settled.

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WIRELESS NEWS.

The Radio Manufacturers' and Distributors' Association.

UP to the time we went to press the wholesalers had not agreed to the draft of the constitution of the new Radio Manufacturers' and Distributors' Association. At a recent meeting the wholesalers' representatives made their support of the scheme conditional upon their being free to import and handle foreign goods, or, failing that, they asked for

A wireless picnic: A radio set contributes greatly to outdoor enjoyment.

a guarantee that the manufacturers would recognise the wholesalers' restricted list. These questions were discussed at a conference of the representatives of the N.A.R.M.A.T. and the S.R.M. on Wednesday.

The Council of the Wireless Retailers' Association of Great Britain recently passed a resolution "that this Council, whilst approving the general desire to introduce and sell to the public British manufactured wireless apparatus wherever and whenever possible, nevertheless endorses the attitude of the wholesale section of the trade in demanding freedom from restrictions in respect of the right to handle goods from overseas."

Wireless News in Brief.

Reading T.C. has passed a by-law making it an offence to operate in the street or any public place a wireless loud speaker to the annoyance of residents.

A contract has been signed between the Government of Bolivia and Marconi's Wireless Telegraph Co., Ltd., whereby the latter will, as from October 1st, control and operate, for 25 years, the postal telegraph and wireless services of Bolivia, on the basis of a percentage of the gross receipts of the services as remuneration for management, plus a proportion of profits when there is a surplus.

Mr. W. G. Gibson, Postmaster-General of the Australian Commonwealth, stated in the House of Representatives recently that the delays in the completion of the beam wireless stations in England and Australia were due to the coal strike in the former country. It was not anticipated that beam wireless communication would be established between England, Australia, and Canada before December next.

In the same assembly, Mr. Brennan, a Labour Member, moved a vote of censure of the Government in regard to its control of wireless matters, chiefly in relation to the Amalgamated Wireless Company and its alleged failure to carry out its obligations. Mr. Brennan said that neither on the beam nor the high-power system was a commercial project (for communication with Great Britain) demonstrated to be possible. Mr. Brennan's motion was defeated.

Capt. Eckersley states that the British Broadcasting Co'.s recent dual transmission experiments proved that the transmission of two programmes from one station, when a desirable wavelength margin is observed is a practical proposition.

We are asked to state that all the motors and control equipment used in the Python Mill, Littleborough, a description of which appeared on page 94 of our last issue, were manufactured by the British Thomson-Houston Co.

PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

Following treatment at Droitwich, the health of Mr. J. W. Burr, Swansea's municipal electrical engineer, is greatly improved.

Sir Hugo Hirst has been appointed a member of the Committee which has been set up to inquire into and report upon the desirability and practicability of developing co-operative selling in the coal-mining industry.

King's Lynn Corporation has decided to increase the salary of Mr. C. W. Jackson, borough electrical engineer, from £440, with emoluments, to £600, with like emoluments. The salary is to cover work connected with the electrification of the waterworks.

Mr. Duncan MacLennan, the new manager of the Inverness electricity undertaking, which was taken over recently by the T.C. from a company, has tendered his resignation, which has been accepted. Mr. Grut has been appointed interim manager for three months.

At the Worcester electricity works last week Mr. C. M. Shaw was presented with an armchair and an illuminated address, as mementos of his having completed 21 years as City Electrical Engineer. Mrs. Shaw received from the Electricity Committee and the employees a porcelain coffee service.

It is reported that Mr. Charles Furness, borough electrical engineer and tramways general manager at Blackpool, has asked to be relieved of all responsibility for tramway and transport work. The General Purposes Committee recently rejected, by 23 votes to 19, a proposal to separate the electricity supply and tramways departments.

Mr. George G. Sim, C.S.I., C.I.E., has been appointed secretary of Vickers, Ltd. Mr. Sim entered the Indian Civil Service in 1901, became an Under Secretary to the Government in 1908 and was Chairman of the Cawnpore Municipal Board from 1912 to 1917, has held several other important posts, including that of Joint Secretary of the Finance Department of the Government of India.

The marriage took place on Tuesday at St. Margaret's, Westminster, of Mr. J. E. Guthrie, of Northallerton, and Miss Mary Renwick, daughter of Sir Harry Renwick, K.B.E. (Chairman of the London Electric Supply Co.) and Lady Renwick, of Coombe Warren, Kingston Hill. The ceremony was followed by a reception at Claridge's Hotel, London. Our illustration shows the bride and bridegroom leaving the church.

Guthrie-Renwick Wedding.—Leaving the Church.

A committee consisting of many eminent men connected with electrical engineering and radiotelegraphy, is inviting subscriptions from friends, colleagues and students of Dr. J. A. Fleming (whose portrait appears on our picture page) to defray the cost of a portrait of Dr. Fleming to be placed in University College, London, and of a replica which will be offered to the Institution of Electrical Engineers. It is suggested that no individual subscription should exceed five guineas. Subscriptions should be sent to the Hon. Secretary of the Committee, Prof. W. C. Clinton, University College, London, W.C.1.

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ELECTRICITY SUPPLY.

Coleraine Council's Electricity Scheme Postponed—Yorkshire Electric Power Co.'s New Station at Ferrybridge—Electric Lighting on Bradford Tramway Routes.

LESLIE (Fifeshire) T.C. has decided to call a special meeting to decide whether electric lighting shall be adopted in the streets.

The North Wales and South Cheshire Joint Electricity Authority has approved an extension of the Crewe special supply area to include parts of Nantwich rural district.

Scarborough R.D.C. has decided not to withdraw its opposition to the application of Scarborough Corporation for an Order to supply electricity in the Scarborough rural and Scalby urban districts.

The Electricity Commissioners have sanctioned the borrowing by Coleraine U.D.C. of £19 500 for the electricity scheme. The Council, however, has adjourned, *sine die*, the question of negotiating the loan.

Cardiff Electricity Committee has recorded its appreciation of the services of the city electrical engineer during the General Strike, and the employees who remained on duty are to receive an extra week's pay.

The Millom U.D.C. electricity scheme, which has now been authorised, provides for taking a h.t. supply from the Millom Iron Works, and its transformation to 400 V and 210 V for power and lighting respectively.

Cockermouth R.D.C. has instructed its engineer to prepare an estimate of the cost of an electricity supply scheme. Seaton P.C. has decided to ask the R.D.C. for particulars of the comparative cost of electricity and gas.

A sub-committee of Walton-on-Thames U.D.C. has been appointed to confer with the Council's technical advisers and the Urban Electric Supply Co., with a view to securing, if possible, a reduction of the price at which the Council may acquire the local electricity undertaking.

Limerick Corporation's electricity output is to be augmented by a supply from the temporary power station of Siemens-Schuckertwerke at Ardnacrusha. The sanction of the Harbour Board to the erection of the necessary cables on steel standards across the Sarsfield Bridge and along the quays is being sought.

Kirkcaldy Electric Committee has adopted a suggestion by the burgh electrical engineer, Mr. O. F. Francis, that an alternative two-part tariff be offered to domestic consumers. Under the new system there will be for all current supplied for lighting, heating, cookers, kettles, washing machines and other domestic appliances a fixed annual charge of one-eighth of the annual rental of the house, plus ¾d. per kWh.

The Local (Yorkshire) Associations of the Institutions of Civil, Mechanical, Electrical, County and Municipal and Locomotive Engineers inspected the Yorkshire Electric Power Company's new Ferrybridge power station last Saturday. This station when completed will make the total capacity of the company's generating plant 91 500 kW. A considerable site has been acquired for future extensions of the Ferrybridge works

Worthing's Diesel-Driven Generating Plant.

The Diesel Engine Users' Association recently visited the Worthing electricity works, in which Diesel plant is used. In the Worthing engines, fuel injection is secured by means of compressed air. During the past year 2 754 000 kWh were generated, and 2 319 000 sold, the generating cost per kWh sold being 0·9d. Mr. Geoffrey Porter, the borough electrical engineer, is joint hon. secretary of the Diesel Engine Users' Association.

At Preston a committee has been appointed to consider and report upon the possibilities of a scheme to form a joint electricity authority to supersede the existing Mid-Lancashire Advisory Board in view of important changes which are foreshadowed in regard to electricity in the district. The investigating committee consists of Coun. E. A. Heaney (Preston), Ald. C. Higham (Blackburn), and Ald. T. E. Higham (Accrington), with Mr. H. Hoyle (Bacup) as secretary. Expert advice is being taken.

London County Council is recommended to agree to the giving of a guarantee in respect of the payment of interest on £1 000 000 to be borrowed by the London and Home Counties Joint Electricity Authority on condition that an assurance is obtained from the Electricity Commissioners that they are satisfied that the technical scheme in respect of which the money is to be borrowed is considered by them to be the best that can be devised for securing a satisfactory supply of electricity at the cheapest possible rate.

At last week's meeting of Bradford Corporation Alderman Pickles moved an amendment to the recommendation of the Street Lighting Sub-Committee that dual lighting (by electricity and gas) on many roads should cease as soon as possible. Alderman Pickles moved to add "where such dual lighting is found to be unnecessary," and this was carried. He failed, however, to secure an amendment to a recommendation to substitute electric lighting for gas on the main tramway and trolley vehicle routes. His suggestion was that the change should be tried on one route only.

The Special Order which has been made authorising the Teignmouth Electric Lighting Co. to add to its present area the districts of Bishopsteignton, Bovey Tracey, Haccombe-with-Combe, Hennock, Ideford, Kingsteignton, Stokeinteignhead, Teigngrace, and Trusham, in the rural district of Newton Abbot, specifies that if, within two years after the commencement of the Order, the Dartmoor Electric Supply Co., Ltd., shall obtain powers to supply electricity in an area comprising the whole or part of the parish of Bovey Tracey this area will cease to be part of the increased area of the Teignmouth company.

Yarmouth's Bulk Supply Terms Declined.

Lowestoft T.C. has rejected the terms quoted by Yarmouth T.C. for a bulk supply, the Electric Works Committee being of opinion that the interests of the Lowestoft area would be better served by increasing the capacity of the Corporation's generating station. The price quoted by Yarmouth was £3 15s. per annum per kVA of maximum demand, plus 0·45d. per kWh, with a coal clause providing for an increase or decrease of 0·0074d. per kWh for each 6d. by which the cost of coal varies above or below 16s. 3d. per ton, after March 31st, 1928, the price prior to that date to be 0·975d. per kWh, with a minimum of £26 per day.

At a recent meeting, Aylesbury T.C. adopted in the rural area a rateable value system of charging which is said to be unique. There is to be a fixed charge of 1s. per annum for every 10 sq. ft. of base area, plus 1½d. per kWh. The 1s. is divided into 5d., 3d., 1d. and 3d. for the winter, spring, summer and autumn quarters respectively. Bungalows of one storey are allowed a reduction of one-third of the base area, and for buildings of more than two storeys the basic charge is increased by one-fourth. For heating and cooking in shops or business premises the charge is 1½d. per kWh. There is to be a sliding scale for power from 4d. to 2½d. per kWh, and if a consumer has a motor or motors of an aggregate capacity of over 5 H.P., the charge for lighting will be 8d. per kWh.

Metal and Chemical Prices.

		TUESDAY, July 27th.		
		Price.	Inc.	Dec.
Copper—				
Best Selected ..	per ton	£64 10 0	15s.	—
Electro Wirebars ..	,,	£66 15 0	15s.	—
H.C. Wire, basis ..	per lb.	9⅛d.	⅛d.	—
Sheet	,,	9 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 1⅛d.	⅛d.	—
Brass 60/40—				
Rod, basis	per lb.	7½d.	—	—
Sheet, basis ..	,,	9⅜d.	—	—
Wire, basis ..	,,	9⅞d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£4 12 6	2s. 6d.	—
Galvanised Steel Wire, basis 8 S.W.G. ..	,,	£13 10 0	—	—
Lead Pig—				
English	,,	£34 0 0	15s.	—
Foreign or Colonial	,,	£32 17 6	15s.	—
Tin—				
Ingot	,,	£289 5 0	£6 10 0	—
Wire, basis	per lb.	3s. 8d.	1d.	—
Aluminium Ingots ..	per ton	£120 0 0	—	—
Spelter	,,	£34 5 0	7s. 6d.	—
Mercury	per bottle	£15 10 0	—	—
Sulphur (Flowers)—Ton		£11 10 0	*Sodium Chlorate*—Per lb. 3d.	
,, (Roll-Brimstone)—,,		£10 5 0	*Sulphuric Acid* (Pyrites, 68°)	
Copper Sulphate— ,,		£25 to £25 10 0	per ton, £6 15 0	
Boric Acid (Crystals) ,,		£37	*Sodium Bichromate*—Per lb. 3½d.	

Rubber—Para fine, 1s. 7½d.; plantation 1st latex, 1s. 8¼d.

The metal prices are supplied by British Insulated Cables Ltd.

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COMPANY NEWS.

Marconi Ordinary Dividend Passed—An Offer for Ferguson, Pailin Shares—Satisfactory Progress of North Wales Power Co.

THE passing of the Marconi ordinary dividend has resulted in a further fall of 5s. in the market price of the shares, which at the time of writing are quoted at 15s.—in contrast with £9 16s. 3d. touched during 1912. Marconi's International Marine shares, which in 1919 were as high as £5 11s. 3d., are now 18s. 9d., a fall of 1s. 3d. on the week. Elsewhere in the electrical markets the feature has been a demand for Siemens shares, which rose half-a-crown to 28s. 9d. A block of Metro-Vickers 8 per cent. preference £2 shares changed hands at well under 47s. 6d., resulting in the marking down of the official quotation to that figure, a fall of 2s. 6d. compared with a week ago. British Electric Traction ord. stock is 3 points down, but London and Suburban debentures are 1½ up.

Last Annl. Divd.	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
%	**Electricity Supply.**				
10	Brompton & Kensington Ord.	32/6	31/10½	45/-	24/-
4	Central Elec. Supp. 4% Deb..	90	90	100	67
15	Charing Cross Elec. Ord. (£1)..	45/7½	45/7½	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/-	17/-	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	48/1½	48/1½	52/6	20/3
6	,, ,, 6% C.P. ..	22/6	22/6	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	59/4½	59/4½	61/3	14/6
6	,, ,, 6% C.P. ..	22/6	22/6	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	13½	13½	13⅜	3½
10	Lon. Elec. Sup. Ord. (£1) ..	32/6	32/6	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	36/10½	36/10½	41/6	8/-
4½	,, ,, 4½% C.P...	17/-	17/-	18/6	9/6
7	N'castle & Dist. Supp. Ord. ..	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/10½	21/10½	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	21/10½	21/10½	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord (£5) ..	16¼*	16½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	43/1½	43/1½	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/-	17/-	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
6	,, ,, 6% C.P...	22/-	22/-	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	134½	137½	123	24
6	,, ,, 6% Pf. Stk.	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	70	70	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	78½	78½	102⅝	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	50½*	52½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½*	73½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98⅝	52
5	Lon. & Sub. Trac. A. Deb. ..	78½	77	89	65
4	Lon. Un. Trams. 1st Deb. ..	47	47	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	64½	64½	101½	49
5	,, ,, 5% Deb. ..	68½	68½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	64	63½	84½	19
3½	,, 3½ Pf. Stk.	64½	64½	88½	40½
3½	,, 3½% Deb.	60½	60½	92⅝	51
3½	Met. Dis. Rly. Ord. Stk. ..	51*	52½	58	12⅝
4½	,, ,, 4½% 1st Pref. ..	77½*	78½	91	45
6	,, ,, 6% Perp. Deb. ..	112½	112½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb.	65	65	73½	48½
—	Underground Elec. Rlys. Ord.(£10)	3⅜	3⅜	5½	21/3
5	Yorks. (W.R.)Trams. Ord. ..	11/6	11/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
†3½	Brit. Elec. Transformer 7% C.P.	18/9	18/9	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	67/6	67/6	62/-	26/6
6	,, ,, ,, 6% C.P.	22/6*	22/6	25/6	14/6
7	British Thomson-Houston Pref.	23/-	23/-	23/4	19/7½
7	,, ,, ,, 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	25/-	25/-	29/-	10/-
‡15	Callender's Cable Ord... ..	65/-	65/-	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref...	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)..	11/3	11/3	28/9½	1/11
7½	,, ,, 1st Pref...	21/3*	22/6	26/-	5/-
10	Elec. Construction Ord. ..	31/10½	31/10½	30/4	6/7½
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	13/9	13/9	29/3	7/3
6	,, ,, 6% C.P... ..	18/-	19/-	21/3	10/6
6	Ericsson Telephones 6% C.P...	22/6	22/6	21/-	12/7½
6	Ferranti 6% Pref.	17/9	17/9	18/6	16/9
7	,, 7% 2nd Pref... ..	18/-	18/-	19/-	13/9
5	,, 1st Mort. Deb. Stock..	91½	91½	96½	80½
7½	General Elec. Ord.	20/-*	30/-	59/-	13/6
20	W. T. Henley's Ord.	77/6	77/6	86/6	23/3
17	Johnson & Phillips Ord. ..	63/1½	63/1½	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	24/4½	24/4½	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	47/6	50/-	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	28/9	29/3	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	29	28½	56/2/6	19½
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½*	61½	68½	40
4	Commercial Cable 4% Deb ..	74½	74½	87½	60
10	Eastern Ord. Stk.	191½	191½	213½	113/2/6
3½	,, 3½% Pref. Stk.	63½	63½	84/17/6	49
4	,, 4% Deb. ..	79½	79½	103½	60
10	Eastern Extension Ord. (£10)..	19⅜	19½	21½	10/12/6
4	,, ,, 4% Deb. ..	79½	79½	97½	60
22	Gt. Northern Telegraph (£10)..	27	27	42/12/6	19
‖10	Indo-European (£25)	46½	46½	59½	25
—	Marconi's Wireless T. Ord. ..	15/-	20/-	9/16/3	20/9
7½	,, Int. Mar.	18/9	20/-	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	18½	18½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	78½	79½	10	60/2/6

† For half-year to June, 1925. * Ex dividend. ‡ Plus share bonus.
¶ Plus 3 p.c. in respect of 1921. ‖ Including bonus.

MATHER AND PLATT, LTD.—Int. div. on ord. shs., 5 p.c. actual, tax free, for half-year to June 30th.

METROPOLITAN RAILWAY CO.—Half-yearly div. on ord. stk., 1½ p.c., and on surplus lands stk., 1½ p.c. actual.

KENSINGTON AND KNIGHTSBRIDGE ELECTRIC LIGHTING CO., LTD.—Int. div. on ord. shs, 5s. p. sh., less tax, payable August 11th.

BROMPTON AND KENSINGTON ELECTRICITY SUPPLY CO., LTD.—Dividend at rate of 10 p.c. per annum, less tax, on ord. shs., for half-year.

LONDON ELECTRIC SUPPLY CORPORATION, LTD.—Int. div. 3s. p. sh. (at rate of 6 p.c. p. annum) for six months to June 30th, less tax,and int. div. 9·6d. p. sh. on £1 ord. shs. (at rate of 8 p.c. p. annum) for six months to June 30th, less tax.

FERGUSON, PAILIN LTD.—An offer has been received from Price, Waterhouse and Co., for the purchase of the £1, 7 p.c., cum. participating pref. shs., at £1 7s. 6d. p. sh., and the £1 ord. shs. at £2 13s. 6d. p. sh. if the shs. offered are not less than 75 p.c. of those issued. The directors recommend acceptance of the offer.

NORTH WALES POWER CO., LTD.—Report on company's operations, as made to the North Wales and South Cheshire Joint Electricity Authority, states that 1925 accounts will show pft. of over £46 000 (increase £6 000) ; deb. int., £25 064. Sales increased over 22 p.c. Important new consumers will take supply as soon as necessary connections can be made. Transmission lines built, 242 miles, under construction, 136 miles, specifications for further 74 miles being prepared.

PERAK RIVER HYDRO-ELECTRIC POWER CO., LTD.—"The Times" gives some particulars of this company's project for supplying electricity over a wide area of the State of Perak. The cost of establishing the works is put at £2 320 000, and it is proposed to raise the funds by an issue of £1 250 000 5 p.c. deb. stk. guaranteed by the Imperial Government, an issue of £1 275 000 7 p.c. participating deb. stk., and £500 000 8 p.c. pref. shs. to be subscribed for by the Federated Malay States Governments.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—The Directors consider that, owing to the continued depreciation of certain of the company's interests in associated and other companies, a further revision of values has become necessary. Pending the completion of the investigations into those undertakings, now being carried out by the company's auditors and by Sir Gilbert Garnsey (of Price, Waterhouse and Co.), the annual meeting has been postponed. Notice of the meeting will be given when the accounts for 1925 are ready. In these circumstances, although the results of trading for 1925 show a profit, the directors do not consider that it will be possible to pay any dividend on the ordinary share capital for 1925. The intention of the directors is to secure that the profits arising from the company's operations shall not in future be diminished by losses which may be incurred owing to any possible future depreciation of its investments in associated and other companies.

New Companies.

W. P. LOVE AND SONS, LTD.—Cap., £1 000. To acquire business of electrical and wireless engineer, etc., now carried on by W. P. Love at Paddock Wood, Brenchley.

LANCASHIRE IGNITION CO., LTD.—Cap., £15 000. To carry on business of and dealers in and repairers of electrical apparatus, formerly carried on by A. Lee, at 288, Deansgate, Manchester, etc.

FRANKLIN AND FREEMAN, LTD.—Cap., £2 000. Manufacturers of appliances for wireless installations, electrical engineers, manufacturers of and dealers in electrical wire, etc. Reg. office: 13, Appold Street, Bishopsgate, London, E.C.2.

STERLAND AND TATE, LTD.—Cap., £1 500. To acquire the business carried on at 41, Blandford Street, Sunderland, as Sterland and Tate, manufacturers and factors of electrical goods, magnetos, magneto parts, lighting set parts and the like, etc.

C. EDE AND CO., LTD.—Cap., £100. Manufacturers, importers, exporters, and distributors of machines, appliances, valves and accessories used in connection with wireless, electrical, radiographic, telegraphic and telephonic apparatus, etc. Reg. office: High Street, Byfleet, Surrey.

F. C. SNOOK AND CO., LTD.—Cap., £2 000. To acquire business carried on at 66, High Street, Plumstead, London, S.E.18, and elsewhere, as "F. C. Snook and Co.," and to carry on business of lamp shade manufacturers and designers, etc. Reg. office: 84, Mansion House Chambers, 11, Queen Victoria Street, London, E.C.4.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

HAWKINS BROS, 101, Station Hill, Kidderminster, electrical engineers. £29 14s. 4d. June 16th.

INO GUARANTEED ELECTRIC LAMP CO., LTD., 35, Aldermanbury, E.C., manufacturers. £22 os. 4d. May 4th.

WOOD BROS., 14A, Back York Place, Harrogate, electrical engineers. £44 17s. 2d. June 21st.

Deed of Arrangement.

KERSHAW, Arthur, and KERSHAW, Jack, trading at 99, Cheetham Hill Road, Manchester, as KERSHAWS, electrical engineers. Filed July 26th. Trustee, A. Yearsley, 27, Brazennose Street, Manchester, I.A. Liabilities unsecured, £569; assets, less secured claims, £71.

Receiverships.

ATLAS WIRELESS CO., LTD.—G. Dickinson, of 82, Victoria Street, Westminster, S.W.1, was appointed receiver and manager on July 14th, 1926, under powers contained in charge dated September 15, 1924.

FARAD ELECTRICAL CO., LTD.—V. S. Wright, of 40-42, King William Street, E.C.4, was appointed receiver and manager on July 14th, 1926, under powers contained in debentures dated June 14th, 1920.

PARAGON ELECTRIC WELDING CO., LTD.—A. J. Francis, of Bute Docks, Cardiff, was appointed receiver and manager on July 17th, 1926, under powers contained in debenture dated December 7th, 1925.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

GOODCHILD, CHAPMAN AND CO., 357, High Road, Wood Green, London, N., electrical engineers, etc. A meeting of creditors was held on July 20th, at the offices of Mills, Lockyer and Co., solicitors, 29, Finsbury Square, E.C. The chairman, Mr. Evill, stated that he had been consulted owing to an execution having been levied and other legal proceedings commenced. A detailed statement of affairs had not been prepared, but it was stated that the liabilities were in the neighbourhood of £691, included in which was an amount of £173 lent by the stepmother of Mr. Goodchild. The bank were partly secured creditors for £131, and held as security a life policy, the surrender value of which was estimated at £50. The assets consisted of: stock-in-trade at cost £430; plant and fixtures, £80; good book-debts, £15. It was stated, however, that the stock included certain wireless parts, and gas and electrical sundries. It appeared that Mr. Goodchild commenced business in 1919 with £200 capital, taking in Mr. Chapman as a partner. No deed of partnership was executed, and Mr. Chapman left the concern some time ago. The present position was attributed to losses in connection with wireless goods, and pressure by creditors. The household furniture was claimed by the debtor's wife. There was no definite offer before the meeting, but the solicitor intimated that a certain lady was prepared to guarantee a composition of 7s. 6d. in the £, payable by equal instalments of 11¼d. in the £ each quarter, the composition to be payable out of any future earnings of the debtor. Before accepting the offer, however, the creditors decided to appoint a representative of one of the creditors to inspect the stock and report to an adjourned meeting.

SHEFFIELD WIRELESS DEPOT, LTD. The statutory meeting of creditors in this voluntary winding-up was held on July 22nd at the Institute of Chartered Accountants. No statement of affairs was presented but the liquidator, Mr. H. Cunningham, I.A., of King's Chambers, Angel Street, Sheffield, reported that the liabilities to unsecured creditors amounted to £1 744 and of that amount £1 599 was due to unsecured creditors, while there were partly secured creditors for £355, who held security valued at £209. There were also fully secured creditors amounting to £262, and they held security at a value of £471, or a surplus of £209. The total assets of £19 were insufficient to meet the claims of the preferential creditors, amounting to £63 13s., and there was a total deficiency of £1 788. In reply to Mr. Houston, of Corfield and Cripwell, the liquidator stated that one of the directors sublet the Norfolk Street premises to the company on a quarterly tenancy. The liquidator went on to say that the liquidation had taken place owing to the fact that one creditor had levied execution in respect of a debt of over £300. The company was formed on June 11th, 1923, with a nominal capital of £1 000 to take over a business previously carried on by Mrs. Jackson. The directors of the company were Mr. T. H. Jackson and his wife. Mrs. Jackson held 100 shares and her husband 176 and they were all fully paid. Replying to further questions put by Mr. Houston, the liquidator said that there was no information in his possession to show what the company paid for the business. He had not seen the agreement under which the vendor sold the assets of the business to the company. Dissatisfaction was expressed at the position disclosed and eventually the meeting broke up without any resolutions being passed. The voluntary liquidation of the company will therefore be continued with Mr. Cunningham as liquidator.

WALKER, Malcolm Montague, trading as WALKER-BAILEY ELECTRIC CO., Stanley Street Lane, Kinning Park, Glasgow, electrical engineers. A meeting of the creditors of the above was held recently at the offices of Messrs. Henderson, Jardine and Dunlop, C.A., of Glasgow. Approximate figures were submitted which disclosed the following liabilities to trade creditors, £647, and to cash creditors, £757, or a total of £1 404, against net assets of £252, or a deficiency of £1 152. It was reported that the business was commenced in October, 1924. A balance sheet was prepared at December, 1925, which showed a profit of £145. The debtor had an interest in the estate of the late Mr. David Walker, amounting to £1 960, but it appeared that he had advanced to him a sum in excess of that sum. It was stated that since December, 1925, trade had been very quiet. The debtor said that he attributed his position largely to lack of capital. The matter was discussed, and it was decided that the debtor should execute a trust deed in favour of Mr. Dunlop, and that a committee of three of the creditors should be appointed to act with him.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Company Winding-up Voluntarily.

ELECTRICAL STORES (NOTTINGHAM), LTD.—S. H. Hill, 1, St. Peter's Church Walk, Nottingham, chartered accountant, appointed liquidator July 10th.

Bankruptcy Information.

DOLLITTLE, John Henry (trading as the ZENITH RADIO MANUFACTURING CO.), Virginia House, Portsmouth Road, Guildford, and 17, Park Street, Guildford, wireless engineer. Receiving order, July 22nd. Debtor's petition.

SELLERS, Harold George (trading as R. SELLERS), 72A, Spital Hill, Sheffield, electrical engineer. Receiving order, July 21st. Debtor's petition. First meeting, August 4th, 12 noon, Official Receiver's Offices, Figtree Lane, Sheffield. Public examination, August 19th, 2 p.m., County Court Hall, Bank Street, Sheffield.

Notice of Dividend.

BARKER, John Richard, Tanshelf House, Front Street, Pontefract, also 183, Kirkgate, Wakefield, wireless dealer. First and final dividend, 3s. 8¼d. per £, payable July 28th, Official Receiver's Office, 21, King Street, Wakefield.

Partnerships Dissolved.

ERLCO (Rufus CHILDS, George Frederick BRAVEY and Francis Ralph BLACKMORE), electrical engineers, 106, Friar Street, Reading, by mutual consent as from November 10th, 1925. Debts received or paid by G. F. Bravey and F. R. Blackmore, who continue the business.

FARQUHAR AND HEYS (John FARQUHAR and James HEYS), electrical contractors, 44, Limbrick, Blackburn, by mutual consent as from June 30th, 1926. Debts received and paid by J. Heys who will continue the business.

WOOD (REGINALD) AND CO. (Reginald WOOD and Arthur Sam COCKCROFT), electrical apparatus and general electrical engineers, 37, Westgate, Huddersfield, by mutual consent as from March 31st, 1926. Debts received and paid by A. S. Cockcroft, who will continue the business.

Bankruptcy Proceedings.

WARREN, Walter John, trading as COLEMAN AND WARREN, wholesale electrical supplies factor, 66, Victoria Street, Westminster, S.W. At the statutory meeting of his creditors last week, a statement of affairs was submitted showing liabilities £1 728 and assets £164. Debtor states that he has traded under the style of Coleman and Warren, but has never had a partner. He began the business in April, 1923, with a capital of £250. Later he obtained loans from his wife and brother amounting to £500 and they are now creditors against his estate. The trading was never a success, owing, in his opinion, to depression in the electrical line. For the last eight months he has been pressed by creditors and when an execution was levied about a month ago the business came to an end. There was no proposal before the meeting, and the estate remains in the hands of the Official Receiver.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

231 481 K. Messing. High pressure mercury vapour electric lamp. (31/3/24.)
234 781 Lorenz Akt-Ges. Method of and means for frequency multiplication in electrical phenomena. (31/5/24.)
239 800 W. Eberl. Spring holder for incandescent electric lamps. (16/4/25.)
239 809 Soc. Anon. Four l'Equipmente Electrique des Vehicles. Coupling device for combined electric starters and dynamos for automobile engines. (18/11/24.) (Addition to 237 541.)
234 509 British Thomson-Houston Co., Ltd. Electromagnets. (24/5/24.)
234 809 British Thomson-Houston Co., Ltd. Electron discharge apparatus and circuit arrangements employing them. (29/5/24.)
235 885 British Thomson-Houston Co., Ltd. Electric control systems. (17/6/24.)
237 570 Chicago Pneumatic Tool Co. Condensers of the countercurrent type. (28/7/24.)
239 565 R. Baillie and M. A. Adam. Dry cells. (3/3/24.)
215 335 Scintilla. Windings for electrical regulating apparatus. (4/5/23.)
239 897 A. G. Bullem and R. L. Jenkinson. Electric switches. (17/4/24.)
225 166 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Electric heating devices disposed within an enclosing envelope. (22/11/23.)
239 899 J. Bamford. Indicators for use with wireless receiving and like apparatus. (15/5/24.)
239 900 British Lighting and Ignition Co., Ltd., and J. C. Hutton. Dynamo-electric machines. (16/5/24.)
216 160 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Incandescent cathodes for electric discharge tubes. (18/5/23.)
239 914 S. Shimizu. Apparatus for determining a magnetic field for the magnetic compass adjustment. (13/6/24.)
217 899 V. Martinetto. Asynchronous induction motors. (20/6/23.)
239 921 M. Strelow. Electric ingition devices. (17/6/24.)
239 926 H. M. Dowsett and H. B. Tilley. Electrical resistances. (17/6/24.)
239 928 T. H. McQuinn. Electric radiators. (17/6/24.)
239 929 Igranic Electric Co., Ltd. (Cutler Hammer Manufacturing Co.) Electric power distribution systems. (17/6/24.)
239 935 W. J. Palmer. Telephone receivers, and the like. (18/6/24.)
239 939 E. L. W. Byrne (E. G. Gage). Means for supplying current to radio tubes and the like. (19/6/24.)
239 940 S. Z. de Ferranti and Ferranti, Ltd. Rotors of mercury bath electricity meters. (19/6/24.)
239 944 C. S. Hodson and A. A. Tarbuck. Winding of duolateral inductance coils. (21/6/24.)
218 301 H. R. Van Deventer. Electrical condensers. (25/6/23.)
218 311 N. Lemlyn. Electric circuit switches. (29/6/23.)
239 950 Waygood-Otis, Ltd., and E. Clemence. Push-button control systems for electric motors and other apparatus. (27/6/24.)
239 968 British Lighting and Ignition Co., Ltd., and J. C. Hutton. Interrupter devices for electric circuits. (15/7/24.)
239 977 T. W. S. Hutchins. Electrodeposition of metals. (24/7/24.) (Cognate application 9552/25.
239 978 Callender's Cable and Construction Co., Ltd., and A. E. Wilson. Filling of joint boxes for electric cables and apparatus thereof. (26/7/24.)
220 628 D. Sciaky. Method of and apparatus for electric welding by means of resistance. (13/8/23.)
240 005 Electrical Improvements, Ltd., and R. W. Gregory. Electric circuit-breakers. (24/9/24.)
222 865 Metropolitan-Vickers Electrical Co., Ltd. Electrical sub-stations. (1/10/23.)
240 019 Dubilier Condenser Co., Ltd. (Formerly Dubilier Condenser Co. (1921), Ltd. (L. Edenburg.) Adjustable electric condensers. (27/10/24.)
240 020 Dubilier Condenser Co., Ltd. (Formerly Dubilier Condenser Co. (1921), Ltd. (W. Dubilier) Electrical structures containing condensers. (27/10/24.)
225 218 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Electric discharge tubes. (20/11/23.)
240 040 G. Pearce and Watson and Sons (Electromedical, Ltd.). X-ray photography. (20/12/24.)
232 917 Piepmeyer and Co. Kommandit-Ges. Electric relays for automatically controlling pressures, temperatures, liquid levels, and for like purposes. (24/4/24.)
231 467 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. X-ray tubes. (27/3/24.)
240 078 W. R. Bullimore. Thermionic valves. (26/3/25.)
231 517 Alos Apparatebau Ges. Electric motor starters. (27/3/24.)
232 575 Forges and Ateliers de Constructions Electriques de Jeumont. Electrical braking systems for vehicles equipped with more than two electric motors. (17/4/24.)
232 202 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. X-ray tubes provided with an incandescent cathode and an envelope which consists partly of insulating-material and partly of metal. (10/4/24.)
232 641 British Thomson-Houston Co., Ltd. Electric regulating system. (21/4/24.)
233 724 O. Ommundsen. Connecting-terminals for electric conductors. (8/5/24.)
240 100 British Lighting and Ignition Co., Ltd., and J. C. Hutton. Dynamo-electric machines. (16/5/24.) (Divided application on 239 900.)
237 584 Telefunken Ges fur Drahtlose Telegraphie. Aerials for wireless telegraphy and telephony. (25/7/24.)
238 245 Automatic Telephone Manufacturing Co., Ltd. Telephone systems. (14/12/23.) (Divided application on 206 154.)
213 258 J. C. Bangrand. Manufacture of rubber-insulated electric wires and cables. (19/3/23.)
239 980 S. L. Price. Wireless valves. (21/3/24.)
240 194 A. T. Philbrook and H. R. J. Sawyer. Thermionic valve holder or adaptor for use in wireless work. (25/3/24.)
240 198 A. Woosnam (L. Ederer). Electric multiple circuit selector systems. (23/4/24.)
240 200 Creed and Co., Ltd., and F. G. Creed. Telegraphic printing apparatus. (19/5/24.)
240 205 G. Kent, Ltd., and A. H. Avery. Electric signalling-systems for indicating and/or recording distant movements. (28/5/24.)
240 212 M. Cooper. Transformers for telephony and wireless signalling, and the method of constructing the same. (19/6/24.)
240 213 A. C. Hyde. Thermionic valves. (20/6/24.)
218 287 Automatic Telephone Manufacturing Co., Ltd. Automatic or semi-automatic telephone systems. (25/6/23.)
240 217 Relay Automatic Telephone Co., Ltd., F. M. Ward and W. T. Finlay. Selecting mechanism for electrical signalling-apparatus. (24/6/24.)
240 222 E. Y. Robinson and Metropolitan-Vickers Electrical Co., Ltd. Rectification of alternating current. (24/6/24.)
240 238 W. J. Mellersh-Jackson (G. A. Startweather). Alternating current systems. (26/6/24.)
240 243 M. J. Railing, H. C. Turner and A. Sherwin. Electrical time switches. (30/6/24.)
240 252 A. S. Cachemaille (Westinghouse Lamp Co.). Cathodes for vacuum electric devices. (7/7/24.)
220 286 Elevator Supplies Co., Inc. Electric switches for elevator controller circuits. (8/8/23.)
240 269 Howes and Burley, Ltd., and A. J. Curnow. Combined vase or bowl and wireless loud speaker. (5/8/24.)
240 271 J. H. Bennison and F. Papf. Devices for grinding the curved contact surface of brushes of electric machines. (9/8/24.)
240 282 G. E. Tate and F. O. Monkhouse. Holders for electric lamps. (4/9/24.)
240 283 L. H. Paddle and J. A. Crisp. Inductance coils as used in wireless apparatus and the like. (8/9/24.) (Cognate application, 24 807/24.)
223 562 Metropolitan-Vickers Electrical Co., Ltd. Electron discharge devices. (15/10/23.)
240 310 Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.). (H. R. van Deventer). Electric power condensers and cooling-means therefor. (27/10/24.)
240 312 English Electric Co., Ltd., and F. Morris. Electric motor control. (30/10/24.)
240 314 C. E. Cleminson. Batteries suitable for use in conjunction with wireless apparatus or the like purposes. (3/11/24.)

Applications for Patents.

July 12th.

17 448 Brevex Soc. Anon. Supporting device for telephone apparatus. (23/7/25, Switzerland.)
17 449 Brevex Soc. Anon. Supporting device for telephone apparatus. (4/3/25, Switzerland.)
17 412 British Thomson-Houston Co., Ltd. Alternating current electromagnets. (10/7/25, U.S.)
17 435 S. G. S. Dicker. Automatic telephone sub-station instrument circuits. (23/10/25. U.S.)
17 438 Ferranti, Ltd., and S. Z. de Ferranti. Loud speakers.
17 462 R. K. Hearn. Electric heating element.
17 372 L. S. Hinks and Intermit, Ltd. Electric switch.
17 454 and 17 455 International Copperclad Co. Electrodeposition. (5/8/24, U.S.)
17 384 C. McCarthy. Electrical motor starters, etc.

July 13th.

17 571 W. H. Apthorpe and Cambridge Instrument Co., Ltd. Electric measuring apparatus, etc.
17 526 British Thomson-Houston Co., Ltd. Electric switches. (13/7/24, U.S.)
17 527 British Thomson-Houston Co., Ltd. Electric fuses. (13/7/25, U.S.)
17 530 British Thomson-Houtson Co., Ltd., and R. C. Clinker. Increasing direct current voltage.
17 539 W. A. Burns and J. B. Pearman. Mounting electric inductances.
17 581 G. Campbell and E. Fowler. Fittings for electric lamps.
17 513 A. Good. Electric terminals, etc.
17 493 H. W. Headland. Wireless apparatus.
17 502 S. T. Hosken. Portable wireless receivers.
17 467 D. D. Jones. Electrical inductance coils.
17 466 P. Molloy. Self-driving device for generating electricity.
17 562 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Caps and sockets of electric lamps. (8/9/25, Holland).
17 557 J. Oldham and Oldham and Son, Ltd. Separators for galvanic batteries.
17 469 D. S. Peacock. Electric bells, etc.
17 538 W. J. Rickets. Four-wire telephonic systems.
17 543 W. J. Rickets and E. E. Smith. Thermionic amplifying means, etc.
17 556 Siemens-Schuckertwerke Ges. Hollow electric cables. (29/4/26, Germany.)
17 510 A. J. Stevens and Co. (1919), Ltd., and H. Taylor. Thermionic valves.
17 469 C. Thomas. Electric bells, etc.

July 14th.

17 642 W. K. Alford and Igranic Electric Co., Ltd. Switches for radio apparatus.
17 614 C. P. Allinson. Wireless signalling.
17 638 Ateliers de Constructions Electriques de Charleroi. Electric motor. (21/5/26, Belgium.)
17 694 and 17 695 B. Bell and W. H. Illingworth. Electrical cut outs, etc.
17 678 R. H. Berry and A. Ricordini. Adjustable mechanism for radio tuning, etc., devices.
17 643 British Thomson-Houston Co., Ltd. Piezo-electric devices. (14/7/25, U.S.)
17 633 G. F. Du Prel. Electric high frequency apparatus. (11/8/25.)
17 626 A. Friederici. Electric power hammers, etc. (14/7/25, Germany.)
17 699 E. V. Kayley. Radio apparatus.
17 648 J. E. Laidley. Smelting ironsand, etc., by the electric arc furnace.
17 665 W. J. Rickets. Electric switches.
17 625 H. F. C. Skelly. Crystal detectors.
17 700 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Automatic telephony.
17 627 Wired Radio Inc. Duplex radio telephone system. (24/7/25, U.S.)
17 628 Wired Radio Inc. Three-phase high frequency system. (21/7/25, U.S.)

July 15th.

17 755 W. K. Alford and Igranic Electric Co., Ltd. Means for eliminating ripple from uni-directional current.
17 750 C. H. Archer, and Automatic Telephone Manufacturing Co., Ltd. Electric fires.
17 739 E. Bolton. Electric switches.
17 757 Brecknell, Munro and Rogers, Ltd., and A. M. Willis. Bow collectors for overhead electric wire systems.
17 766 F. Z. Chalmers. Control of electric lighting.
17 724 G. Cotterell. Electric time switch.
17 746 International General Electric Co., Inc. High tension cable. (16/7/25, Germany.)
17 720 B. Preston. Movable electric light for motor cars.
17 744 S. Sokal. Electrical measuring instruments.
17 702 T. W. Stevens and A. R. Timms. Electric lead burning appliance.
17 712 T. Winston.. Electric batteries.

July 16th.

17 856 Automatic Telephone Manufacturing Co., Ltd., and C. Remington. Remote control systems.
17 844 Bower Electric (1926), Ltd., and F. E. Kewley. Electromagnetic interrupters, etc.
17 864 A. H. Curtis and Igranic Electric Co., Ltd. Electric transformers.
17 909 P. Freedman. Production of thermionic emission.
17 896 G. Ganz and Co. Electric glow lamps. (31/7/25, Austria.)
17 822 K. Haenschke. Inductance coils.
17 877 R. Hurlimann. Electric light installations, etc.
17 810 F. J. Hutton. Electric fans.
17 849 International General Electric Co., Inc. Method of winding electric transformer, etc., coils. (18/7/25, Germany.)
17 885 W. Kassteen. Electric arc welding.
17 801 E. Mackay. Radio inductance coils and coil holders.
17 798 A. McKellar. Electric fittings.
17 813 J. J. Rathbone. Electrical relays.
17 859 Siemens-Schuckertwerke Ges. Regulation of asynchronous electric machines. (17/7/25, Germany.)

July 17th.

17 962 Automatic Telephone Manufacturing Co., Ltd., and F. Tench. Automatic, etc., telephone systems. (4/6/25.)
17 955 H. G. Bell, M. P. Hinton and Metropolitan-Vickers Electrical Co., Ltd. High frequency electrical apparatus.
17 966 W. Prior and C. E. Riley. Telegraphy.
17 963 Siemens Schuckertwerke Ges. Electric gas purifiers. (18/7/25, Germany.)
71 927 I. Turner. Gas or electric heating apparatus.

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SCIENCE AND THE STATE.

SOME weeks ago H.R.H. the PRINCE OF WALES was credited with the intention of devoting his Presidential Address to the British Association to an account of his travels on the Empire's business. Whether or not this rumour had any basis of truth we do not know, but if it had, we do not think that the result would have been so interesting or so ultimately fruitful to scientific and industrial development as was the speech which he delivered at Oxford on Wednesday night. His subject was one with which all readers of THE ELECTRICIAN and indeed all scientists are closely familiar: the bearing of scientific research on the daily life of the community and, as a corollary, a discussion of the part the State has played and should play in fostering the work which is bound up in that term.

We are often told that to ensure the continuance of our industrial supremacy we must take every opportunity of doing all we can to increase our scientific knowledge; and that it is the duty of the State, no less than of ourselves, to give those who are capable of conducting these investigations every encouragement and especially financial aid. We do not deny the truth of these dicta and, so far as the electrical industry is concerned, which is, as has been rightly said, more nearly based on science than any other, we believe that we can do a great deal more to help ourselves than we have done in the past. We believe also that the State can do more to help us. But it is obvious that before that assistance can be obtained there must be a real and continuous public demand for it. State departments are slow in moving; but they yield in time to public pressure, and their dealings with science and research are not likely to prove an exception to this rule. A first step then towards the end we desire must be to stimulate a public demand that more attention should be paid to scientific work.

The numerous speeches and writings that have already been made on this subject, admirable though they are in content, fail from this point of view for a very natural reason. A scientist asks for financial aid for scientific work. A miner asks for financial aid for the mining industry. It shows a great lack of discrimination, but the average man in the street does not see much difference between the two. It is another matter, however, when a publicist of the eminence of the PRINCE OF WALES takes up the cudgels in favour of science. For while it is true that, as he himself said, he dealt with the matter as an outsider, he can have left his hearers in no doubt that in him we have a most doughty champion of our cause. The same truth must also be faintly dawning on the other large audiences to which HIS ROYAL HIGHNESS addressed himself. The Sheldonian Theatre was crowded, but the words of the president were conveyed by the public address system to two equally packed halls in the City of Oxford and by the broadcasting service to innumerable homes both in this country and abroad. That this was possible is in itself a tribute to the work of scientists, among whom it is not inappropriate that we should mention Sir OLIVER LODGE who, the last time the British Association met in Oxford in 1894, gave the first public demonstration of wireless telegraphy. To this event the PRINCE made graceful reference.

The main portion of the address, an abstract of which will be found elsewhere in this issue, was a substantiation of claims that if civilisation is to go on it can only progress along a road the foundations of which have been laid by scientific thought and research and that the future solution of practically all the domestic and social difficulties, with which we have to grapple nowadays, will be found by scientific methods. There was of course no difficulty in doing this before such an audience as he addressed, for even the earlier attitude of Oxford is being replaced by a more modern and, if we may say so, a saner outlook.

The subject with which the Prince dealt was first mooted in 1830 by DAVID BREWSTER, one of the founders and later a president of the Association. BREWSTER was one of the foremost of those who contended that to the ignorance and supineness of the Government were due the then wretched state of scientific depression and this theme was enlarged upon in a number of later presidential addresses. It was, for instance, dealt with by the PRINCE CONSORT in 1859, who said that it was to be hoped that "the State will recognise in Science one of its elements of strength and prosperity, to foster which the clearest dictates of self-interest demand."

The result was that something began to be done, though marked progress was not visible until the end of last century, when the National Physical Laboratory was established, to be followed some years later by the Development Commission, the Medical Research Committee and, during the war, by the Department of Scientific and Industrial Research. It therefore took practically the whole of the period between the Napoleonic and the World Wars to

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mature the conception of a State department of scientific research.

This was not entirely due to the supineness of the State. For a strong body of scientific opinion was avowedly afraid of Government interference, and rightly so, because the progress of which the PRINCE spoke in such commendatory terms is due largely to the individual and can be more easily marred than made by official interference.

It is just here that a little demon of doubt must creep in. It is true that in recent years the attitude of the State towards science has been admirable and far-sighted, and has thus permitted many difficulties to be cleared out of the way, so easing the path for the advancement of science in many directions. But fine scientific work was done before the State came upon the scene. FARADAY'S discoveries, to which the PRINCE called attention, are but one of many examples. And it is therefore essential to realise that, because the State is taking a more active and practical interest in scientific research, there is no reason why there should be a lessening of interest on the part of the individual. Here is work which can only be done by personal effort, and it is also work which can only attain its highest success in an atmosphere of the greatest freedom.

In conclusion, the PRINCE said one more wise word. In order that the country may fully realise all that it owes to the advancement of science, the channels of communication between research and the public mind must be kept clear and maintained and widened. We hope this statement will sink into the brains of those to whom it was addressed. It is useless to demand support for research work from the State, and still less from individuals, if a dense and altogether unnecessary obscurity is permitted to surround the activities of the associations and individuals who are doing that work. If the public are to help they have a right to know. Publicity is the first step towards greater recognition.

Current Topics.

New Power Station for London.

IN February last the House of Commons rejected a Bill promoted by the London Power Co., in which authority was sought to erect a capital generating station at Brentford. The main grounds for this action were that the requirements of the West End of London should be considered as a whole and that the Joint Electricity Authority were well forward with plans for a station, which would deal with this problem. These plans have now matured and the London and Home Counties Joint Electricity Authority has made an arrangement with the Chiswick Urban District Council under which a station with an ultimate capacity of 250 000 kW will be erected on the Duke's Meadows site. This site, as is well known, has ample railway and water facilities, and, a further important point, the erection of a station on it will not interfere with existing amenities. It is hoped that the plant will be in commission by 1928-29 and it is estimated that it will cost £2 000 000. It looks, therefore, as if a step will at last be made towards the fruition of a long-standing suggestion, whereby the electrical needs of London were to be met by large riverside stations in the west, centre and east of the area. Bankside, Limehouse, Deptford and Barking are already in being, and now Chiswick will be added to them. We hope this means that an end will before long be made of London's electric chaos.

Economics of Large Power Stations.

THIS step having been taken it will not be inappropriate to consider certain criticisms of what may be called the large station policy. Stated broadly, that policy envisages a higher efficiency, lower capital costs and a better diversity factor; but the critics contend that these advantages cannot be proved. Their contention, however, is based on a misapprehension of what the policy is intended to effect. It is not intended, for instance, to transmit large blocks of power from a station at one end of a line to an important district, without a generating station, at the other. Large towns will continue to be supplied from stations in or near them and interconnection between these stations will merely be for the purpose of pooling the spare plant and, an important fact which is often overlooked, for supplying the intermediate districts. It is often argued that to-day many small stations are as economical as large ones; and it is deduced from this that it would be better to continue as we are than to adopt the policy laid down in the Electricity Bill. If this view is correct it should be equally economic to supply streets and even houses from small stations established in the "centre of area," for by so doing transmission and distribution losses would become almost non-existent. Stated in this way, the proposition is manifestly absurd, and it therefore comes to this: that as the consumption of electricity increases, it becomes more and more economic to concentrate the generating plant in a few large stations. In this country at the present time we have some areas which are well developed electrically and where therefore a cheap supply can be given from a local station. But we have also a number of areas which are not developed electrically at all. The new policy seeks to alter this. It may disturb things for the moment, but in the end it cannot be denied that it is the right course. Power stations will, of course, continue to be established with regard to large centres of population, but their duty will be to serve not only those centres but the surrounding districts, which have, under the present scheme of development, been too often neglected.

The Ethics of Monopoly.

AN engineer, for whose opinion we have great regard, takes us to task more in sorrow than in anger for our support of the Government electrical policy. He does this not for technical reasons, on which we gather he is in agreement with us, but on the broader lines of national polity. The effect of the Bill will, he says, be to place electricity supply in this country under one control and the financial conditions under which the Central Board will work will be such as to divert the capital which is now used for speculative purposes to a Government guaranteed security. Inventors and others therefore who come along with new ideas will find an increasing difficulty in getting their schemes financed and the enterprise and pioneering work, for which the inhabitants of this country are justly renowned, will receive a severe check. Put more particularly, suppose some means of generating and distributing power, which is more efficient than electricity, is discovered (and such possibility must not be ruled out), the policy of the Central Board will inevitably be to prevent such discovery being developed, and even to attempt to secure Parliamentary powers to forbid its development. This is a very interesting speculation. Its ramifications are so wide that they cannot be adequately discussed in a note or in many notes. Before they are discussed at all they require most careful consideration. At the moment we only reply, as we already have replied to our philosopher, that the possibility of some new method coming along is no argument for not employing present methods as efficiently as possible.

Electricity and Sulphur.

ANOTHER example of the way that electricity can be used to revive a depressed trade is provided by the Sicilian sulphur industry. Sulphur is one of the few minerals that Italy possesses and until about twenty years ago she had a practical monopoly of its supply. Since then America has come into the market and there has been a heavy decline in output, especially in the past few years. Sulphur mines occupy about one-fifth of the area of Sicily and afford employment to some 18 000 persons. Their equipment is, however, antiquated and the wages are low. To improve these conditions electrification has therefore been decided on and we have no doubt that the results will be beneficial.

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It is proposed to supply power from a thermal station at Catania *via* main and subsidiary transmission lines, working at 40 000 V and 10 000 V respectively, with a total length of about 300 miles.

Stray Electric Currents Underground.

THE "Coal Age" contains an interesting account of the genesis of stray electric currents underground and shows that these give rise to a puzzling series of phenomena. It is not surprising that such currents should be found in mines where locomotives are employed. But the writer of the article draws attention to the fact that only after strict and painstaking efforts can it be stated with certainty that they do not exist in any given mine. Moreover, they appear and reappear. In a mine where electric locomotives are working, for instance, the readings from one rail to another or from a rail to the water pipes may reach 40 V and 30 A at a distance of 600 ft. from the machines, while a reading of 5 V and 1·5 A has been obtained in a mine where no electrical machinery was working at all. The writer concludes that, as there appears to be no means of eliminating this source of danger, the best course to pursue is continuously to guard against it. This may be done by always making sure that no stray current can find its way to the cables before the final connection is made. It is a good plan to twist the ends of the cables together, whenever they are disconnected from the battery, or to place a clamp across them, which will form an effective short circuit.

Coal and Engineering.

IN spite of numerous comings and goings and much misplaced eloquence, the dispute in the coal industry is no nearer a settlement than it was on May 1st. It is becoming abundantly evident, moreover, that the terms that could have been obtained on that date are no longer possible, because markets have been lost, at least temporarily, and the economic position has become worse in many other ways. We have already quoted some striking figures of the cost of the stoppage to date. These, of course, take no account of orders lost or the money which will have to be expended in regaining the business, which Great Britain once had the right to regard as her prerogative. These are important factors in the situation, but no less important is the absolute necessity that the settlement, when it comes, shall be on an economic basis. This was emphasised by a deputation representing the iron and steel, cotton spinning, chemical, engineering, shipping and shipbuilding industries to the Industrial Group of the House of Commons last week. The general situation was well expressed by Mr. D. A. BREMNER, who represented the engineering industry and whose statement we reproduce on another page of this issue. As regards coal consumption, in 1925 the engineering industry consumed about 2 000 000 tons of iron and steel, in the production of which 6½ million tons of coal was required, while, in addition, coal was necessary for generating the power utilised in the various industrial processes and for other subsidiary matters, making a grand total of some 8½ million tons. There was every reason, therefore, said Mr. BREMNER, and the argument has a general application, why from the engineering point of view the primary causes of our industrial troubles should be analysed and the real issues faced. These are wise words. We must get down to facts, and we must have an economic settlement. Anything else would be a disaster of the first magnitude. We are glad, therefore, to learn that Sir ARTHUR STEEL-MAITLAND assured the deputation that the Government were most anxious to bring about a settlement on a fair and economic basis.

The Electrical Industry in Germany.

B.E.A.M.A. Special Publication No. 3, which has just been issued by the Economic and Statistical Department of the British Electrical and Allied Manufacturers' Association, deals with the financial and competitive position of the electrical industry in Germany. Its object is to enable the British manufacturer to estimate the strength and weakness of the forces which his German competitors can array against him and the main lines along which their organisation is developing. To carry out this endeavour an array of useful statistics is given which will, among other things, prove a sharp weapon when that vexed question of allocating contracts abroad next comes to be considered. The general financial and economic conditions since the war are examined and industrial finance is gone into with some particularity. Organisation, general development and prices and wages also receive treatment and some interesting conclusions are arrived at. One of the most important of these is that the future of Germany lies with the success or failure of the Dawes plan, though still more vital is the conclusion that this plan cannot be realised without danger to British industry. That being so, it is the duty of British manufacturers to press for its revision before dumping and general depression, which are even now evident, have their full effect. This is the more necessary in that "a formidable industrial machinery is being oiled up by reorganisation preparatory to the biggest onslaught of modern times on the markets of the world." We believe this statement to be quite true. Before the war German industrialists thought they could obtain their desires by force of arms. They have now abandoned that idea. But they have not abandoned the idea of dominating the trade of the world. Their national qualities give them a prospect of success in that endeavour. The publication of this book will at least ensure that British industrialists have been forewarned of what may happen.

Gas and Railway Carriage Lighting.

THE report by Col. J. W. PRINGLE on the unfortunate accident which occurred at St. Margarets, Edinburgh, during the General Strike, discloses one feature to which attention has been often enough directed in these columns. The accident occurred in a tunnel, and after the collision there was an escape of gas due to the perforation of the gas cylinders and the breakage of the gas pipes under two of the vehicles. Fortunately, as Col. PRINGLE says, the precaution was taken to use electric lamps in the rescue and clearing work and no fire resulted. Nevertheless the gas dissipated slowly, and a number of those who were engaged in clearing the wreckage were overcome by the fumes so that it was necessary to call in the assistance of the military with their gas masks. The company, it is stated, is fitting all their new stock with electric lighting. But a great deal of gas-lighted stock is still used, and though our experience shows that conversion is taking place, the pace is exceedingly slow. Railways have a responsibility to the public in this matter. A safe and convenient form of lighting is available. But they do not use it.

Business and Wages.

AT the annual general meeting of Petters Sir ERNEST W. PETTER was able to produce a fairly satisfactory report in spite of the cloud of depression which has overhung the country and especially the engineering industry. He reported a net profit of £28 516, which is about £3 500 in excess of last year, and a dividend of 5 per cent. less tax. In the course of an interesting speech Sir ERNEST dealt with the prospects of the company, and in doing so launched a complaint against Governments in general for following a financial rather than an industrial policy. The result is wage anomalies, such as the high wages paid to workers in sheltered occupations as compared with those obtainable for those of greater skill engaged in industries that are vital to the country. This is the more disastrous, as on these industries depend our export trade, There are, therefore, two things the Government should do. They should see that our home needs are supplied as far as possible from home markets and that the country is rid of foreign influences, which have as their object the destruction of our industries.

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THE PRINCE OF WALES ON SCIENCE.

Presidential Address to the British Association—The Results of Faraday's Work—Importance of Trivialities—Need for Greater Attention to Research.

THE Prince of Wales delivered his Presidential Address to the British Association on Wednesday in the Sheldonian Theatre, Oxford. The address was relayed to two other halls in the city by the public address system and was also broadcasted.

After reading a message from H.M. the King expressing appreciation of the work of the Association and a second message, which had been sent in reply, the Prince said that for a man who could lay claim to no intensive scientific training, it was no light responsibility to be called on to address the annual gathering of the British Association. But those who worked in the scientific field would be the first to admit that no task was really hopeless, and, when he approached this one, he began to think he might find a few topics of interest. For, after all, science was only another name for knowledge, and any man who went about the world with his eyes open could not fail to acquire knowledge of some sort, which must appeal to any audience.

Though he could claim no insight into pure science, he could fairly claim an onlooker's experience of many practical instances of science as applied to the needs of our civilisation to-day and it had been borne in on him more and more that if civilisation was to go on, it could only progress along a road of which the foundations had been laid by scientific thought and research. More than that, he had come to realise that the future solution of practically all the domestic and social difficulties with which we had to grapple nowadays would only be found by scientific methods.

Research and Daily Life.

He therefore wished to say something of his general impressions of the bearing of scientific research on the daily life of the community; and to show how that relationship could be developed by the mutual co-operation of scientific workers and the State. There was an attitude towards science, which personified it somewhat as the ancients personified the powers of darkness, and invested it with some of their sinister attributes. Such an attitude of mind was fortunately less common than it used to be and at least it had ceased to be vocal, as it was, for example, at two of the meetings of the B.A. in Oxford. The later of these two occasions was the meeting in 1860, and the field of battle was the section of botany and zoology, in which the theories put forward in Darwin's "Origin of Species" were debated, in a manner which had passed into history, between Wilberforce, Bishop of Oxford, on the one hand, and Huxley and Hooker on the other. The earlier occasion, however, more appropriately illustrated, by contrast, the modern realisation of our debt to science.

The second meeting of the Association, in 1832, took place in Oxford. The University was not, at that time, without distinguished cultivators of science. But a strong body of opinion resented its recognition by the University when carried to the extent of conferring honorary degrees upon four of the distinguished visitors. David Brewster, Robert Brown, John Dalton and Michael Faraday. Each of these men had left in the history of his own special branches of science an outstanding memorial. Faraday's labours provided one of the most wonderful examples of scientific research leading to enormous industrial development. Upon his discovery of benzene and its structure the great chemical industries of to-day were largely based, including, in particular, the dyeing industries. Still wider applications had followed upon his discovery of the laws of electrolysis and of the mechanical generation of electricity. It had been said that the two million workers in this country alone who were dependent upon electrical industries were living on the brain of Faraday; but to his discoveries in the first instance many millions more owed the uses of electricity in lighting, traction, communication, and industrial power.

The Work of Pioneers.

The services rendered to mankind by the labours of outstanding figures in science, such as Faraday, or Kelvin, or Pasteur, or Lister, were matters of common knowledge. What was perhaps less generally appreciated was the extent to which, through the efforts of very numerous workers, th results of scientific research had been brought to bear upon many of the most pressing domestic and industrial problems of the day, and that the co-operation between the laboratory and the State (which means the community) had been greatly strengthened of recent years. The British Association had always supported such co-operation. The Prince Consort, for example, who was president in 1859, thus indicated his view of the situation at that time——

> We may be justified in hoping, he said, that by the gradual diffusion of Science, and its increasing recognition as a principal part of our national education, the public in general, no less than the legislature and the State, will more and more recognise the claims of Science to their attention; so that it may no longer require the begging-box, but speak to the State, like a favoured child to its parent, sure of his parental solicitude for its welfare; that the State will recognise in Science one of its elements of strength and prosperity to foster which the clearest dictates of self-interest demand.

It might be fairly said that the position foreshadowed in those words was now, in a large measure, attained. The progress towards it was visible, if slow, down to the end of the last century; but the beginning of a new era was then marked by the establishment of the National Physical Laboratory. In historical sequence among the events which have strengthened interaction between science and the State, there followed the establishment of the Development Commission in 1908 and the constitution of the Medical Research Committee in 1913.

Broadening the Scientific Horizon.

Looking backward a dozen years or so, it might be said that science was definitely, by that time, a working part of the machinery of the State, though not a part working at full power. The Great War caused a broadening of the scientific horizon for men of science themselves in some measure, but for the layman in a measure far greater. All were brought to recognise the applications of science as adding in certain respects to the distresses of warfare; but also as immensely alleviating the sufferings caused by it, and as indicating many methods of strengthening the arts of defence—some of which methods were no less valuable in strengthening the arts of peace. The creation of the Government Department of Scientific and Industrial Research was an act which fell, historically, within the period of the war; but as an outstanding incident in the scientific advancement of national affairs, it certainly could not be regarded as merely a war measure. Nevertheless, by an odd freak of history, it needed the whole period of a century between the Napoleonic and the World Wars—to mature the conception of a State department of scientific research. But it was not entirely owing to lack of prevision on the side of successive Governments that the developments which had been outlined were so long delayed. There was an element of mutual distrust between science and the State. A strong body of scientific opinion was avowedly afraid of "organisations of any kind dependent on the State." It was to be hoped that modern developments had removed that fear. The progress of Science could not be kept wholly within training-walls, and no one wanted to try to keep it so. The guidance of scientific research, in its inception, lay with the genius of the individual; its results for the future might lie far beyond the realisation even of the scientific workers themselves. The Oxford Meeting of the Association in 1894 supplied a simple example of this. There was a discussion on flight, in the Section of Mathematics and Physics, opened by Hiram Maxim; and no less a leader in science than Kelvin afterwards described Maxim's own flying machine as a child's perambulator with a sunshade magnified eight times. Yet it was not many years before research in aeronautics had become the care of the State as well as of the individual; and the work carried out before 1914 under (what was now) the Aeronautical Research Committee led to our wonderful development of aircraft during the war.

A recent report of the Committee of the Privy Council for Scientific and Industrial Research showed that under the Department there were eleven research boards, some of which directed the work of committees to the number of three dozen

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in all. These boards co-ordinated and governed researches in chemistry, fabrics, engineering, and physics, radio, building, food investigation, forest products, and fuel; and to these were to be added the board of the Geological Survey and the executive committee of the National Physical Laboratory. Under the general supervision of the Advisory Council there were upwards of twenty industrial research associations, formed in alliance with the same number of the principal industries of the country, for the purposes of scientific investigations connected with those industries. Some of the present activities of Science in co-operation with the State might appear to wear an aspect even of triviality, because they dealt with common things. But it was precisely because they did deal with common things that they were not trivial. There might be matter for amusement in the fact that science was concerning itself with the contents of the clothes-basket; but there was also matter for congratulation, and there might, in the future, be matter for sincere gratitude. Scientific research, properly applied and carried out, was never wasted. It might prove that a thing could be done, or that it could not be done; but even the proof of a negative might save the waste of further effort. This attitude of the State toward science made for an easing of the paths for the advancement of science in many directions; it marked a definite step in human progress, taken after long hesitation, but in itself new; and because it was new, it might be believed with some reason that we lived not merely in an age of science, but at the beginning of it. This movement for co-operation had borne fine fruit already in other lands; and in particular it was active in our own Dominions.

It was impossible in the Imperial connection to overstate the case for science. Sir William Huggins, in his Presidential Address to the Royal Society in 1901, said that "assuredly not only the prosperity, but even the existence of this Empire will be found to depend upon the more complete application of scientific knowledge and methods to every department of industrial and national activity." To-day we saw that application in much fuller progress than when Huggins spoke only a quarter of a century ago, and already we knew how truly he had prophesied.

Continuance of Individual Effort.

It is not for a moment to be supposed, because the State had come to take a more active and practical interest in scientific research, that there was therefore any occasion for the lessening of interest on the part of societies and individuals. The State interest involved that other interest, and invited it. It could never become the exclusive function of the State to aid the individual research worker. The State might, and did, co-operate in aiding him. Nevertheless, there were whole departments of research which did not come within the range of public assistance, but were no less valuable because they did not. Therefore the support of science remained the concern of our scientific societies, educational institutions, industrial organisations, and private benefactors, no less than it ever did; nay, the very fact that the State had lent its aid should encourage them to continue their aid and to reinforce it—indeed, there was satisfactory evidence that this actually happened.

There were parallels in many respects between the periods of our history following the Napoleonic Wars and the Great War. The application of science in industry and daily life received impetus in the earlier of these periods in such directions as the introduction of steam motive power; it was receiving it now, but the auspices were more favourable. Science was more powerful. Men more adequately and more generally recognised its power, and therein by a certain ethical value for it, as offering a new point of view, in the manifold interest of which all could share. Should not the application of science, for instance, offer a new field for community of interest, not only between one industrial organisation and another, but within the whole body of workers in any single organisation? But in order that the commniuty might fully realise all that it owed and all that it might owe, to the advancement of science, the channels of communication between research and the public mind had to be kept clear, maintained and widened. The non-scientific public was accustomed to view science as it might view a volcano; prepared for the eruption of some new discovery from time to time, but accepting the effects of the eruption without realising the processes which led up to it during the preceding period of quiescence. The period of preparation by research before science could offer the world some new benefit might be long, but the scientific machine was always running quietly in the laboratory. There was an example ready to our hands. They might recall the introduction of wireless telegraphy and telephony as a scientific gift of quite recent years. Did they all realise that it was here in Oxford, at the meeting of the British Association so long ago as 1894, that the first public demonstration of wireless signalling by means of electro-magnetic waves was given by Sir Oliver Lodge? It was the work of science to develop the methods then demonstrated until they had been brought to their present marvellous uses. On the other hand it was often the case, whether in industrial or agricultural, domestic or whatever application, that science had knowledge at command, awaiting use, long before mankind could be brought actually to apply it. Though we had quickened, we were not yet so quick in the uptake of the results of applied scientific research as some of our commercial competitors. The public support of scientific research, upon all these grounds, should be accorded freely, with understanding, and with patience.

REVIEWS.

Ether and Reality. By Sir Oliver Lodge, F.R.S., D.Sc. (London: Hodder and Stoughton. Pp. ix+179. 3s. 6d. net.

The author, in a brief preface, describes this little volume as an attempt to set forth in intelligible fashion something of what is known about the ether and its functions, and represents the outcome of a lifetime of study and meditation which may be acceptable as a guide until something still better is available. He regards the ether of space as the fundamental substantial reality in the material world and the connecting link between the material and the immaterial. It is dealt with not as a rarefied essence but as a substance with ascertainable physical properties.

Beginning with a brief prologue on science and philosophy, he shews how its vibrations may be felt, how wireless waves are started in it; and how it has two properties, an electric one corresponding to elasticity and a magnetic one corresponding to density. The ether is seen to be always the transmitter of force between two bodies, whether far apart like two planets or close together like one brick resting on another; there is always a cushion of ether between them. Electrons and protons are discussed, as is the action of electricity across space. Something is said about the curious relations between electricity and magnetism and how radiation comes about, what atoms are like and what becomes of them, how matter is one of the forms of ether energy, and how the sun loses some four million tons of matter every second. In the concluding chapter the author contrasts the liability to decay of every known form of matter with the absolute permanency which he ascribes to the ether, which, in an epilogue, is presented as the ultimate physical reality. G. W. de T.

Die asynchronen Drehstrommotoren und ihre Verwendungsmöglichkeiten. By J. Ippen. (Berlin: J. Springer.) Pp. vii+90. $0·9.

When dealing with the various uses to which the induction motor can be put, the operating engineer—for whom the subject matter in this booklet was primarily intended—ought to be made aware of the reasons which render the simple, robust squirrel-cage motor unsuitable for many drives and often entail complicated and costly auxiliary apparatus. The drawback of a low power factor does not appeal to the general engineer in the same way as the difficulty in starting an internal-combustion engine; while the problem of speed control and its solutions may well appear to be very complex to those who have not had the advantage of an electrical training. However paradoxical it may appear, the engineer must be taught to appreciate that the very charm of the induction motor, the property which makes the motor the ideal of many users—namely, the absence of the commutator—renders smooth and economical speed control out of the question.

To our mind, the author of this booklet might well have devoted more space to an explanation of these facts, for it is only by a clear appreciation of the inherent characteristics of a machine that the various auxiliary devices can be understood. There is one other point to which attention might be drawn. In the enumeration of the different methods of speed control, we do not find any mention of the devices due to Hunt and to Creedy—indeed our experience would lead us to infer that the interesting and practical machines developed by these inventors have escaped notice in Germany.

On the whole, much useful and practical information on the uses of the induction motor is given, though in many places the reader may find the information insufficient for his purpose. S. Parker Smith.

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PARIS SUBURBAN ELECTRIFICATION.

Details of Scheme Adopted by Western State Railway of France—A Difficult Traffic Problem.

By THEODORE RICH.

EVERY day the question of the electrification of suburban sections of main line railways becomes of more importance to the electrical engineer; many factors superficially insignificant are of great influence, and therefore it is of interest when discussing the electrification of the French Western State Railway to deal with, and compare with home conditions, a number of traffic features

The present population of Paris itself can be taken as about three millions. Many cities tend to expand towards the west. Paris is no exception to this rule, and even in 1910, when the traffic problem on the Western Railway began to be acute, the St. Lazare station handled well over one million passengers a week; at present it handles a quarter of a million passengers every week-day.

traffic in the near future; it will affect the Sunday traffic in the summer.

The eight-hour day, which was proclaimed in France after the Armistice as a means of overcoming the ravages of war by diminished effort, has had its effect on traffic congestion, as the hours of the manual and office workers have tended to coincide.

The Octroi system is a material factor in the suburban traffic in some Latin countries; by this system a material part of the municipal revenue is earned by a tax on many classes of commodities coming into a city or commune; this involves modified custom house formalities at the city gates and at railway stations, although at Paris terminal stations, owing to the mass of people dealt with, the regulations

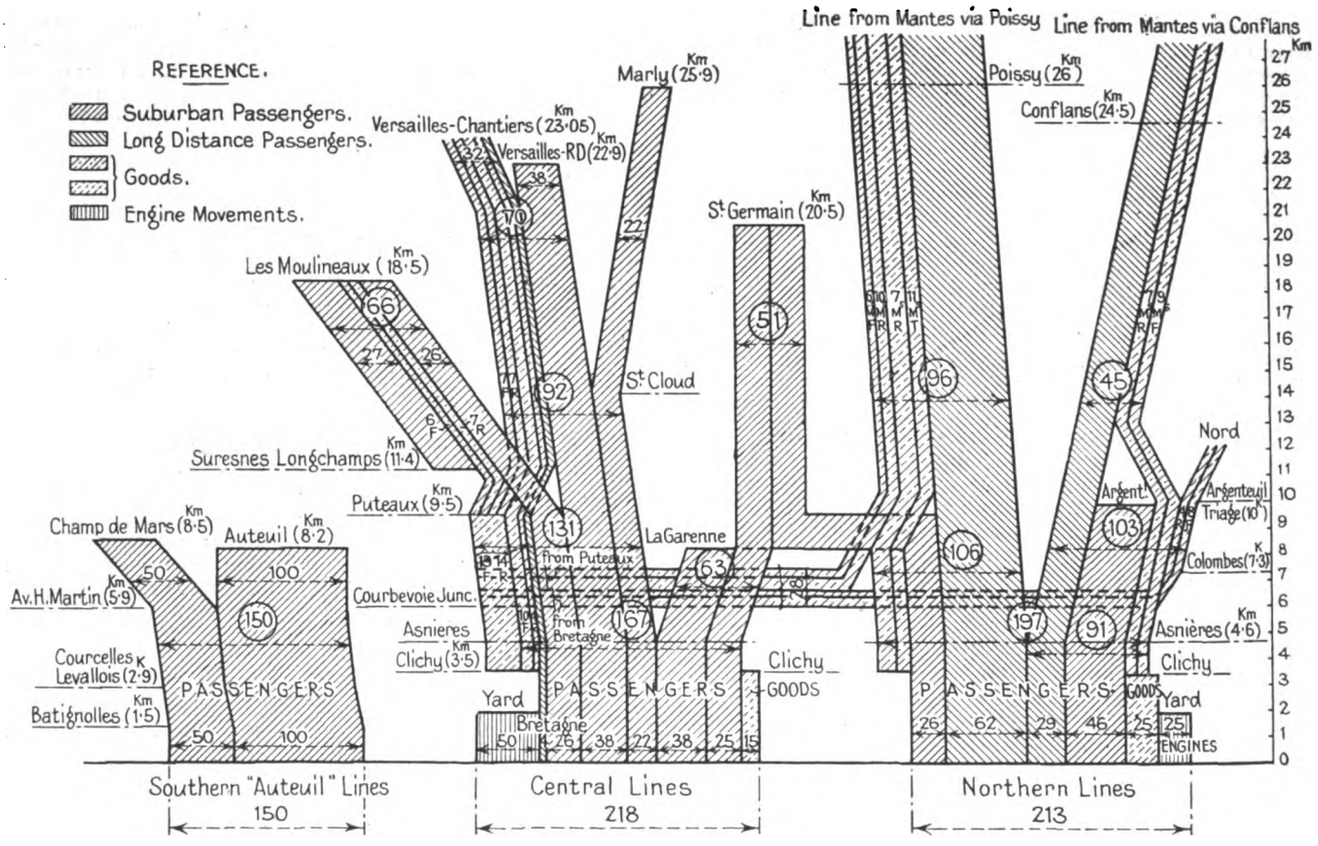

Fig. 1.—An Analysis of the daily traffic leaving the St. Lazare terminus, Paris.

People in Paris and in the districts close to the fortifications live mainly in flats, the classes being mixed up in an extraordinary way on the different floors from basement to attic. The density per square mile is very high; there are very few parts analogous to the City of London where the night population is mainly caretakers. As in other European countries, to please the voters drastic rent-restricting regulations were passed during and since the war, and this factor, as in other countries, has tended to upset house property as a gilt-edged security, so that since the Armistice building in and closely around the city has not met the demand, although the municipal authorities have put up blocks of buildings on part of the site of the old fortifications.

Although the inner suburbs have been developed for many years, the result of the shortage of housing has been a veritable land boom on many of the open spaces within easy reach of the city; the land has been cut up into minute plots, and all sorts of buildings, from pretentious villas to wooden shanties, are springing up like mushrooms. Many thousands of the best class of working men have purchased plots and have started cultivating the soil, even before they have started to build, the Frenchman being by instinct a good cultivator. This factor will have a material influence on the suburban

are honoured more in the breach than in the observance. At Paris and in many other cities an Octroi official inspects tramway cars coming in. The result has been that up to date it has been found impossible to extend the Metropolitan and Nord-Sud Underground Railways of Paris beyond the city gates, which are on the site of the old fortifications, and, although probably no city in the world has such a remarkable network of under-road tramways, its usefulness is checked by the congestion at railway interchange points such as the St. Lazare, the Nord, Est and Lyon stations. In London, for example, the pressure at terminal stations is relieved by the fact that such points as Wimbledon, Richmond, Hounslow, Ealing, Watford, Harrow, and Barking, can be reached without having to go to a railway terminal; any extension of the Metro Railway beyond the gates of Paris would not merely relieve the railway termini, but would have a very important influence on the housing problem of the city. The existence of the Octroi system has so far stood in the way of the linking up of suburban lines with the Underground.

When considering the progress of different nations with regard to suburban railway electrification, it should be remembered that in England and Scotland steam traffic has been handled with a higher degree of efficiency than in

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any other country; as a rule, engine docks and crossings are laid out for rapid handling, high platforms facilitate rapid loading and unloading, and the signalling is of a high order. Liverpool Street, with steam traction alone, handles about 242 000 passengers per day, and 40 000 per hour during the time of greatest density; the Chingford branch, having the greatest rush, is dealt with by two platforms out of 18. At the time when particulars were last taken Waterloo in winter handled 130 000 passengers per week-day and about 15 000 during the rush hour. Some remarkable traffic is also handled by the Tilbury and Southend section of the L.M.S. at Fenchurch Street; with good lay-out the terminal advantages of electric traction are not as great as some authorities have claimed.

At St. Lazare, even, in 1910 thirteen thousand passengers were handled per hour during the period of greatest density, and this figure now reaches about 50 000 between 8 and 9 a.m. and 6 to 7 p.m.

It is strange that although France is go-ahead with regard to electrical matters, with the exception of a part of the Western State Railway, and the main line of the Orleans Railway, there is no electrified railway out of Paris. The Western Railway handles far more suburban traffic than any other line in France. There are three terminal stations: St. Lazare, the Invalides, and Montparnasse (see Fig. 2). St. Lazare, with its 27 platforms, in size and traffic ranks with Waterloo (21 platforms) and Liverpool Street (18 platforms) as one of the most important stations in Europe.

The Versailles Railway.

The first section of the Western Railway to be electrified was that from the Underground Invalides station to Versailles (Rive Gauche), which was set to work in 1900. Originally only suburban traffic terminating at Versailles was operated electrically, what might be termed baggage-waggon locomotives hauling some of the trains. These were of the four-motor double bogie type, each motor having a capacity of 120 H.P. Some of the locomotives had gearless motors arranged with hollow armature spiders connected through springs with an internal axle, on the system originally designed by the late Prof. Short for the Baltimore Tunnel locomotives; others were arranged with geared motors. In 1912 a number of motor cars and traillers on the multiple unit system were put to work on this section to deal with the increasing traffic.

One reason which encouraged the original electrification of the Invalides-Versailles section was the difficulty of operating heavy traffic with steam locomotives on a steep grade through the tunnel at Meudon 2¼ miles long, in fact accidents happened owing to the suffocating smoke. Recently, for the same reason, it was decided to haul electrically the long distance passenger trains from the Invalides station and goods trains from the Champ-de-Mars depot as far as Versailles-Chantiers station in order to obviate the use of steam locomotives through this tunnel. Details of the new electric locomotives for this service will be given later.

Before the war the traffic dealt with from St. Lazare became more and more congested, and while the railway was still in the hands of a company electrification of several of the more northern lines was decided. Fig. 1 is a diagram showing the state of the traffic in 1910 at the time when extensive electrification was decided on. In Fig. 2 can be seen the inner suburban district included in the programme. When the war broke out a great deal of the heavy work, sub-station building construction and general lay-out had been far advanced, but military exigences stopped the operations completely. After the Armistice every penny of State cash and credit that could be spared was wanted for the reconstruction of the devastated areas, and later, at and after the Versailles Conference, professional politicians on both sides of the Channel and across the Atlantic found it inconvenient to search too deeply the pockets of the late enemies, because such a process might interfere with that rare and refreshing international financial bread and butter which forms nowadays such an essential feature in the political "menu," so that much anticipated cash was not forthcoming for the French Exchequer. The internationally organised run on the franc, which bears no relation whatsoever to the extraordinary increase in national industrial assets since 1919, made matters still more difficult regarding State finance. For these reasons the programme of electrification has not gone ahead as fast as anticipated.

As will be seen from Fig. 2 the lines from St. Lazare which are running electrically or are on the point of completion reach to Bois-Colombes, St. Germain and Auteuil Boulevard. On the south side the Montparnasse Versailles-Chantiers line will be electrified before long. One difficulty is that over several important sections electric traffic uses the same track as steam trains, but before long that situation will be materially ameliorated. The opening out of the Battignoles Tunnel in which a serious accident took place some years ago, will, with its increased track near the terminus fanshaped lay-out, assist matters.

Around Paris much of the steam-operated suburban traffic of four railway companies is handled in four-wheeled, double story carriages weighing about 18 tons each, the trains are very long, often weighing with passengers 500 tons or more; they are hauled by very heavy tank engines. In the first place the number of passengers per foot run of train with double story carriages is not as high as one would anticipate, because stairways are put at each end of the carriage and ordinary buffers are used, not close couplings. The new

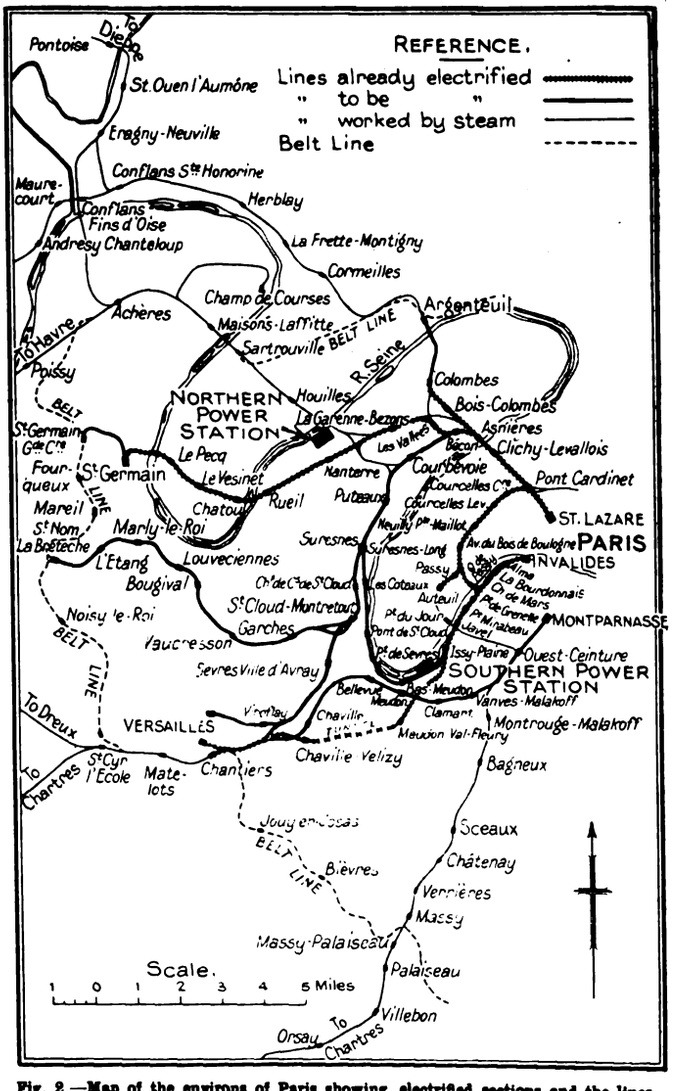

Fig. 2.—Map of the environs of Paris showing electrified sections and the lines which it is intended to electrify shortly.

electric trains will run at shorter intervals and, although they have no upper story owing to the internal width 2 m. 742, or practically 9 ft. (which the loading gauge allows), the total passengers that can be carried during the rush hours, including those standing is about 180 per car, so that the total passengers per metre run of the train will be about the same as before. One thing which interferes with the rapid handling of suburban traffic is the existence of low platforms. The Nord Railway is beginning to remedy this state of affairs.

Since the Armistice a material improvement has been made by French railways in the provision of fly-over junctions, the steep grades easily negotiable by the multiple-axle-driven rolling stock under modern electric traction operation, facilitates such constructions.

It is interesting that before the war a proposal was made to construct a loop-station under St. Lazare to handle the

(*Concluded on page 158.*)

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THE BALANCED SEA EARTH FOR CABLES.

A Theoretical Method of Estimating Extraneous Disturbances—Its Application to the Latest New York-Azores Cable.

By J. J. GILBERT, Bell Telephone Laboratories, Inc.

ONE of the interesting features of the continuously loaded submarine cable recently laid for the Western Union Telegraph Co. between New York and Azores is the "sea earth" at the New York terminal. This, by reducing the effect of extraneous disturbances, has helped to make available the great gain in speed due to permalloy loading. A discussion of the permalloy loaded submarine telegraph cable has been given in a recent paper by Mr. O. E. Buckley.* The present article presents a brief outline of a theoretical method of estimating the magnitude of extraneous disturbances on cables together with a description of the means employed in the New York-Azores cable for reducing the interference due to this cause.

The Interference Factor.

Interference due to electrical disturbances picked up along the cable and transmitted with the incoming signal to the receiving instrument constitutes one of the most important factors limiting the speed of operation of a submarine cable. The effect of such disturbances can be observed, on the tape of a siphon recorder, for example, as a succession of impulses and surges, the amplitude of which may range, depending upon the particular cable, from a fraction of a millivolt to ten or twenty millivolts, assuming the large, slowly varying surges to be eliminated. Unless the amplitude of the incoming signal is sufficiently large compared with the amplitude of interference, the latter will seriously interfere with the interpretation of the siphon recorder tape or with the functioning of relays operated by the signal current. Since the amplitude of received signals falls off rapidly as the signal frequency is increased, it is evident that for a given value of sending voltage there is a maximum speed of operation which cannot be exceeded without danger of serious mutilation of the signal. If by any means the magnitude of the extraneous interference can be diminished, signals of smaller amplitude can be employed and the speed of operation consequently increased.

The disturbances encountered on submarine cables are due to electromotive forces induced in the cable conductor by extraneous electromagnetic fields in the sea water, arising from a variety of sources, which may be broadly grouped into two classes. The first class comprises artificial sources, such as electrical power or railway systems in the neighbourhood of the cable terminals. Currents circulating between the various earth connections of such systems give rise to electromagnetic fields in the earth and sea water, which fields may have the form of transient surges or pulses, or may be periodic in nature. The second class includes the various manifestations in the atmosphere or at the surface of the earth, such as electric or magnetic storms, which are also responsible for the disturbances in radio communication known as "static." Very little definite data is available regarding the magnitude and character of this second class of disturbances, but it is found that, as in the case of radio static, the intensity of such effects is influenced by a number of factors, the season of the year and the geographical location being among the most important. At times of unusual electrical disturbance such as that accompanying the aurora polaris or local electrical storms, the voltages induced in the cable conductor are so large as to endanger the receiving instruments or even the cable insulation.

Disturbing Effects.

An electrical disturbance, such as the discharge between a cloud and the earth, is felt electrically at distant points on the earth through the medium of electromagnetic waves which are conducted by the earth's surface layer in accordance with the laws governing "skin effect," that is, the electric and magnetic effects accompanying the wave tend to concentrate at the surface, the degree of concentration being higher for rapid changes in the disturbance than for slow variations. An idea of the magnitude of this effect can be obtained by a consideration of the distribution of the electric and magnetic fields accompanying a sinusoidal disturbance of frequency f, uniformly distributed over the surface of the ocean. At a depth z below the surface the field intensities are equal to ϵ^{-kz} times the corresponding intensities at the surface, where $k = 2\pi\sqrt{\lambda f}$, λ being the electrical conductivity of sea water. Table I gives the magnitude of sinusoidal disturbances of various frequencies at various depths of water, computed on this basis, assuming $\lambda = 5 \times 10^{-11}$.

TABLE I.—*Ratio of amplitude of electric or magnetic field at depth z to corresponding amplitude at surface.*

z=depth ft.	5 c.p.s.	50 c.p.s.	100 c.p.s.
100	0·73	0·38	0·26
200	0·54	0·14	0·07
500	0·22	0·01	0·001

At any point on the surface of the ocean the electric and magnetic fields at any instant are the resultants of disturbances coming from many points on the earth, most of them quite distant, and over any region of the surface having dimensions comparable with the depth of water in which the cable is immersed, that is, of the order of a few miles, the surface disturbance can be considered as practically uniform. Consequently the values given in Table I represent closely the electric and magnetic field intensities at points in the vicinity of the cable in terms of the field intensities at points vertically above on the surface. It can be seen that the magnitude of a disturbance falls off rapidly as it penetrates the water; also that this attenuating effect is greater the higher the frequency. At a depth of one or two miles, at which the greater part of the typical transoceanic cable is submerged, only the extremely low frequency components of the surface disturbance are encountered to an appreciable degree. In the vicinity of the terminals, however, where the water is comparatively shallow, the cable is exposed to the higher frequency components of the disturbances, and it is usually in these sections that the greater part of the most troublesome disturbances is picked up. This is especially true in localities where the zone of shallow water extends a considerable distance from shore. In the neighbourhood of New York, for example, cables traverse for a distance of approximately 100 miles a section where the depth of water is only 100 to 200 ft.

Method of Computation.

The electromotive force induced in each unit length of the cable conductor is proportional to the electric field intensity in the adjacent sea water. These electromotive forces distributed along the cable conductor give rise to currents which are transmitted in both directions, landward and seaward, from the point of induction in accordance with the well known laws of signal transmission, accompanied by variations of potential between the conductor and ground. The resulting current and potential at the cable terminal constitutes the extraneous interference.

In a recent article* the writer has described a method of applying the principles discussed above to compute the relative reactions of various cables to extraneous disturbances, with the idea of predetermining the interference on a prospective cable from measurements of interference on cables already laid. This method consists in computing for various values of frequency the disturbance at the cable terminal due to a sinusoidal disturbance of unit amplitude, uniformly distributed over the surface of the ocean, along the route of the cable. By comparing the computed terminal disturbance on the two cables at frequencies of particular significance with regard to the speed at which the cable is to be operated, the relative amplitudes and characteristics of extraneous interference on the two cables can be determined.

In employing this method it is essential to bear in mind that, although the disturbance at the cable terminal is a composite of sinusoidal voltages and currents of all frequencies from zero to infinity, we are principally concerned with the components lying within a certain frequency range, the limits of which depend upon the speed of signalling. This is due to the fact that the characteristics of an ordinary submarine

* "Proc. A.I.E.E.," vol. 44, p. 821, August, 1925, and "Bell System Technical Journal," vol. 4, No. 3, July 1925.

* "Bell System Technical Journal," July 1926.

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cable are such that the low frequency components of a signal are transmitted with much less diminution of amplitude than are the higher frequency components. Consequently it is found necessary, in order to render the signal intelligible, to employ a correcting network at the receiving terminal, one function of which is to attenuate the arriving low frequency components so that they finally are in the proper proportion to the higher frequency components. Also it is found that frequencies which are higher than about one and one-half times the signal frequency are not required in order to obtain intelligible signals, so that the receiving network is usually designed to remove the higher frequency components of the disturbance. The receiving apparatus therefore emphasises the part played by the components of interference of frequencies in the neighbourhood of the signal frequency. For this reason it is necessary, in the majority of cases, to consider only the disturbances picked up on the portion of the cable submerged to a depth of approximately 1 000 ft. or less, since, as has been previously indicated, only disturbances of extremely low frequencies are encountered in the deep water portion of the cable.

The method just outlined was applied to predetermine the interference at the terminals of the New York–Azores permalloy loaded cable. At the Horta terminal the cable reaches deep water within a few miles of the terminal, and the results indicated that the magnitude of interference to be expected would be sufficiently small to permit of signalling at the speed at which it was desired to operate. At the New York terminal, however, the ocean for a distance of about 100 nautical miles is comparatively shallow, and cables in this vicinity are exposed to rather severe disturbances. This is partly due to unusually strong stray fields from the numerous electric railway systems in the neighbourhood of New York. By means of an amplifier and a recording string oscillograph records were obtained of the interference on the Western Union Telegraph Co.'s non-loaded cables terminating at New York. Another series of tests was made, on board the Western Union cable ship "Clowry," during which a cable was raised from deep water and cut and interference studies made on the two parts of the cable. A study of these results, according to the method that has just been described, indicated that unless some means were employed for reducing the terminal interference, a great sacrifice of signal speed would have to be made, at least on westbound traffic. The remedy that was adopted is a special type of earth connection 100 miles at sea, to which the earth terminal of the receiving apparatus is connected by means of a core having a structure similar to that used in the corresponding portion of the cable. The principle of this arrangement will now be explained.

Eliminating Reflection.

For the purpose of diminishing extraneous interference there is provided on most cables what is known as a sea earth which consists of a length of core extending for a distance of a few miles from shore, to a point where its conductor is earthed by connection to the armour wires. The shore end of this conductor is connected to the earth terminal of the receiving apparatus. A discussion of some of the points involved can be found in various patent specifications, particularly Osborne, U.S. Pat. 1 390 580, 1921; Heurtley, Br. Pat. 198 978, 1923; and Gilbert, Br. Pat. 218 261, 1926. It is evident that, if the main core and the sea-earth core are close together, they will both be exposed to the same disturbances over the length of the sea-earth core. If the two cores would react in the same manner to these disturbances it is clear that corresponding to each disturbance at the terminal of the main core there would be an equal impulse at the shore terminal of the sea-earth conductor and there would be no resulting difference of potential impressed on the receiving network due to these disturbances. As a matter of fact, however, the sea-earth conductor does not react to disturbances in the same manner as the corresponding section of the main conductor, for the reason that the impedance to earth of the former is different from that of the latter. The portion of the disturbances picked up on the sea-earth conductor and transmitted seaward is reflected at the sea end, travels back along the cable to the shore end, and since there is no corresponding reflection on the signalling conductor there will be a resulting difference of potential across the terminals of the receiving apparatus.

The remedy for this condition is to eliminate reflection at the sea end of the sea-earth conductor by earthing the sea end of this conductor through a network having an impedance that bears the same relation to the impedance of the sea-earth conductor as the impedance of the signalling conductor beyond the sea earth bears to the section between this point and the shore. In the case where the sea-earth conductor has the same characteristics as the corresponding portion of the signalling conductor the impedance of the network should equal the impedance of the main cable beyond the sea earth.

In order that a sea-earth arrangement of this type shall operate at its maximum efficiency it is necessary that the factors affecting the pick-up and the transmission of interference on the two cores be made as nearly as possible the same. In manufacturing the cable, core lengths should be paired off in such a manner that the electrical constants of any portion of the sea-earth core match the constants of the corresponding portion of the main core, and the two cores should preferably be armoured together.

An Economic Problem.

The question as to how far from shore the sea-earth should be located in a particular case is an economic problem, the optimum location being that where the increase in value of the cable, due to diminution of interference by further extension of the sea-earth, balances the additional cost of making the extension. In some cases it is found economical to obtain the desired ratio of signal-to-interference by means of a more efficient and expensive core rather than by an extended sea-earth conductor. In the case of cables terminated at points on the North Sea for example, sea-earth conductors several hundred miles in length are required in order to get a deep water termination. By increasing the weight of the main conductor, thereby increasing the amplitude of signals received over the cable, a greater amount of interference can be tolerated, in which case a comparatively short sea-earth can be employed, just long enough to get rid of local interference and of the pick-up of signals from cables terminating nearby.

An inductively loaded submarine telegraph cable possesses characteristics which make the balanced type of sea earth particularly adaptable. If the cable has been suitably designed for the speed at which it is operated, its characteristic impedance for all values of frequency higher than a value well below the signal frequency, has a resistance component which is practically constant and a reactance component which is comparatively small. In the case of a typical cable designed to operate at a speed corresponding to about 60 c.p.s. the characteristic impedance for all frequencies higher than about 20 c.p.s. can be approximated very closely by a pure resistance of about 400 Ω. In contrast to this, the characteristic impedance of a non-loaded type of cable varies with frequency and has a reactance component about as large as the resistance component. In the case of the loaded cable the problem of designing a terminating network for the sea-earth conductor is therefore a matter of including in the cable structure a resistance of several hundred ohms. It is true that a network of this sort does not provide a good balance for frequencies which are low compared with the signal frequency, and components of interference of these low frequencies will be found at the cable terminals due to the lack of balance between the main cable and the sea earth. As was previously pointed out, however, these components will be so greatly attenuated by the signal correcting networks that their effect upon the receiving instrument will be inappreciable. Moreover, it is probable that a considerable amount of low frequency disturbance is picked up beyond the sea earth and the gain obtained by improving the balance for these frequencies would not be very great.

A Practical Design.

A practical design for the terminating resistance consists of a length of several hundred feet of stranded wire, approximately 0·05 in. in diameter, of high resistivity material, insulated with gutta percha. After being joined at one end to the sea end of the sea-earth core, the insulated conductor is served with jute and laid up with the main core for armouring exactly in the same manner as any other portion of the sea-earth core. The free end of the conductor is grounded by connecting to the armour wires in the usual manner. A structure of this sort satisfies very completely the requirement of simplicity and lightness, and is as easily maintained as a length of ordinary cable similarly located.

There is a second characteristic of the loaded type of cable that tends to simplify the problem of the design of a balanced type of sea earth. It has been shown that the portion of the extraneous interference that it is most desirable to eliminate consists of the components of frequencies in the neighbour-

(*Concluded on p.* 158)

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STEAM ACCUMULATORS.*

Some Notes on Their Theory, Application and Development—The Ruths Principle in Practice—Use in Traction Stations.

By H. E. WITZ.

TO convert 1 kg. of water at 0 deg. C. into steam at atmospheric pressure, the water must first be heated to 100 deg. C., for which 100 kg.-cal. are required; a further 540 kg.-cal.

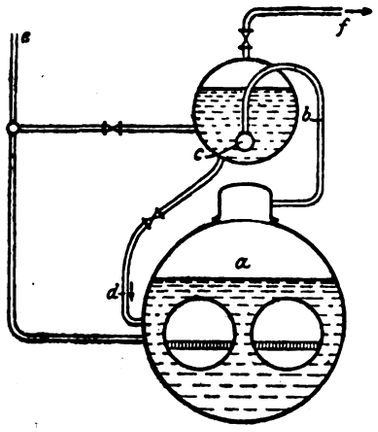

Fig. 1.—Principle of the Druitt-Halpin accumulator.

is necessary for the conversion into steam. If steam be required at a higher pressure, however, more heat must be supplied, since the boiling-point of the water rises. At the same time the latent heat of vaporisation decreases with rising pressure, and the heat-drops available for power-production increase. Now, the quantity of heat required to raise the water-temperature to evaporation point does not rise proportionally to the pressure: for example, the boiling-point of water increases from 100 deg. C. to 120 deg. C.—that is, by 20 deg. C.—when the pressure increases from 1 to 2 atm. (absolute). On the other hand, a pressure rise from 15 to 16 atm. involves only the 3 deg. temperature rise from 197 deg. C. to 200 deg. C. If, therefore, water at 200 deg. and 16 atm. have its pressure reduced to 15 atm., it will assume a temperature of 197 deg.; and since it now has a heat excess of 3 kg.-cal. per kg., steam will be developed to an amount depending upon the total heat of steam at 15 atm., i.e.,

$$3 \times \frac{1}{665 \times 197} = 0{\cdot}0064 \text{ kg.}$$

Thus, to obtain 1 kg. of steam by a pressure reduction from 16 to 15 atm., $\frac{1}{0{\cdot}0064} = 156$ kg. of water is needed. The same operation performed on water at 2 atm. (120 deg.), release s

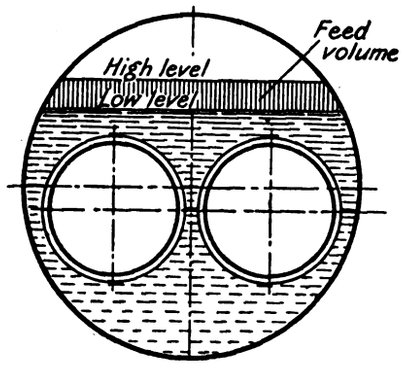

Fig. 2.—"Feed-volume" accumulator.

20 kg.-cal. for each kg. of water reduced in pressure to 1 atm., developing

$$20 \times \frac{1}{640\text{-}100} = 0.037 \text{ kg.}$$

of steam, or 1 kg. of steam for every 27 kg. of water.

The reverse process is possible, and the two operations constitute the principle of the "steam-accumulator." The figures above quoted indicate that practical applications will be confined to low-pressure systems.

* Abstract of an article in the "Elektrotechnische Zeitschrift."

One of the oldest steam-accumulators was that patented in America by MacMahon in 1873. This was followed by the 1880 German patent of Jurisch, Lewis, Pröll and Scharowsky. Later, in 1900, Rateau patented a steam and heat storage system for utilising the exhaust steam of reciprocating engines in low-pressure turbines.

A well-known modern development is the Ruths steam-accumulator, which to-day holds an important place among devices designed to increase the thermal efficiency of steam plants. While the Rateau storage system involved the supply of continuous steam flow to turbines from discontinuous sources (reciprocating engines), the Ruths accumulator goes a stage further. The introduction of the Ruths storage in a steam power plant renders the steam generating equipment independent of the load fluctuations, allowing the use of smaller boilers having a more constant loading and a consequently higher furnace efficiency.

Druitt-Halpin in 1893 patented a system for supplying water, pre-heated in a separate vessel, to the main boiler at times of heavy load: the result being that less heat was then required for heating the feed water, and all the more steam could be generated. The system is shown diagrammatically in Fig. 1. A development of this arrangement, suitable for large boilers, is the discontinuance (or reduction) of the supply of feed water during periods of heavy steam consumption, thus allowing the water level to fall from a maximum to minimum. This, of course, reduces the amount of heat necessary to raise the temperature of the feed to boiling-point. At times of light load the water-

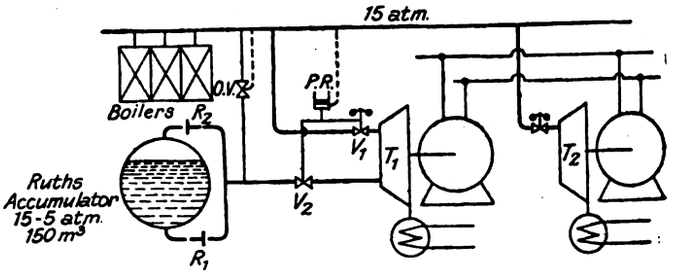

Fig. 3.—Ruths accumulator storage system in traction generating station.

level is maintained at the high level. The water volume between high and low levels serves directly as a heat storage system. See Fig. 2.

Kouznezoff's patent in 1896 provided for a storage "boiler" arranged over the main boiler. A pipe connected the two in such a way that when the main water-level fell on load, hot water from the storage boiler was injected into the main boiler. In 1913, Christians patented an arrangement for heat storage wherein with small loads the feed-water supply increased and hot water was led to a heat accumulator, while on heavy loads the feed was reduced and the boiler was supplied from the accumulator.

With installations equipped with economisers the application of such methods as the above leads to possibility of the flow of feed-water through the economiser being interrupted, with consequent danger. To meet this case a third method of heat storage—the displacement method—utilises a storage tank between the economiser and the boiler, as shown diagrammatically in Fig. 4. The storage tank *c* is connected to the boiler by pipes *a* and *b*. Should the flow of feed-water to the boiler on load become interrupted, the feed through the economiser *d* enters the tank *c*, displacing hot water into the boiler by the pipe *a*. On light loads the economiser water is returned to the boiler through *b*, hot boiler water entering the tank through *a*. Thus the storage tank will contain alternatively hot or (comparatively) cold water, according to the state of the steam consumption.

Turning to practical applications, a Halpin system was installed in France in 1902. Owing to the temperature variation of the storage-boiler content, this boiler suffered in reliability, while great care and attention was demanded from the personnel to maintain service. The completely automatic regulation of to-day was then unknown. In

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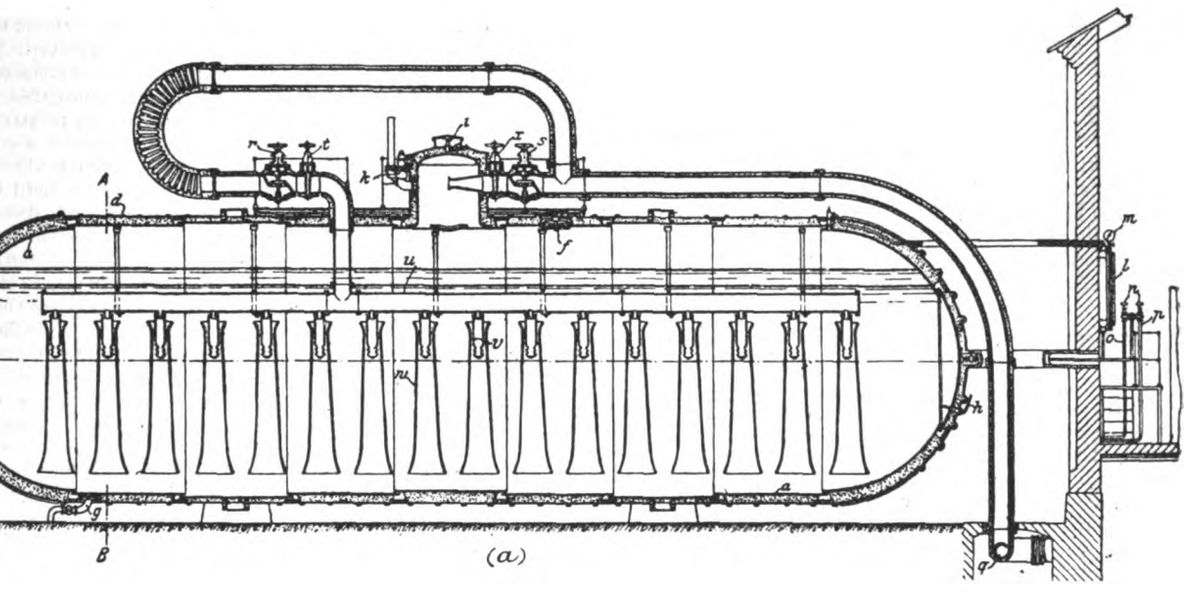
consequence the question of heat storage received little attention until 1921, when the successful Ruths accumulator stimulated further interest. Fig. 5 shows a section of a Ruths accumulator. Surplus steam is taken through a distributing system *u* and *w* in the lower part of the accumulator to ensure a thorough mixing of steam and water. Steam developed in consequence of pressure drop is collected in the domed portion and conveyed to apparatus in which it is to be used. The size of the accumulator naturally depends upon the quantity of steam to be stored; and its connection into the thermal system depends upon the operations for which the system is intended.

As examples of the use of the Ruths steam accumulator, some practical cases are here described.

Fig. 3 shows the connections of the storage accumulator system for the Altona Railway generating station, Hamburg. The accumulator works between the pressures of 15 and 5 atm. (gauge), and has a content of 150 cub. m., its accumulation capacity amounting to 2 600 kWh. The accumulator operates with the turbine T_1, which has two sets of nozzles (one for live steam from the boiler, the other for steam from the accumulator). The steam supply to this turbine is controlled by a pressure regulator P.R. operated by the boiler pressure. With increasing load, the boiler pressure falls on account of the extra demand for steam. This suffices to cause the pressure regulator P.R. to open the valve V_2 and admit steam from the accumulator to the turbine T_1. The increased load is in this way taken by the accumulator, leaving the boilers working under approximately constant demand. When, on light loads, the boilers make more steam than is required, the surplus is passed through the automatic valve O.V., charging the accumulator in preparation for the next peak load.

The steam accumulator is of great utility in providing reserve steam capacity, practically eliminating danger of interruption of the supply. The system is in operation at the Malmö power station, Sweden. This station works in parallel with a hydro-electric plant. When a sudden fault occurs in the latter, the Ruths accumulator takes over the load at the steam station. Thus Malmö suffers no interruption of service, while the whole of south Sweden becomes electrically dead.

The thermal arrangements in a paper-making works are of considerable interest. Steam is generated in three boilers, each with 225 sq. m. heating surface, at a pressure of 12 atm. (gauge). To the high-pressure steam distribution system are connected: a uniflow engine, a compound engine, and six small works engines. Three paper machines receive steam at 2 atm. (gauge) from the Ruths accumulators. The pulp-boilers can be connected either to the main boilers or to the accumulator. The mean steam demand of the equipment is 13 500 kg. per hr., a further 2 000 kg. per hr. being needed in winter to provide for room heating. The pulp-boilers make sudden demands for steam at intervals, the overload being met by the accumulator, which has a capacity of 11 300 kg. of steam available in a short time. The accumulator is charged through a valve which is operated by the boiler pressure when the main boilers are lightly loaded.



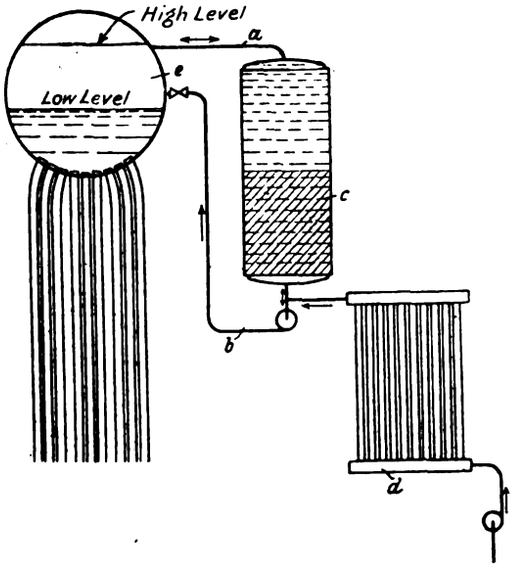


Fig. 4.—Principle of the displacement accumulator.

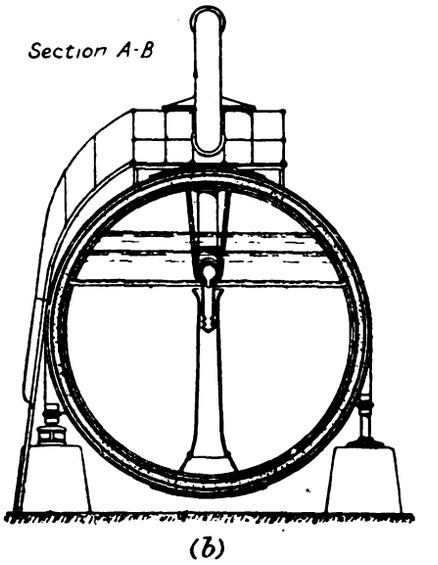


Fig. 5.—Section through a Ruths accumulator.

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VERY INTENSE MAGNETIC FIELDS.*

Their Employment to Disturb Electronic Orbits—Methods of Generation—Some Tests on Solenoids.

By T. F. WALL, D.Sc., D.Eng.

MR. S. EVERSHED has recently suggested the possibility of a disturbance of the electronic orbits within the atoms of a magnetic substance being effected by impressing on them a very intense magnetic field.

The following investigation was undertaken primarily for the purpose of generating very intense magnetic fields and impressing these fields on a magnetic substance with a view to disturbing the electronic orbits within the atoms. Now calculation shows that even if the impressed magnetic field is of the order of 1 million gauss, the corresponding change in the magnetic moment of a revolving electron will only be of the order of 0·1 per cent. It appeared however that one might obtain an appreciable disturbance of the electronic orbits if the impressed magnetic fields were to be repeatedly applied. In these circumstances we might expect a cumulative effect, so that eventually a marked change in the magnetic properties of the material would be observed—in particular, a marked change in the magnetisation curve of the material.

In the present paper, attention is confined mainly to the problem of generating the very intense magnetic fields and the measurement of the condenser discharge currents to which these fields are due.

Details of Apparatus

In order to obtain the desired highly concentrated magnetic field it is necessary (1) that very large currents should be generated in the solenoid winding, and (2) that the currents should only be allowed to flow for a very small fraction of a second. For this purpose it was determined to use the oscillatory discharge of electrostatic condensers of high capacity and charged to high potential difference.

The condensers were of the paper-insulated oil-immersed power type as supplied by the British Insulated and Helsby Cables, Ltd., and were supplied in units of a nominal value of 50 μF each. Each unit was capable of withstanding a charging pressure of 2 000 V (d.c.). For the tests 28 of these units of an aggregate capacity, when connected in parallel, of 1 366 μF, were used. They were charged by means of a small d.c. generator giving about 1 200 V, supplemented by a battery of small accumulators to bring the total e.m.f. up to 2 000 V. The d.c. supply was connected in series with 0·25 megohm resistance, so that when the discharged condensers were connected to the supply there would not be a heavy rush of current. The condensers required about 3 to 4 min. to become fully charged under these conditions.

After having become fully charged the condensers were connected directly to the solenoid winding, care being taken to keep the resistance and inductance of the leads from the condenser to the solenoid as small as practicable. The solenoid was immersed in a bath of transformer oil, which served the double purpose of maintaining high insulation between windings and cooling the winding after the passage of the heavy currents, which reached a momentary value of many thousands of amperes. The measurement of these currents was a matter of some difficulty but was effected by the aid of a Duddell high-frequency oscillograph and "falling plate" camera. The arrangements for making such measurements are described in detail in the original paper. In particular special arrangements were necessary to eliminate mutual induction effects between the solenoid leads and the leads to the oscillograph, which was used as a shunt to a standard resistance.

Condenser Arrangements.

The arrangement adopted enabled the condensers to be charged to 2 000 V in parallel, but discharged in two equal sets connected in series. In these circumstances the magnitude of the first peak of the oscillatory discharge current attains 7 780 A, the frequency being 1 200 cycles per sec. If, on the other hand, the condensers were kept in parallel during discharge the first peak of the current would attain 5 800 A, the frequency now being 563 cycles per sec. Thus, by adopting the above device, the maximum value of the current is increased by 34 per cent. The pressure at the moment of discharge with this arrangement would be double the charging pressure—i.e., 4 000 V.

In the subsequent section of the paper the author illustrates tests on a series of solenoids. Oscillograms in one case show that the second peak of the pressure wave is almost equal to the first. Another oscillogram shows the effect of the bursting of the solenoid under a heavy current, which reached 7 000 A. The whole process only required about 0·0005 sec., which shows the great mechanical stress involved. In this and other cases the current and frequency, as calculated from the constants of the discharge circuit, were compared with those actually observed. In the case of one specially prepared solenoid giving a yet higher intensity of magnetic field, a considerable discrepancy between observed and calculated values was noted, apparently the result of an effect equivalent to a reduction in the effective inductance of the solenoid. In a later portion of the paper the author advances the theory that the so-called "frictional" electricity or "contact e.m.f.," which is developed whenever any two unlike substances are brought into intimate contact, is sufficient to account for the apparent decrease in the inductance of this solenoid (*C*.) The effect of change in dimensions of the solenoid winding on the intensity of the magnetic field generated is also discussed in detail. The results of the investigation are plotted as curves connecting intensity of magnetic field and current in amperes, with condensers charged respectively to 2 000 and 4 000 V. It is shown that there is a value for the winding depth giving maximum field intensity, other things remaining equal; also that the magnetic flux shows a distinct increase when the method of charging condensers in parallel and dividing them into groups in series before discharging is adopted. A particularly interesting oscillogram was obtained for a solenoid wound on a steel bobbin. This coil also burst when the discharge took place. The current wave in this case consisted in a single peak of 2 230 A, and then fell to zero. The p.d. wave at first followed in similar course, but after remaining zero for about 0·002 sec. showed high frequency ripples of small amplitude, afterwards becoming definitely negative and remaining so for about 0·010 sec. Other fluctuations subsequently occurred. The curious activity of the p.d. after the current had ceased to flow was apparently due to the iron in the bobbin, and the atomic disturbance evidently took considerable time to settle down to a state of quiescence.

As previously stated the main purpose of this method of generating very intense magnetic fields is to ascertain the effect of repeated applications of such fields on a magnetic substance. For this purpose the magnetic specimen is prepared in the form of a short tube of approximately the following dimensions: Length $\frac{5}{16}$ in., internal diameter $\frac{1}{8}$ in., external diameter $\frac{3}{16}$ in.

The specimen is inserted in the hollow core of a solenoid which is wound on a steel bobbin. The bobbin has a longitudinal slit to minimise the generation of eddy currents in the metal of the bobbin.

Treatment of Specimen.

Before subjecting the specimen to the intense magnetic fields the magnetisation (i.e., the *B-H*) curve is determined. The specimen is then inserted in the tubular core of the solenoid and the oscillating switch *E* (Fig. 1), is set in operation so that a condenser discharge passes through the solenoid about once every five minutes. After a few hundred discharges have in this way taken place, the specimen is removed and its magnetisation curve is again determined.

It has been found that the magnetisation curve for a specimen of stalloy is distinctly improved after having been subjected to the intense magnetic fields in this way.

This process is being carried out for a long period of time to ascertain what limit, if any, there is to the observed change in the magnetisation curve due to the repeated application of the very intense magnetic fields.

Tests will also be made on specimens of bismuth and other representative materials.

* Abstract of a Paper presented to the Institution of Electrical Engineers.

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THE DIRECT CURRENT SERIES SYSTEM.*

Its Application to Electrical Winding—Operation and Regulation of a 100 000 V Equipment—Some Obstacles to Development—Future Possibilities.

By W. H. BADGER.

THE direct-current series system, described in this paper, is unknown as yet in South Africa, although it was once under consideration for the transmission of power from Victoria Falls. In this system all generating and utilising devices are connected in series and the current is continuous and constant, while the potential is varied in proportion to the demand for power. In this case field windings of the series type are essential and the inherent instability of series motors requires to be counteracted. On machines of the "Thury" type the main field is deliberately distorted by armature reaction, but in such a manner that there is good commutation under all loads. An essential feature is the use of moving brush gear which comes into operation when the current strength in the line varies from its normal magnitude. In the case of motors regulators forming part of the Thury equipment must adjust the back e.m.f. as the torque varies.

Current regulators are used chiefly in controlling the generating plant so as to afford a constant current. The forces developed as a result of the magnetic action of the line current on the regulating gear are very small; hence direct action is not relied upon, but is used to operate a relay valve, which in turn admits oil under pressure to a distributor valve, unbalancing the pressures on a moving gate and thus adjusting the position of the brushes. In the original paper a detail sketch of such a regulator is given. With several generators running in series it is not desirable to have the regulator too sensitive and a "percentage spring" is fitted which becomes extended as the load increases and reduces the current slightly. Motor regulators, also described in the original paper, may vary in design according to the conditions—e.g., whether the motor is required to operate at constant speed, or to be reversible and with variable speed. In addition there are various safety devices, also necessary. Constant speed motors are fitted with an arrangement similar to the automatic runaway trip on steam turbines. These short circuit the machine if the speed exceeds a certain value.

Insulation Essentials.

In order to illustrate the applications of the method the author gives some particulars of a system designed to withstand an ultimate voltage of 100 000 d.c. The line current was 100 A and the maximum capacity of the scheme 10 000 kW. The voltage of individual machines is 5 000, but as one machine will be at the maximum potential to earth, it must be adapted to withstand the full line pressure. It would be impracticable to insulate between windings and frame for this voltage. Hence the machines are themselves insulated from earth by supporting on insulators the concrete blocks which carry the bedplates. Asphalt compound is then used to fill in between the block and the concrete foundations, and subsequently the whole floor of the engine room is covered with asphalt to a depth varying from 1½ to 2½ in. in thickness. These precautions completely obviate any danger of electrocution. The generating plant in this case consisted of synchronous motor generator sets, the synchronous motors driving the generators through special insulated couplings. The operating characteristics of the generators are simple. The brushgear comes up against a stop shortly before it reaches the no-volt position, and at full speed a current of 50 A flows. In starting up after a shut-down the generator is run up in series with the line, since to run it up on short circuit and throw it on the line might lead to a flash over. Once the line is alive a second machine can be run up from the d.c. side, the regulator being taken out of commission and the brushgear advanced by means of a hand wheel. Once synchronised the regulator takes charge. When running up a machine from the a.c. side the generator is on short circuit, and the short circuit current is brought up to the same value as that in the line. The short-circuiting switch is then opened and the line current flows through the machine. The regulator is then allowed to take charge. When shutting down a single generator the set may be tripped on the a.c. side and allowed to come to rest. A machine in series with another has its voltage reduced to zero and is then short circuited. Stops are fitted which prevent the brushes being rocked beyond the full load position, as serious sparking would then take place.

While this system was originally developed for high tension transmission of power, it has been successfully applied to electric winding. Operation was effected by means of a sub-station containing a motor-generator flywheel set, the flywheel serving to deal with peaks, and also enabling the plant to complete a wind should the supply fail. Two methods of control are in use. In one a hand lever is connected directly to the brush rocker. A foot-brake is also employed, but is only used during the last fraction of a second to make the drum stop opposite some fixed point. Under automatic control the method is somewhat different. A hand lever is advanced and a regulator of the three-point type advances the brushes and starts the motor. Once the correct speed is attained the regulator brings the brushes past the no-volt position and automatically maintains the speed. Bringing the hand lever to the zero position causes the regulator to stop the drum.

Mechanical Details.

In the original paper the author describes the mechanical details of the arrangement more fully. He also refers to the debatable point whether the winder should keep the cage under control throughout the wind, and not allow a departure from the predetermined speed-curve. This is doubtless the safest policy as any risk of the cage striking the head gear or the bottom of the pit is eliminated. There are times, however, when a departure from the predetermined speed curve may be desirable, owing to the need for more rapid acceleration and increased flexibility. The Thury system under normal conditions gives a controlled wind; but if desired the regulator can be taken out of commission and the winding motor controlled directly to meet any emergency.

The applications of the series system have not as yet been very numerous. One circumstance that checks its development is the limited size of machines of this type, leading to the employment of a number of small units. The second drawback is the inability of giving a reasonable transmission efficiency at low load factors, since the resistance losses in the line and generators are constant and independent of the load. In addition a machine with a commutator is not well adapted for direct coupling to steam turbines of modern design.

Nevertheless the general demand for economy, and the prospect that in course of time the amount of energy transmitted over long distances will continually increase, render other considerations of importance. The charging currents necessary for extra high tension a.c. lines may reach considerable values. Rigid adherence to existing methods will mean the ultimate use of lower frequencies or of conductors of greater diameter than those at present used. It is conceivable that eventually circumstances might favour the adoption of a d.c. system, which will also be favourable to lower insulation stresses. Amongst future possibilities in connection with d.c. transmission there is the series generator. This has the defects common to commutating machinery of not being adapted to high peripheral speeds and large outputs and therefore cannot be readily used with steam turbines. It is possible, however, that such methods might prove useful in connection with the utilisation of water power in some districts, in view of the more moderate rotational speed of hydraulic turbines. In some such cases the higher cost of the generating plant has been compensated by lighter and cheaper transmission lines and switchgear.

Next there is the new device known as the "Transverter," about which not much is known as yet. At present a capacity of 2 000 kW at 120 000 V has been attained, but the dimensional limitations have not yet been determined. Rotation has been transferred from the commutator to the brush gear, thus overcoming in some degree the problem of mechanical stress. Its speed is naturally high, its efficiency at full load is of the order of 96 per cent., and it is completely reversible, transforming from a.c. to d.c. or vice versa. The capital cost would probably be lower than in the case of series d.c. machines, but the provision of an a.c. supply is necessary. It eliminates the disadvantage of having to supply a constant current in order to obtain satisfactory commutation.

(*Concluded on page* 158.)

* Abstract of a Paper read before the South African Institute of Electrical Engineers.

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CORRESPONDENCE.

ESPERANTO AND TECHNICAL LITERATURE.

[To the Editor.]

Sir,—I am able to speak from experience of the difficulties of utilising Esperanto for translations of technical details as some years ago I endeavoured to use this language as a medium for obtaining technical data from collaborators speaking other continental languages only.

The ambiguity arising from the paucity of the technical vocabulary in official Esperanto and the consequent prevalent use of arbitrarily chosen words compelled me to abandon its use. When I found that the authorised Esperanto translation by Prof. Lorentz of "A Rotary Transformer might be called a Motor-Generator" was translated (literally) as "A Self-Turning otherwise-making-instrument can be called a Motor-Producer," I realised how readily the precise meaning could be hopelessly obscured.

That this difficulty was a very real one and a practical bar to any but Esperanto enthusiasts largely led to the calling of an international congress of linguists following the Paris Exposition, who after seven years' deliberation unanimously pronounced for an Esperanto so reformed as to be unacceptable to the ultra-Esperantists.

This, the "Ido" system and the official "International Language of the Delegation," I have now been using for some two years, almost entirely for an interchange of wireless data with fellow engineers in Russia, Poland, Czekoslovakia, Italy, Germany and Sweden, so far without hitch. In my experience its growing use, although perhaps mainly by ex-Esperantists and following the publication of "The Hundred Defects of Esperanto," augurs for its gradual more general adoption, particularly as being comprised purely of international roots, it is less artificial and not unnatural.—I am, etc.,

E. H. Turle,
Member I.R.E., A.M.I.E.E.

Beckenham,
July 29th, 1926.

Paris Suburban Electrification.

(*Concluded from page* 151.)

electric traffic; this scheme, so far, has not been proceeded with. When the Central London Railway was extended to Liverpool Street, during arbitration proceedings regarding an easement under the station, the same question was brought up. The two loop stations so far constructed in England, namely, Wood Lane and Charing Cross Underground (Hampstead Line), have not been successful because terminal passengers usually exceed those at intermediate stations as all get out or get in, so that the extra station time involved tends to block the following trains. The remedy is to use at least two loop platforms for each double track. On the French Metropolitan almost everywhere terminal stations have arrival and departure platforms connected by a loop; a somewhat analogous arrangement is being constructed at the Oval Station, where the Hampstead Line joins the City and South London section.

There is one factor that must in time be a very useful one to the Paris inner-suburban traffic, and that is, an admirable outer Belt Line (Grande Ceinture), which mainly handles goods traffic and which inter-connects the radial main lines of the five railway companies at points well outside the area of densest traffic. Thus delays due to through goods traffic at complicated junctions can be minimised. Part of this can be seen in Fig. 2 as a dotted line.

The line from Clapham Junction through Willesden to Dalston and Bow fulfils a similar function at home, although it is too close to town; before the war proposals were made to build a similar relief line round the north of London; the project was defeated through the agency of well-meaning artists of Golders Green. During the war such a line would have been what the French line was, invaluable. Although the French belt line *per se* is not a paying proposition, it pays indirectly, especially as it keeps unnecessary traffic off goods yards in districts where land is very dear.

Although in the past the French State Railway has been the butt of many gibes, yet as far as Paris suburban traffic is concerned, under the able guidance of M. M. C. Thomas, the chief electrical engineer, it is now, in a way, showing a lead to the Nord, Est and P.L.M. Railways which also have a material suburban traffic around Paris.

The Balanced Sea Earth for Submarine Cables.

(*Concluded from page* 153.)

hood of the signal frequency. Since the maximum signal frequency of a loaded cable is five to ten times that of the corresponding non-loaded cable, it is evident from the preceding discussion that in order to effect a given reduction of interference in any particular locality, the sea earth of the loaded cable can be located closer to shore and in shallower water than in the case of the non-loaded cable.

In the case of the New York–Azores cable the balanced type of sea earth has been very effective in reducing extraneous interference. Comparison of the records taken simultaneously on this cable and on a cable provided with an ordinary type of sea earth indicates that the interference on the latter cable is about ten times that on the cable with the balanced sea earth. The contrast between the two types of sea earth is still more pronounced at times when terminal interference is unusually large. It has been found possible, for example, to operate the New York–Azores cable during violent local electrical storms when neighbouring cables were compelled to cease operation.

Direct Current Series System.

(*Concluded from page* 157.)

A third development is the mercury rectifier, which has been built in sizes up to 1 200 kW and for pressures up to 4 000 V (d.c.). A possible objection is its inability to regenerate, but this drawback appears to have been removed by an even more recent device, the "inverter."

Continental systems on the series system appear to have been successful in maintaining continuity of supply, and to be little affected by atmospheric disturbances. But the effect of the more severe conditions characteristic of a semi-tropical climate such as that prevailing in the African subcontinent has yet to be determined. In some respects such a system appears to have advantages—e.g., in the highly inductive nature of the series circuit and the remoteness of the dangers of a flash-over with machines insulated from earth.

Hitherto the disadvantages of d.c. systems have outweighed their advantages. Nevertheless difficulties are increasing with the length of transmission lines and when a.c. systems have reached their limit, which will probably be when about 300 000 V has been passed, the pendulum may once more swing over in favour of d.c. transmission.

"Colardo."

In spite of the many advances of modern science in heating and lighting, as well as in fire extinguishing methods and appliances, the amount of property destroyed by fire, even in Great Britian, with almost universal brick or stone houses and public buildings, is still enormous. A really effective and practical fireproofing material has therefore long been sought after, and claims are now made that the solution of the problem is represented by a new product known as "Colardo," which is supplied in various forms, chiefly as a paint and a liquid for general impregnation. In the latter case all kinds of material, such as fabrics, paper, cardboard, feathers and straw, are merely dipped in the liquid, which is non-poisonous and quite harmless, squeezed, and allowed to dry, thus making them absolutely non-inflammable.

The paint is available in a wide range of colours, and has the consistency and appearance of ordinary paint, while being applicable to any surface, such as wood, plaster, bricks, wall-paper and stage scenery.

Perhaps the most remarkable expert and independent testimony is contained in the "Red Book" of the Prussian Fire Prevention Police, Charlottenburg, which gives the results of detailed tests carried on over three years with great success. It is, of course, impossible for lack of space to give details, but it may be stated that one series of tests consisted in painting 1 in. pine boards with the "Colardo" and directing the flame of a petrol blast lamp on them for two minutes, while, even more severe, treated textile fabrics were subjected to the flame blast for 30 secs. All that happens is that the wood or fabrics are blackened by the heat without any sign of ignition.

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NEWS IN BRIEF.

Visit of Women's Electrical Association to B.T.-H. Works—Lectureship in Electro-communications to be established at University College, London.

HENLEY Parish Church is to be wired for electric lighting, at a cost of about £400.

A first award of merit was given to Holophane, Ltd., for its exhibit at the recent New Zealand and South Seas Exhibition.

Members of the Southern Railway Engineering Society (Eastleigh) visited the Lots Road power station of the Underground Railways Co. of London recently.

One of the latest old Highland mansions to undergo modernisation is the ancient castle of Dunvegan, in the Isle of Skye, where electric light has just been installed.

It is reported that a British company, with a capital of £1 000 000, is being formed to purchase the Jerusalem lighting, traction and water supply concession held by M. Mavromatis.

We are informed that the excellent results achieved recently by Mr. J. L. Baird, of Television, Ltd., were obtained with the aid of a 2 000 V, 3 Ah Hart battery of 20 units each, consisting of 50 2 V, three-plate " ACR " cells.

The Institution of Fuel Economy Engineers informs us that negotiations with a view to the co-ordination of the interests of that Institution and those of the proposed Institution of Fuel Technology have proved abortive.

Members of the Birmingham and Midlands Branch and some London members of the Electrical Association for Women visited the Rugby works of the British Thomson-Houston Co. on July 22nd. The processes of manufacturing electric generators and electric lamps were demonstrated.

Huddersfield T.C. has refused an application by the Hurley Machine Co., for permission to organise a demonstration of their machines at the Corporation's electricity showroom. The borough electrical engineer will consider the question of arranging a general demonstration of all kinds of domestic electrical utensils.

Oil Firing in Electricity Works.

A report has been made by Mr. J. Douglas Knight, borough electrical engineer of Ealing, on the question of equipping boilers at the electricity works for oil firing. He puts the cost of such equipment for two boilers at £515. The Electric Supply Committee has been authorised to incur this expenditure, as a matter of urgency if necessary.

The autumn meeting of the Iron and Steel Institute will be held at Stockholm on August 27th and 28th. Amongst the papers to be read is one by Messrs. C. Benedicks and R. Sundberg on " Electrochemical Potentials of Carbon and Chromium Steels." Particulars from the Secretary, Mr. G. C. Lloyd, 28, Victoria Street, London, S.W.1.

Under a concession granted recently by the town of Lille (France), to the Compagnie Continentale du Gaz for the supply of electricity, the charge per kWh for lighting is fixed at 1 franc. For power, the rates vary according to the power of the motors installed and the consumption. For h.t., the annual charges per kVA installed range from 220 to 140 francs, and the rates per kWh from 0·36 to 0·24 francs.

A special lectureship in electro-communications has been established, at University College, London, in the first instance for the Session 1926–27, and Prof. Fleming has consented to hold that lectureship for the Session. The establishment of a part-time Chair of electro-communications is under consideration, and it is hoped that the project will be carried out when sufficient funds are available.

The British Legion Appeal Fund, which is directed by Field-Marshal Haig, is asking for increased support in its work of alleviating distress amongst ex-service men, and their dependents, and the widows and orphans of those who lost their lives in the Great War. Contributions should be sent to the organising secretary (Capt. W. G. Wilcox), 26, Eccleston Square, London, S.W.1.

The Council of the Institution of Electrical Engineers has awarded five Students' Premiums of the value of £10 each. The names of the recipients and the titles of their papers are as follows: W. F. C. Cooper, " Some Experimental Work on Relays "; F. J. Lane, " A Rotary Converter Automatic Sub-station "; C. T. Melling, " The Design of Current Transformers "; H. Pryce-Jones, " Electric Winding Engines in Collieries "; and E. Youel, " The Thermionic Vacuum Tube."

The Electricity Commissioners have sanctioned the borrowing by Islington (London) Borough Council of £3 000 for the steam-driven soot-removal apparatus at the electricity works.

A fund has been formed to defray the cost of lighting Fetcham (Surrey) Church electrically. The bulk of the £150 required for the work has been raised, by voluntary contributions.

The Postmaster-General has been inquiring into the question of extending the main trunk telephonic service to the Isle of Man, and he hopes details of the scheme may be available in the autumn.

The eighth of the series of popular " Model Engineer " Exhibitions opens on September 17th at the Royal Horticultural Hall, Westminster, and will close on the 25th.

The annual sports of the London County Council Tramways Social and Athletic Association took place at Leyton recently. Mr. C. W. Matthews (chairman of the Highways Committee) was present, and his daughters, the Misses Olive and Ethel Matthews, distributed the prizes.

The annual sports of the Portsmouth Tramway Employees' Social, Athletic, Sick and Benevolent Society took place last week. In spite of bad weather, some good performances were witnessed. Lady Timpson, wife of the chairman of the Tramways Committee, distributed the prizes.

Electricity Works Fire.

A fire occurred at the Goring and Streatley electricity works early on July 24th. Despite the efforts of the Goring, Pangbourne and Wallingford fire brigades, the whole of the buildings were completely gutted. The damage amounts to several thousands of pounds.

Electric light signalling for the regulation of traffic was put into operation in Piccadilly (London) on Tuesday. The main object of the system is to obviate delay and confusion at points where other streets enter or cross Piccadilly. Signal standards have been erected at eight places, and the lights are controlled by a police officer in a cabin at the top of St. James's Street, to which place the constables at the different points send signals by means of press buttons.

The report on the work of the Institute of Physics for 1925 contains a list of the personnel of the Board and its Committee and particulars of the membership, the present number of corporate members being 441, compared with 428 at December, 1924, and the total membership roll 530. The annual examination and the appointments register are also dealt with, the annual meeting is reported, and a record is given of the lectures delivered during the year, and other matters.

Dr. F. J. Waldo, coroner for the City of London and Southwark, states in his annual report that 186 fires were reported in the City last year, of which 33 were electrical in origin. Dr. Waldo says that 15 of these fires occurred in electrical distribution boxes on the public footways, 13 of the boxes belonging to the City of London Co. and two to the Charing Cross Co., and he suggests that the root cause of such fires should be inquired into by the responsible Government authorities, and that observance of the I.E.E. Wiring Rules should be compulsory.

Sir Philip Dawson on the Electricity Bill.

At the annual luncheon of the Reading Chamber of Commerce on July 23rd, Sir Philip Dawson, M.P., said, in reference to the Government's Electricity (Supply) Bill, a recommendation had been made by Chambers of Commerce " that no alteration of frequency in any large area be made where fresh development has already taken place." If such a request were granted the whole Bill would fall to the ground. If undertakings were producing electricity in such a way that they could not be connected with anyone else, they were going to make the whole scheme unworkable.

Mr. H. W. Preece, of Preece, Cardew and Rider, has advised the Hydro-Electric Board (Colombo) to take immediate steps to arrive at a definite understanding with Boustead Bros., agents for the Colombo Electric Tramways and Lighting Co., either to take over the company's generating plant or to come to an agreement for the company to continue to run its tramways as hitherto, to purchase its energy from the Government and to become the Government's distributors of energy for power and lighting. In any case, the plant should augmented as soon as possible, and mains should be laid to the suburbs.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given. Unless otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade, 35, Old Queen Street, London, Westminster, S.W.1.

POWELL-DUFFRYN STEAM COAL CO., LTD.—Six months' supply of electric cable and accessories. Form of tender (No. 23) from the Stores Manager, Aberaman Offices, Aberdare.

SKELMANTHORPE LIBERAL CLUB, NEAR HUDDERSFIELD, August 7th.—Electric light installation. Particulars from Mr. G. H. Ellis, Strike Lane.

READING CORPORATION, August 9th.—Supply of about 160 tons of steel tramway rails, for the Tramways Department. Specifications from the General Engineer and Manager, Corporation Tramways, Mill Lane, Reading.

WHARFEDALE RURAL DISTRICT COUNCIL, August 11th.—Electric wiring, etc., of 12 parlour and 14 non-parlour houses on Stockshill housing estate, Menston; deposit £1 1s.

NEWARK CORPORATION, August 12th.—One 200 kVA oil cooled static transformer (contract F.2); and e.h.p. 11 000 V switchgear cubicle (contract F.3). Specifications from the Electrical Engineer, Bank Chambers, Market Street, Newark; desposit £2 2s. for each contract.

DONCASTER CORPORATION, August 14th.—Electric wiring of 238 houses on Warmsworth Road (South) site. Particulars from Mr. R. E. Ford, housing surveyor, 3, Priory Place, Doncaster.

SITTINGBOURNE AND MILTON JOINT HOSPITAL BOARD, August 16th.—Complete electric lighting installation, for the hospital buildings at Keycol Hill, near Sittingbourne. Specifications, etc., after August 5th, from Mr. T. W. Ellis, 70, Victoria Street, London, S.W.1, or from the Clerk, 76, High Street, Sittingbourne.

SWANSEA CORPORATION, August 16th.—Electric lighting installations, etc., at new Isolation Hospital, Hill House Sketty, Swansea. Specifications from Mr. E. E. Morgan, 3, Prospect Place, Swansea; deposit £3 3s.

INDIA STORE DEPARTMENT, August 17th.—Supply of three electrically driven metre-gauge rope inclines, with gears, ropes, cars and rollers, for Uhl river hydro-electric project. Specification (5s.) from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1.

LEWIS HOSPITAL, STORNOWAY, August 18th.—Electric wiring, etc., in connection with extension of hospital. Schedules, etc., from G. Gordon and Co., architects, Inverness.

DUNDEE CORPORATION, August 20th.—Supply and erection of six 200 kVA outdoor type transformers. Specification, etc., from Mr. D. H. Bishop, general manager and engineer, Electricity Supply Department, Dudhope Crescent Road, Dundee.

DUNDEE CORPORATION, August 20th.—Supply of e.h.t. three core and l.t. four core and two core paper insulated lead covered and double steel tape armoured cable. Specifications, etc., from Mr. D. H. Bishop, general manager and engineer, Electricity Supply Department, Dudhope Crescent Road, Dundee.

MANCHESTER CORPORATION, August 21st.—Two electrically-driven centrifugal pumps, with switch and starting gears, etc., for the Waterworks Committee. Specification, etc., from the Chief Clerk, Waterworks Offices, Town Hall, Manchester; deposit £1 1s.

BARNES URBAN DISTRICT COUNCIL, August 23rd.—One 3 000 kW turbo-alternator, with condensing plant and auxiliaries. Specification, etc., from Mr. C. S. Davidson, Electricity Works, High Street, Mortlake, London, S.W.14; deposit £1 1s.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD., August 23rd.—Supply and erection of a central evaporating equipment at the company's Barking power station. Specifications, etc., from F. C. McQuown, joint manager and secretary, Moorgate Court, Moorgate Place, London, E.C.2; deposit £5 5s.

METROPOLITAN ASYLUMS BOARD, August 25th.—Rewiring electric lighting circuits and installing main supply cable at Princess Mary's Hospital, Cliftonville, Margate. Specification, etc., from the Board's Office, Victoria Embankment, E.C.; deposit £1.

STIRLING TOWN COUNCIL, August 26th.—Electrical work in connection with erection of eleven houses and four shops, being the first development of St. Mary's Wynd rehousing scheme. Specifications from Mr. A. H. Goudie, burgh engineer; deposit £1.

LIVERPOOL CORPORATION, August 31st.—Supply and installation of closed circuit code-signalling street fire alarm and telephone system. Specification from the Town Clerk.

SEVENOAKS URBAN DISTRICT COUNCIL, September 1st.—Supply and fixing of electrically-driven syren at the Fire Station, Eardley Road, Sevenoaks. Specification from the Surveyor, Council Offices, Argyle Road, Sevenoaks.

COVENTRY CORPORATION, September 3rd.—Buildings, foundations and subways; eight 15 000 kW turbo-alternators condensing plant and economisers; eight water-tube boilers, complete with induced draught plant, and chimneys; coal and ash handling plant; switchgear; steam and water pipework; crane; and cooling towers. Specifications, etc., from Mr. Geo. Tough, engineer and manager, Electricity Department, Council House, Coventry; deposit £5 5s.

CROYDON CORPORATION, September 6th.—Supply of two 50 000 lb. per hour water tube boilers, etc. Specifications from the Engineer and Manager, Electric House, 38, High Street, Croydon.

STOKE-ON-TRENT CORPORATION, September 7th.—Supply and erection of one 10 000 kW turbo-alternator and condensing plant (contract 2 614); one natural draught cooling tower (contract 2 615); and ironclad l.t. three-phase switchgear (contract 2 616). Specification, etc., from the City Electrical Engineer, St. George's Chambers, Wolfe Street, Stoke-on-Trent; deposit £2 in respect of each contract.

INDIA STORE DEPARTMENT, September 10th.—Supply of power station and switchgear and auxiliary plant, in connection with Great Indian Peninsular Railway electrification. Specification (£1) from the Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1.

Overseas.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

AUSTRALIAN POSTMASTER-GENERAL'S DEPARTMENT.—Supply of electric soldering bits. Forms of tender from the Supply Officer, Australia House, London, W.C.2.

INDIA STORE DEPARTMENT, August 6th.—Boiler house equipment with other plant and piping for power house, or, alternatively, complete boiler house installation, including pulverised fuel equipment, etc. Specification (£2) from the Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1.

INDIA STORE DEPARTMENT, August 9th.—Electrical generating plant for the Peshawar power station of the North Western Railway. (Reference B.X. 2 644.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, August 10th.—Dry cells. (Reference B.X. 2 649.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, August 10th.—Supply of telephone exchange indicators (schedule C. 99). (Reference B.X. 2 597.)

MELBOURNE CITY COUNCIL, August 11th.—Supply of high and low tension three-phase sub-station switchgear (specification No. 810). (Reference B.X. 2 565.)

SOUTH AFRICAN RAILWAYS AND HARBOURS ADMINISTRATION, August 12th.—Supply of cables and wires and bare copper wire during 1927 (tender No. 834). Reference B.X. 2 639.)

AARHUS (DENMARK) LIGHTING DEPARTMENT, August 17th.—Steam turbo-generator and boiler plant, for new power station. (Reference A.X. 3 371.)

INDIA STORE DEPARTMENT, August 17th.—Transformers for power station in connection with G.I.P. Railway electrification. Specifications (10s.) from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1.

JOHANNESBURG MUNICIPALITY, August 19th.—Overhead tramway equipment, comprising double pull-offs, straight line hangers and insulator pins. (Reference B.X. 2 702.)

JOHANNESBURG MUNICIPALITY, August 19th.—Supply of h.t. switchgear. (Reference B.X. 2 726.)

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CHILIAN STATE RAILWAYS, August 20th.—Signals, telegraphs, telephones, etc. (group 36); electric materials for sub-stations, aerial lines and lighting, 1st-zone (group 37). (Reference C. 1 935.) Booklets (in Spanish) numbered to correspond with the group numbers, and giving further particulars will be loaned to British firms in the order of application.

JOHANNESBURG MUNICIPALITY, August 21st.—Street lighting material. (Reference B.X. 2 728.)

JOHANNESBURG MUNICIPALITY, August 21st.—Reverse power relays (contract 668). (Reference B.X. 2 725.)

VICTORIAN ELECTRICITY COMMISSIONERS, August 23rd.—Supply of 10 in. diameter disc suspension insulators, with cotton split pin or similar coupling device. (Reference B.X. 2 614.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 24th.—Synchronous condensers (section 18, Waikaremoana). (Reference B.X. 2 608.)

PRETORIA MUNICIPALITY, August 26th.—Equipment for five transformer stations. (Reference B.X. 2 721.)

SOUTH AFRICAN RAILWAYS AND HARBOURS ADMINISTRATION, August 26th.—Material for distribution system in connection with the Cape Town surburban electrification. (Reference B.X. 2 680.)

CITY ELECTRIC LIGHT CO., LTD., BRISBANE, August 27th.—Supply, delivery and erection of one 12 500 kW turbo-alternator. (Reference A.X. 3 085.)

NEW ZEALAND RAILWAYS DEPARTMENT, August 30th.—Supply of slip ring induction 400 V 50 cycle three-phase motors and starters. (Reference B.X. 2 561.)

DEPUTY-DIRECTOR OF POSTS AND TELEGRAPHS, MELBOURNE, August 31st.—Telegraph equipment (schedule C. 109). (Reference B.X. 2 653.)

PERNIK STATE COAL MINES, BULGARIA, September 1st.—Electricity generating plant, consisting of two 4 000 kW steam turbo-generator sets, buildings, etc.

VICTORIAN RAILWAY COMMISSIONERS. September 1st.—Equipment for automatic control of two rotary converters at Seaford sub-station.

VICTORIAN RAILWAY COMMISSIONERS, September 1st.—Automatic sub-station equipment (contract No. 39 287), for Elwood sub-station. (Reference B.X. 2 598.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 2nd.—Electro-pneumatic working of points and day colour light signalling, with alternative current track circuits, in connection with the electrification of the Cape Town surburban railways. Specifications, etc., from the Office of the High Commissioner for the Union of South Africa, Trafalgar Square, London, W.C.2, or from the Chief Railway Storekeeper, Park Station Chambers, Johannesburg; deposit £5 5s.

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, September 6th.—Supply of 66 000 V oil circuit breakers for Barren Jack hydro-electric scheme. (Reference B.X. 2 749.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 7th.—Synchronous condenser for Arapuni power scheme, section 165. (Reference B.X. 2 665.)

DUNEDIN (N.Z.) CORPORATION, September 8th.—(i) Reaction water wheel for direct connection to a.c. generator; (ii) one 3 000 kW, 6 600 V, 50 cycle generator; (iii) four 1 000 kW 6 600/20 000 V, 50 cycle transformers; (iv) switchboards, oil-break switches, disconnecting switches, voltmeters, ammeters and wattmeters, current and potential transformers, etc. (Reference B.X. 2 654.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, September 14th.—Telephonists' telephones and handsets. (Reference B.X. 2 696.)

CONSTANTZA (ROUMANIA) PORT ADMINISTRATION, September 15th.—Supply and erection of eight electric portal cranes. (Reference A.X. 3 399.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 15th.—Supply and installation of electricity distribution system for the town of Luxor, including 6 830 metres of h.t. and 1 210

NEW SERVICE FOR ELECTRICAL INDUSTRY.

The Spacious reception room at Bouverie House, Fleet Street, London, in which building "The Electrician" and the other technical and trade journals owned by Benn Brothers, Ltd., are edited and published. The purpose of the reception room is to provide a meeting place in which readers from the provinces and inquirers for information on electrical matters can find the comfort and the assistance that they require. Our Inquiry Department, with its research staff, can be interviewed personally, and will also answer questions through the post.

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metres of l.c. armoured cable, 6 transformer cabins, 12 transformers (from 10 to 50 kVA), copper cable, poles, cable boxes, cut-outs, insulators, lamps, etc. (Reference B. 2 737.*)

SYDNEY CITY COUNCIL, September 20th.—One h.t., d.c. Kenetron valve testing set for underground cables. (Reference B.X. 2 748.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, September, 21st.—Switchboard keys, and parts (schedule 26/720). (Reference B.X. 2 699.)

AUCKLAND ELECTRIC POWER BOARD, September 27th.—One 14-ton electrically-operated crane. (Reference A.X. 3 415.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 28th.—Three motor-driven low lift pumps with control apparatus, for Taieri drainage scheme. (Reference A.X. 3 274.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, October 5th.—Switchboard cords (schedule No. 115). (Reference B.X. 2 747.)

CHRISTCHURCH (N.Z.) DRAINAGE BOARD, October 19th.—Supply and erection of three sets of electric centrifugal pumping plants (contract 26 329). (Reference A.X. 3 215.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Supply of 110 000 V transformers for Waikaremoana power scheme, section 17. (Reference B.X. 2 744.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd,—Indoor control gear and switchgear for Waikaremoana electric power development (section 14). (Reference B.X. 2 675.)

Tenders Accepted.

DUMFRIES CORPORATION.—Merrall and O'Grady, hydro-electric plant for the Maxwelltown sub-station, £4 796 10s.

HULL "DAILY MAIL."—C. F. Pardoe, electric lighting, power, telephone and clock installation in the "Mail" buildings.

LONDON COUNTY COUNCIL.—Johnson and Phillips, Ltd., switchgear for transformers at Greenwich power station, £3 386 10s.

KENDAL CORPORATION.—Alton Battery Co., supplying and installing at Lound Gardens an 800 Ah battery, £3 431 6s. 9d., less 5 per cent.

SHEFFIELD CORPORATION.—Oliver Bros., electric light wiring and fitting of Walkley and Hillsborough District Baths, Langsett Road.

SALFORD CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., installation of e.h.t. switchgear at Irlam o' th' Height, £250 10s.

HASTINGS CORPORATION.—Grierson, Ltd., electric wiring of refreshment room, kitchen and service lobbies at White Rock Pavilion, £271.

BEDFORD CORPORATION.—Siemens Bros. and Co., Ltd., supply, laying, etc., of 11 000 V cable between Bedford and Sandy, £10 368 (recommended).

STAFFORD CORPORATION.—Mitchell Conveyor and Transporter Co., Ltd., circulating ducts, culverts, etc., for the Electricity Department, £13 500.

TEVIOT (N.Z.) WATER BOARD.—Metropolitan-Vickers Electrical Co., Ltd., water-wheel, required in connection with hydro-electric development work.

HACKNEY (LONDON) BOROUGH COUNCIL.—Stewarts and Lloyds, Ltd., pipework and valves for 10 000 kW turbo-alternator, £2 353 (recommended).

LEICESTER CORPORATION.—Worthington-Simpson, Ltd., surface condensing plant for 15 000 kW turbo-alternators at Freeman's Meadow electricity station.

MARYLEBONE (LONDON) BOROUGH COUNCIL.—Siemens Bros. and Co., Ltd., luminous signal equipment for the Council's generating station, £527 5s. (recommended).

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY.—Fuller's United Electric Works, Ltd., 1 346 T.G. 13 type, 180 Ah train-lighting cells, in addition to 736 already in hand.

OESTE DE MINAS RAILWAY (BRAZIL).—Metropolitan-Vickers Electrical Co., Ltd., electrification of 73 km. of main line, including generating sets, electric locomotives, etc.

SHOREDITCH (LONDON) BOROUGH COUNCIL.—W. T. Glover and Co., single core, paper insulated, and plain lead covered cable, £3 371 14s. 7d.; three core, paper insulated, lead covered, double steel tape armoured cable, £1 288 14s.; two core, rubber insulated, lead covered cable, £64 4s. 7d.

WIRELESS NEWS.

Novel Wireless Demonstrations from a Van Equipped by the Mullard Company.

WIRELESS demonstrations are being given in Hereford, Gloucester, Wiltshire, Somerset, Devon, Cornwall, Dorset and Hants from a van specially equipped by the Mullard Wireless Service Co., Ltd. Wireless retailers have supplies of a specially printed brochure for distribution to the public in the districts visited. This contains particulars of a competition in connection with the scheme. The arrival of the demonstration van in the various towns is advertised through the local Press and by posters in retailers' windows. Free entertainments

Mullard wireless demonstration van.

are given, special attention being paid to the relaying of local talent. Mullard "P. M." type valves are employed exclusively in the "P. D." receiver and amplifier (made by Automobile Accessories (Bristol), Ltd.), whilst for special "power" Amplion loudspeakers, similar to those used with the Amplion public speech equipments, are used. The tour will continue until September 11th.

Wireless News in Brief.

An interesting feature of the two miles' long procession which was one of the final events of Plymouth carnival week was a touring wireless station equipped and exhibited by Mr. G. C. Lazenby, wireless engineer, Plymouth.

A "short-skirted" telephone kiosk is beginning to appear in America. The new box, designed to ensure more ventilation, resembles the ordinary kiosk from the top to within about 3 ft. of the ground, where the enclosing walls are cut off.

Over 85 per cent. of the space at the National Radio Exhibition, to be held at Olympia, London, in September, has already been allotted, and the number of exhibitors to date is 157: more than twice the number in the Albert Hall Exhibition last year.

Between £200 and £300 damage was done by fire at the premises of Mr. H. Wilkinson, the Radio Store, North Street Arcade, Keighley, on July 22nd. About 70 accumulators were on charge at the time of the outbreak, and the principal damage was to these, the whole being destroyed.

The whole of one end of the gallery at the National Radio Exhibition at Olympia in September is to be occupied by the British Broadcasting Co., who will erect a replica of one of the studios at Savoy Hill. Through glass windows visitors will be able to see 2LO at work. Famous artists will broadcast at certain times during the day and the various "uncles" and "aunts" will be seen at work. A well-known wireless concert party will probably be among the performers and a revue may be presented.

A statement issued by the British Broadcasting Co. shows the growth of listening-in since January, 1923, when the Postmaster-General granted the company a licence to broadcast. In the year ended March last, the revenue from broadcast licences was £982 000, against £689 000 in the previous year and £556 000 in the year ended March, 1924. The proportion paid to the company was £500 000, against £489 000 and £177 000. At March, 1926, the number of receiving licences was 1 964 912 and the number in force at the end of May was 2 049 549. The staff of the company is now 725, including 250 engineers. To provide two programmes for nearly every listener in the United Kingdom it will be necessary to erect a number of new high power stations.

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ELECTRICAL CONTRACTIONS.

Practical Hints for Contractors by a Contractor—Importance of the Trading Policy—How to Overcome the Summer-time Slump.

By "FEEDER-BOX."

THE application of some definite system of operation to an electrical contracting business, invariably has a very pronounced effect upon the progress of that business. But before any system can be applied, the contractor must have some definite object in view, this means that he must adopt a trading policy, and the success of that policy depends entirely upon the contractor's enthusiasm.

Unless he has a large amount of capital, the contractor can, as a beginning, only hope to concentrate with success upon one class of business. Which is it to be and how is it to be gone about?

Some contractors rely to a great extent upon sales and callers—that is to say, they pay a great deal of attention to their window displays and the interior of the shop. Others are nearly always out and about the district making themselves known, canvassing and following up likely business in the way of actual installation work; in other words concentrating on wiring and leaving the sales to come in at the end.

Small Profits and Quick Returns.

The type of sales, and the type of installation selected depends, of course, upon the position of the contractor's premises, and possibly his technical knowledge and experience. It is, however, quite obvious that with moderate capital, the local contractor cannot expend the full amount of time, energy and expense upon every outlet, and that the wise course is a concentration upon one; and moderate attention to other sections. In this matter, the district, its proportions, the class of people, and possibly the price of electricity will largely affect the contractor's choice.

The trading policy should also imply the method of running the business commercially, that is to say, the manner of realising the profits. Some business people, for instance, adopt the policy of small profits and quick returns, meaning that they are prepared to take whatever comes along at comparatively small profit. Others consider that jobs or sales which realise only a small profit are not worth the trouble, and they therefore adopt a policy of aiming at the larger kind of job or sale with a larger, but still reasonable, profit.

The trading policy covers also the contractor's class of work, his particular method of dealing with wholesalers, the amount of credit he gives and takes, and many other points. It is, therefore, obvious that unless there is some sort of regulation in these matters, the business will exist in a state of instability, it will have no character, and might he likened to business run by a different man each day. A little consideration cannot fail to bring home to readers the fact that unimportant as the trading policy may seem, it really has a very important and definite relation to the successful operation of the business.

Obliging the Customer.

The contractor who maintains a presentable shop window display of domestic utility apparatus and lighting wares; canvasses, and distributes an attractive leaflet at seasonable times of the year; is ready to oblige any customer over the smallest matter; pays his accounts regularly; keeps a file of all inquiries and does not regard an order as lost until he has definitely assured himself that the job has been done; makes a point of perusing any catalogue or list pertaining to domestic appliances of electricity, or any technical newspaper articles discussing the question; attends any association meeting or function dealing with domestic matters; has a policy, for he aims at getting domestic work, makes sure that he misses none, and probably makes each job a work of art.

He advertises himself in a small way, consequently certain people get to know his name and his business, and unconsciously include an inspection of his shop window in their Saturday night's shopping tour. His shop window need never be dull or stale, and old customers can be canvassed several times over with a different electrical attraction.

It is not necessary for any contractor to metaphorically put up his shutters in the summer season and complain that there will be nothing doing until the darker and colder season arrives. There are a large number of appliances which will sell quite as well at any time of the year, although installation work may perhaps fall off a bit. The contractor can, however, very usefully occupy any slack times by preparing his winter campaign. Let him make or obtain a list of all thoroughfares in his district in which mains are laid, of all those in which mains are not laid, and of any houses or premises which he knows are not electrically equipped. By a process of elimination, impossibles can be deleted, leaving a list of prospects which should be divided into batches according to their relative positions. Attractive leaflets (which can be obtained from the E.D.A.) should if possible, be dispatched to all, and then followed up by a call. Calls may have to be repeated in many cases until the housewife herself, for instance, has been interviewed, or the husband, perhaps, to whom the contractor may be referred.

Unless a campaign of this sort is very thoroughly carried out, good prospects will be missed, as no particular house can be noted as an "impossible," or a "not at present" until the proper person has been interviewed, and no mainless road must be given up until all residents have been called upon, and the supply authority has finally stated its unwillingness to lay a main.

The campaign can be backed up by means of a shop window notice, or by an offer to supply an electric iron free to all those ordering installations before a certain date, or of above a certain value. On any reasonably sized job the cost of an electric iron is negligible, and certainly worth trying.

Exceedingly careful estimating and inquiries from a large number of residents should enable a slight reduction to be made in prices, but each job should receive the greatest possible amount of care and attention.

Need for Up-to-Dateness.

Everything supplied, more especially the fittings and "gadgets," should be of the very latest pattern, for nothing annoys the housewife more than the discovery that a friend in another part of the country has a more modern fit-up. On the other hand nothing pleases her so much as the realisation that she has the very latest, and is therefore in the fashion.

Of all people, the contractor is the most closely acquainted with the public at home. Competition, for the most part, is with fellow contractors only, but it is not necessarily financial competition; it is a competition of ideas. The competition of numbers of contractors on the same lines, will, contrary to some ideas, create an increase of public demand which will make things better for the whole trade, and will increase power station loads.

Domestic appliances are being sold in large numbers, but is it the contractor who is reaping the profit? Or do the housewives find more attractions in the big retail stores? Any individual contractor who has to give adverse replies to these questions should not despair; he has the means of altering such a state of affairs by creating an attraction nearer home. It may take time, but it can be done, so why not get ready now for a real good push ready for the coming season, turn your organisation inside out, examine your district, and consider every point in detail, and think out a real good plan of campaign.

Work in Prospect.

AXBRIDGE.—Houses, Blagdon, for Rural Council. Particulars, the architects, Ball and Pope, 30, West Street, Weston-super-Mare.

BRISTOL.—Chalet for consumptive patients at Southmead Hospital, for Guardians. Particulars, the clerk, Mr. T. S. Lamb, St. Peter's Hospital.

CARLISLE.—Conversion of prison into offices, for Cumberland County Council. Particulars, the County architect, Mr. J. Forster, The Courts.

COCKERMOUTH.—Housing scheme (26), for Urban Council. Particulars, the surveyor, Mr. Henry Graham.

ELTON.—Schools (£9 026), for Cheshire Education Committee. Particulars, the contractors, W. Williams and Son.

GREAT OUSEBURN.—Housing scheme (24), for Rural Council. Particulars, the clerk, Mr. H. S. Thompson, Boroughbridge.

GUISBOROUGH.—Infectious diseases hospital (£10 250), for Joint Hospital Board. Particulars, the contractors, J. G. Porteous, Ltd., Middlesbrough.

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EXCHANGE INDICATOR.

A New Electrical Device for Displaying the Latest Foreign Exchange Rates.

HAMBROS Bank has introduced an interesting innovation, which is likely to have imitators among other banks. An electrical foreign exchange indicator has been placed in the general banking hall. This shows the rates of the principal exchanges. It is connected by electric wire with the dealers'

Apparatus through which exchange rates are sent to the indicator.

room, so that any changes in the rates can be transmitted to the board instantaneously. The indicator is very convenient to the public, and at the same time, it reduces the time spent by the staff in answering inquiries. Similar indicators are in use in the New York Stock Exchange to

Exchange rate indicator in general banking hall.

give the prices of stocks. The accompanying illustrations show (1) the merchants' room in which members of the staff operate the mechanism by means of keyboards, and (2) the indicator, upon which the latest rates are shown much more quickly than was possible by former methods.

ENGINEERING AND COAL.

Situation Growing Rapidly Worse—Facing the Real Issue.

IT is patent enough that the continuance of the coal dispute is having a deleterious effect on the other industries of the country, and this is strikingly brought out in memoranda which has been furnished by representatives of the iron and steel, cotton spinning, chemical, engineering, shipping and shipbuilding industries to the Industrial Group of the House of Commons.

On behalf of the engineering industry, Mr. D. A. Bremner said it was deeply interested in coal both as a direct and indirect consumer, and as a seller of machinery and plant to other home industries, whose purchasing power was affected by the price of coal and the availability of adequate supplies of the kinds of coal suited to their special requirements. The data were not available for the exact quantitative expression of the engineering industry's economic interest in coal, but coal costs in one form or another entered into almost everything purchased by the engineering industry, including transportation, and the effects were cumulative. The engineering industry consumed in 1925 about 2 000 000 tons of iron and steel, for the production of which about 6½ million tons of coal would be required. To this must be added the coal required for power generated or purchased, foundry fuel, non-ferrous metals, and other items. At a rough estimate this would amount to about two million tons, bringing the total up to 8½ million tons. It was important to bear in mind the close connection and interdependence of the engineering industry, the iron and steel and shipbuilding industries, and the innumerable branches of manufacture for which engineering provided the plant, machinery and tools, all of which were directly or indirectly dependent on coal.

The effects of the coal stoppage on engineering production so far had not been so disastrous as might have been anticipated, but it must be remembered that in overcoming the difficulties greatly increased costs were being incurred and that many orders which would have shown a profit would now show a loss. The situation would, of course, grow rapidly worse. That it was sufficiently serious to justify grave concern was shown by the fact that between the end of April and the end of June unemployment in the engineering trades increased from 11·2 per cent. to 18·3 per cent. The coal stoppage came at a time when the engineering industry was showing signs of a much-needed improvement, and the ultimate effects of the setback would be very serious.

The financial results of 65 representative engineering firms for the years 1924 and 1925 had been analysed, from which it was clear that they would be unable to withstand this additional strain without definite loss of vitality. He thought, however, that it was much more important and useful to study and deal with the primary causes of our industrial troubles than merely to measure their evil effects, no matter how meticulously. What was needed most was that we should intelligently and courageously apply some of the knowledge we already possessed, and that we should not shirk the real issues by ignoring unpleasant facts. It appeared to him that one of the primary causes was the prevalent fallacy that, by some special dispensation of Providence, the people of this country could determine their own ease of circumstance, whereas the fact was that it was mainly dependent on conditions external to this country and quite beyond their control.

The Testing of Broken Cables.

Coroner's Suggestion that Present Methods Should be Discontinued.

AT an inquest at St. Asaph into the circumstances attending the death of Wm. John Roberts, who was killed by an electric shock due to his having come into contact with a broken overhead cable owned by the North Wales Power Co., a verdict of accidental death was recorded.

The coroner (Mr. F. Llewellyn Jones) said, in the course of his summing up, one could appreciate that immediately a fault occurred a wire became dead, and in this case there was evidently a wire that was dead at any rate from 6 till 7 a.m. But between 7 and 9, while tests were being carried out to discover the section in which the fault had occurred, there were intermittent periods when the wire in question was alive. It was scarcely fair to the public that tests to discover the whereabouts of faults should be carried out in that way.

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ELECTRICITY SUPPLY.

Swansea Corporation to Supply Electricity to Collieries—Further Extensions of Worcester Undertaking Predicted—Middlesbrough Corporation to establish Electricity Works.

PLYMOUTH Electricity Committee has authorised cable extensions to nine additional streets.

Kirton Lindsey Parish Council has decided to avail itself of the national electricity scheme, " if it matures."

Beckenham U.D.C. has received sanction to a loan of £3 000 for turbo-generating plant, for the electricity works.

The revenue accounts of Yarmouth electricity undertaking for the year to March last show a credit balance of £4 676.

Blackpool T.C. has decided to apply for a Special Order to supply electricity in Poulton-le-Fylde, Marten and Carleton.

Swansea Corporation has decided to spend £15 000 in connection with bulk supplies to certain collieries in the Amman Valley.

Birkenhead Electricity Committee recommends application for a loan of £60 000 in connection with the supply of electricity to Wirral.

Brighton Corporation Electricity Department made a profit of £25 272 for the past year, and £20 000 has been allocated to relief of rates.

The Peacehaven Ratepayers' Association is urging the inclusion of Peacehaven in the Newhaven and Seaford Electricity Special Order.

The net profit on the Walsall electricity undertaking for the past year is £13 065, and a contribution of £9 000 has been made to relief of rates.

Burnley Rural Council has consented to an Order permitting the supply by Nelson of electricity to the Wheatley Lane and Fence District.

Prestatyn U.D.C. having failed to come to terms with the North Wales Power Co., with regard to a supply of electricity to Prestatyn, has appealed to the Electricity Commissioners.

The Pooley Hall Colliery Co., Ltd., intends to apply for a special Order to supply electricity in parts of Tamworth, Atherstone, Ashby-de-la-Zouch and Market Bosworth rural districts.

Torquay Corporation's Extension Proposals.

Newton Abbot U.D.C. has received from Torquay T.C. a proposal for the supply of electricity in Highweek. The U.D.C. has asked for an amended plan which will not interfere with the Broadlands housing extension.

Middlewich U.D.C. has decided to object to the proposal of the Mid-Cheshire Electricity Supply Co. to erect a 3 000 V overhead cable in Sutton Lane. The Council will ask the company to lay the cable underground.

Ulverston R.D.C. has decided to offer no objection to the application of the Cark and District Electricity Co., Ltd., for a Special Order to supply electricity in the Council's area. The company has supplied the area for some years.

Mr. B. C. Roe, of Lincoln, has informed Ruskington U.D.C. that he proposes to instal a generating plant to supply a number of houses with electricity. The Council has given him permission to carry cables over certain highways.

At a recent meeting of Worcester Electricity Committee it was stated that Kempsey, Callow End, Fernhill Heath and Powick are all connected to the Worcester electricity undertaking, and that the service to the extended areas will be greatly expanded next year.

Middlesbrough Corporation has decided to establish its own generating station, having failed to come to terms with Cleveland and Durham Electric Power, Ltd., regarding the prices to be charged to consumers after the expiration next year of the existing agreement.

Clutton Guardians have decided to apply for a loan for the purchase of a combined electrical plant and water pumping apparatus for the Institution, at an estimated cost of £930 10s., and that Mr. T. Hood, of Bristol, be engaged as engineer to supervise the work at a fee not exceeding £60.

The preliminary survey in connection with the South Wales Electrical Power Co.'s new e.h.t. transmission line from the Upper Boat power station to the Towy Valley and the Swansea Valley as far as the river Loughor has been completed, and it is hoped to commence the erection work shortly.

Sir William F. Marwood, on July 23rd, held inquiries at Wolverton and Earls Barton relative to the proposal of the Northampton Electric Light and Power Co. to erect overhead cables for the transmission of electricity. Wolverton U.D.C., Earls Barton R.D.C., and Earls Barton P.C. opposed the proposal.

The Dalbeattie Electric Light and Power Co, has informed Dalbeattie T.C. that, owing to the load now carried in the Maxwell Street, Union Bank Square and High Street to Southweek Road area, the company cannot guarantee that the public lights supplied last season will be maintained during the coming season.

Maidstone T.C. has approved a scheme for further extensions at the electricity works, at an estimated cost of £60 000, which includes building extensions, £8 000, 5 000 kW generating set and accessories, £25 000, switch-gear and cables, £1 500, boiler and accessories, £22 000, and cooling tower, motors, etc., £3 000.

Overhead Transmission of Bulk Supply.

Sir William Marwood held an inquiry, on behalf of the Ministry of Transport last week, into the proposal of the Derbyshire and Nottinghamshire Electric Power Co. to use overhead lines in connection with the bulk supply of electricity to Newark and the objections of certain land owners to the erection of such lines over their property.

The parish of Paulton is to be supplied with electricity for public lighting by the North Somerset Electric Supply Co., Ltd., at a cost of £3 5s. per lamp for the season. Forty lamps will be used, and the contract is for five years. The company desire £1 000 of capital to be raised in Paulton, and it is stated that this can be done.

Hackney (London) Borough Council is recommended by the Electricity Committee to increase the charges for electricity by 10 per cent., in view of an estimated deficiency of £13 000 on the present financial year in consequence of extra cost of coal and a drop in the quantity of electricity consumed, due to the coal strike.

Preston Electricity Committee recommends that the amount of the tender for the supply of the cable for the Preston-Blackpool transmission line be increased from £15 572 to £21 106, as it has been found necessary to include extra lengths of cable in the control consequent upon having to cross the river at a different point from the one originally contemplated.

Southend T.C. has lodged an objection to the application of Shoeburyness U.D.C. for an Order to supply electricity in its district. The Corporation has a scheme under consideration which has for its object the supply of electricity in an extended area including Shoeburyness. The Corporation has received sanction to a loan of £10 000 on account of an estimated sum of £13 935 required for the additional plant for the electricity works.

Dover Electricity Committee recently discussed the tenders received for an e.h.t. voltage regulator. The electrical engineer, Mr. R. C. Harpur, said he had been impressed by a voltage regulator at the Staines works and had asked the tenderers to submit alternative tenders on the lines of the Staines regulator. Some of the revised tenders were not complete, and it was agreed to fix September 6th as the date for the receipt of final tenders.

Yorkshire Company's Views on Electricity Supply.

Electrical Distribution of Yorkshire, Ltd., has issued a brochure on " The Ownership of Public Utility Undertakings." It is claimed that one outstanding consideration in the proper organisation of the supply of electricity is its magnitude, that the provision of a cheap and abundant supply of electricity can but rarely be obtained within the confines of a local government district, and that this fact was recognised as long ago as 1898, when a joint committee of the House of Lords and the House of Commons reported in favour of the establishment of electric power companies supplying over wide areas.

It is intended to change the source of supply of electricity for the town of Skipton from the station of the Keighley Corporation to the station of the Yorkshire Electric Power Co., at Thornhill. This change will necessitate alterations in Skipton's transformers to deal with 10 000 V instead of 6 000, and it is hoped that the expense would be borne by the Power Company. It is stated that the price paid for coal at the Thornhill Power Station is 10s. per ton less than the price paid at Keighley. The net loss on the Skipton electricity department for the year ended March last was £123, compared with £626 the previous year.

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An inquiry was held recently by Mr. G. H. E. Parr and W. Abbott, Electricity Commissioners for Northern Ireland, into an application by Armagh U.D.C. for sanction to a loan of £12 500 for carrying out an electricity supply scheme. Mr. J. A. Pringle, K.C., for the promoters, said Mr. P. A. Spalding had prepared the scheme, which was supported by a large majority of the members of the Council. The proposed charge for private lighting was 9d. per kWh, for public lighting 3d. and for power 4d, with reductions to 3½d. in the second year and 3d. in the third.

A movement has been started for securing supplies of electricity for certain parishes in the Meon Valley. The Electricity Commissioners advised that Portsmouth Corporation should be approached in regard to extending beyond its present area of supply. A scheme is in hand to link up Petersfield and Wickham with the Portsmouth undertaking, and it is suggested that the main could be extended through Langrish, East and West Meon, Warnford, Exton, Corhampton, Meonstoke, Soberton and Droxford to Wickham. The various parish councils concerned are making inquiries to ascertain what support for the scheme can be relied upon. Bordon and District Gas Co. has applied for powers to supply electricity in Rogate, Liss, Bramshott, Liphook, Bordon, Headley, etc.

The London and Home Counties' Joint Electricity Authority, which is responsible under the new Act for the supply of power from Guildford in the west to Gravesend in the east, and from Hertford in the north to Reigate in the south, and including London, has made an arrangement with the Chiswick District Council under which a capital generating station on a large scale will be set up on the Duke's Meadows by the River Thames at Chiswick. The area required by the Authority consists of 45 acres on the south-western side of the Southern Railway as it runs from Chiswick over Barnes Bridge. The new works, which it is hoped to get into commission in the winter of 1928-29, will have a frontage of 900 ft. to the Chertsey arterial road, and is eventually expected to produce 250 000 kilowatts.

In Parliament.

The Electricity (Supply) Bill to be the First Business in Autumn Session.

In answer to a question by Mr. Ramsay MacDonald, the Prime Minister stated that the first business of the House of Commons on its re-assembly on November 9th would be the report and third reading stages of the Electricity (Supply) Bill.

The Passing of Tramcars.

In the House of Lords on Tuesday, Lord Strathspey called attention to the serious menace caused in many streets by thoughtless motorists, especially to people about to enter tramcars.

Lord Desborough said that the general question of the danger to the public owing to thoughtless motorists was under the serious consideration of the Government, and a Road Vehicles Bill had been promised.

The Earl of Crawford said that it would be a very serious thing to impose restrictions on motorists passing stationary tramcars. Until they got rid of the tramcars, particularly in congested areas, the difficulties of transport would continue to increase.

Progress of Bills.

The House of Commons considered the Leicestershire and Warwickshire Electric Power Bill on July 30th and ordered it to be read a third time.

The House of Commons on July 28th received a message from the House of Lords that the latter had agreed to the Swindon Corporation Bill, with amendments.

The Expiring Laws Continuance Bill was passed through Committee and read a third time in the House of Commons on July 28th. Amongst the Acts which the Bill is intended to keep in force is the Wireless Telegraphy Act (1904).

Replies to Questions.

The following are points from answers to questions in the House of Commons this week :

There are still certain difficulties to be overcome before a transatlantic wireless telephone service can be offered.

The Home Secretary considers that where a local authority thinks a by-law in regard to the use of loud speakers is necessary it should be allowed to put it into force, provided it is limited to the use of loud speakers in streets and public places or places adjacent.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

A proposal has been made to extend the Sunday tramcar service at Bournemouth by beginning it at 10 a.m.

Manchester Tramways Committee has agreed to a schedule of through fares and services on the tramcars in and between Manchester and Salford.

London County Council has rejected a proposal to reconstruct the tramway subway from Southampton Row to the Victoria Embankment so as to make it suitable for double-deck cars.

Blackburn Tramways Committee cannot see its way to accede to the request of Church U.D.C. for cheap return fares between Blackburn and Church, with a penny stage between Church and West End.

The Lanarkshire Tramway Co.'s 2d. maximum fare has been greatly appreciated by the public, and the company has now decided that the same tariff shall apply on Saturdays, which have hitherto been excepted. It is stated that the tramways are fast coming into favour again.

A Ministry of Transport inquiry was held on July 23rd into the application of the Dudley, Stourbridge and District Electric Traction Co., Ltd., for an Order to abandon the tram routes between Stourbridge and the Hayes (via Lye Cross) and Wollaston Junction. There was no opposition.

The Metropolitan Electric Tramways' lease of the lines of Middlesex County Council expires in 1930, and the Council has decided to ask Lord Ashfield and members of the board to discuss with the Highways Committee the question of a renewal. The company wishes certain restrictions to be placed upon omnibus competition.

During the recent 10 days' tercentenary celebrations at Leeds, the receipts on the Corporation's tramways amounted to £33 262, and the passengers numbered 5 133 306, or over ten times the city's population. The Tramways Committee has passed a resolution thanking the general manager (Mr. W. Chamberlain) and the whole of the staff for the splendid manner in which they discharged their duties.—Some of the 200 new cars which it was decided some time ago to put in hand are now in service.

Glasgow Tramways Department has put into service two new types of tramcars. One is a two-deck car on two bogies, instead of the single truck, and it has air, electro-magnetic and hand brakes. The majority of the seats on the upper deck are upholstered. The other is a new type of two-deck car with a pivotal truck and two 50 H.P. motors. A further new type, which will be used shortly, is a single-deck car on two bogie trucks. All three cars have transverse inside seats.

The Industrial Court has issued its decision that the railway companies should not continue to pay the 6¼ per cent. advance to their power-house staffs in London. The E.T.U. and the N.U.R. contend that since 1918, by custom and practice, any changes in the electricity supply industry have been extended to the railway power-houses, and that the 6¼ per cent. should follow this practice. The court is satisfied that the wages of the work-people concerned do not compare unfavourably with the rates paid in other occupations in the railway industry.

Obituary.

The following deaths are reported :—

MR. FREDERICK FOWKES, on July 18th, at the age of 83 years. Mr. Fowkes was formerly managing director of the Windermere and District Electric Supply Co., Ltd.

MR. WILLIAM SMITH, ex-Controller of the Telegraph Department of the Edinburgh General Post Office, aged 72. Mr. Smith entered the service of the Electric and International Telegraph Co. in 1869, and was transferred to the Post Office in the following year.

Business Items.

Kent Bros. Electric Wire Co. and E. H. Phillips, Ltd., have purchased and equipped works at Kew Gardens, Surrey, for the output of insulated copper wires.

Mr. E. R. Wynne has joined the board of Lewenz and Wilkinson, Ltd., 25, Victoria Street, London, S.W.1, as co-managing director with Mr. H. I. Lewenz, and will look after the firm's home agencies and industrial electrification contracts.

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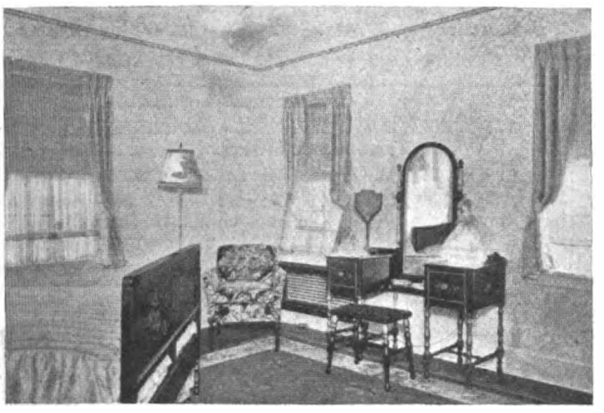
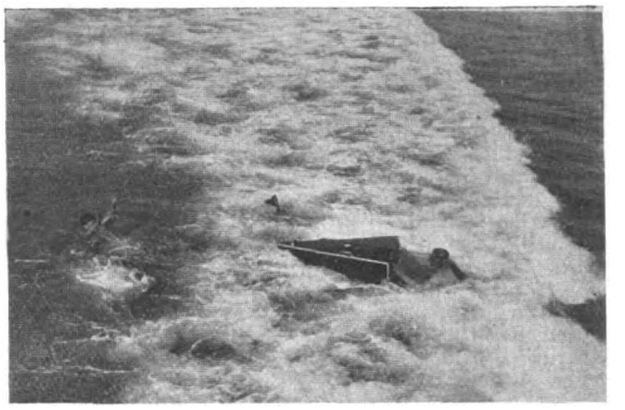
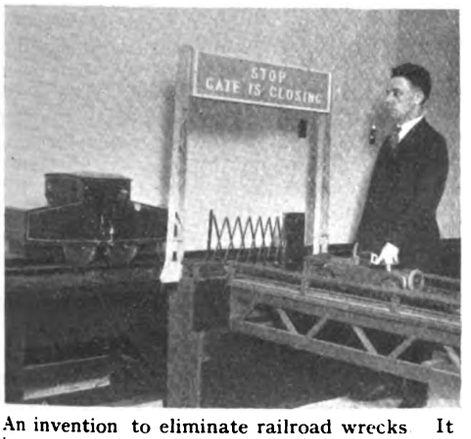
ELECTRICAL NEWS IN PICTURES



Bedroom in model electric home recently erected at Portland, Oregon, and furnished and decorated by the Ira F. Powers Co., of the same city. The house was offered as a prize in an essay competition organised by the National Electric Light Association, and was awarded to Julia Groo of Portland, Oregon. The illustration is reproduced from "The Decorative Furnisher" (New York).

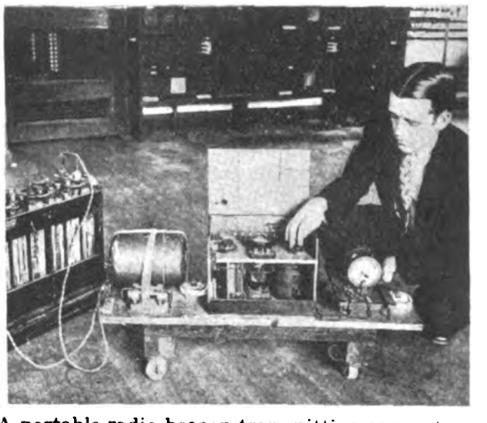


A new electric motor-driven buoy, designed to enable a rescuer to reach a drowning person quickly. It is 4 ft. long and looks like a small motor boat. On the stern is a bar to which one or more persons may cling. A button on the stern bar starts and stops the motor, while the operator acts as the rudder. Its inventor claims that it is unsinkable and is easily launched in the worst breakers.



An invention to eliminate railroad wrecks. It is an automatic train-controlling and grade-crossing device operated by means of a lever projecting from the locomotive, which trips the hydraulic pressure signal block, automatically shutting off the train power. The grade-crossing device operates in a similar way.

A portable pyrometer, designed by W. S. Roeser, of the Pyrometry Section of the U.S.A. Bureau of Standards, for recording the temperatures of rails during welding.



A portable radio beacon transmitting apparatus, which has been designed in the Radio Laboratory of the United States Bureau of Standards for calibrating direction finders of ships. The Lighthouse Service has about 24 radio beacon stations in service. F. M. Baer of the Radio Laboratory, Washington, is seen with the set.

The landing at Dumpton Gap from the cable ship "Faraday" of the largest submarine telephone cable yet laid. It contains 28 loaded conductors and enables 24 simultaneous conversations to be carried on. It has been laid from La Panne (Belgium) to Dumpton Gap, Broadstairs. The first Anglo-Continental telephone cable was laid between St. Margaret's and Sangatte (France), in 1891.

The new "Pullman" tramcar which the London County Council has recently introduced on its tramway system. It will be noticed that an innovation (on the L.C.C. cars) is the use of transverse seats in the interior of the car. The seats are upholstered and provided with springs. The lighting is improved, and the "hanging" straps are redistributed to coincide with the altered seating.

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LEGAL INTELLIGENCE.

Compensation for an Employee in the India Rubber Company's Works.

IN the Bow (London) County Court, last week, before Judge Hargreaves, Charles Marks, a greaser, was the applicant in a Workmen's Compensation Act claim, the respondents being the India Rubber, Gutta Percha and Telegraph Works Co., Ltd.

The applicant said whilst oiling machinery at the Silvertown factory, his right hand was caught in, and he lost the tops of two fingers. The respondents had ceased to give him compensation, which he had been receiving at the rate of 23s. 4d. a week, on the ground that he was capable of doing something or other, but, as his Druids doctor would not discharge him as fit, he had not attempted to find any work.

Judge Hargreaves decided that there was still disability, and he awarded applicant 11s. 8½d. per week as compensation, from the date of cessation and to continue.

Dutch Lamps to be Returned.

Mr. Justice Tomlin, in the Chancery Division on July 29th, had before him a motion by the British Thomson-Houston Co., Ltd., against Henri Engel, of Oxford Circus House, Oxford Street, London, W., and the Naamlooze Vennootschap Nederlandsche Gloeilampen Industrie Neglin, of Nymegen, Holland, for injunctions restraining infringements of their letters patent for incandescent electric lamps.

Parties had come to terms, and the defendants agreed to treat the motion as the trial of the action and to submit to a perpetual injunction. It had been agreed that he should return to the defendants in Holland his stock of lamps.

Extension of Objects of Electricity Co.

Mr. Justice Romer, in the Chancery Division on July 24th had before him a petition by the West London and Provincial Electric Supply Co., Ltd., to confirm an addition to the company's objects—viz., to acquire and hold, dispose of, underwrite or guarantee the subscription of any stocks, shares, debentures, debenture stocks, obligations or securities issued or guaranteed by any company or other authority, and to carry on a general business of an investment trust company. His lordship sanctioned the alteration.

Electricity Supply Powers for Gas Company.

In the Northern Ireland High Court last week, Mr. Justice Wilson granted the petition of the Cookstown Gas and Lighting Co. for authority to alter its memorandum and articles of association so as to enable it to supply electricity.

Brown-Boveri Locomotives.

Electrical Equipment of Locomotives for the Pennsylvania Railroad

THE American Brown-Boveri Electric Corporation recently secured from the Pennsylvania Railroad an order for the complete electrical equipment of seven locomotives of the 1B-B1 type, the mechanical part being manfactured in the workshops of the railroad company.

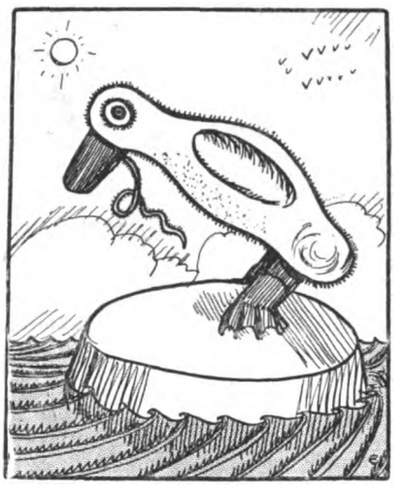
The main driving motors are of special interest, because for the time being they have to be arranged for use with d.c. current at 650 V, but they must also be suitable for use at a later date, without many alterations, on a single phase 11 000 V supply.

The locomotives will weigh about 163 tons each when the supply is d.c., the maximum admissible axle load at the leading axle being 20 tons and at the driving axle 35 tons. There will be four driving motors per locomotive, one pair being coupled through simple gearing and rods to two adjacent driving axles. The gearing will be arranged in such a manner that ratios of 53 : 95 and 30 : 118 can be readily provided for goods or fast train traffic. With the ratio of 53 : 95 the speed at one hour rating will be 21 m.p.h. and at 30 : 118 it will be 46 m.p.h. At continuous rating the speeds will be 23 m.p.h. and 50 m.p.h. respectively, and the maximum speeds are 34 m.p.h. and 75 m.p.h. The capacity of the locomotives when running with d.c. 650 V and separate ventilation of the motors is, at one hour rating at the motor shaft, 4 200 H.P., and at continuous rating 3,670 H.P. The capacity when running with a.c. 11 000 V, 25 cycles, and separate ventilation of the motors, is, at one hour rating at the motor shaft, 3 400 H.P., and at continuous rating, 3 100 H.P., the maximum tractive effort being 45 000 kg.

IN LIGHTER VEIN.

Random Comments and Reflections on Electrical Topics.

THE Fuseling, the subject of the sketch below, is an independent and reserved bird, remaining in its cage until pulled out. Very hasty tempered, it gets more heated the more it eats, finally completely losing its temper and blowing up. Easily recognised by a clean, white glossy plumage and copper-coloured beak, it is not always easy to find, owing to a peculiar habit of building a nest in the most inaccessible places, daunting even the most intrepid climber, and making the naturalist use unnatural language. However, the modern species are better than their forbears in this respect, as the effect of training is now beginning to show.



The Fuseling is "The Electrician's" latest electro-ornithological discovery.

When captured and domesticated, the greatest fault in rearing the Fuseling is overfeeding. Although it has a constitution of iron and, like the ostrich can digest wire nails, hairpins and other sundry objects, care should be taken to see that the right amount and size of wire wirms are given. The habit of giving a noisy Fuseling more and more food in the form of hairpins, iron wires, and so on, is to be deprecated, for although this is a temporary remedy, sooner or later the effects will be felt. Permanent blackness in the face, cracked body, frizzled feet and bent beak are all very often directly traceable to this pernicious habit. At the same time, care should be taken to see that the Fuseling is well supplied with food, as a wirm in the beak is worth two on the reel.

Fuselings are generally found in two's and three's, and can often be seen sporting with the seals in the currents of the Aye and Dee Seas. Like the weasel, the Fuseling often goes "pop," but always for some definite reason; for who knows why a weasel goes "pop"?

The Fuseling has been immortalised in the following verses:

The Fuseling stands up all alone,
Alone upon a porcelain base.
Isolated, insulated,
He is in disgrace.

The heavy currents surge around,
But still he takes no heed,
On wire wirms he's been overfed,
Feels lazy from his feed.

At length the current's warm appeal
Just melts his heart away.
He saves his face from dire disgrace,
Re-fuses, then says Go!

Personal.

Mr. H. C. Trenam, general sales manager of Standard Telephones and Cables, Ltd., London, has been appointed a director of that company.

The late Mr. Alfred John Collier, retired superintendent of telegraphs of the Eastern Extension, Australasia and China Telegraph Co., left unsettled property valued at £120 650; net personalty £120 578.

Commander R. L. Nicholson, D.S.O., late director of Wireless Telegraphs in the Posts and Telegraphs Department of the Government of India, has also been appointed a director of Standard Telephones and Cables, Ltd.

The staff and employees of Paisley Electricity Department have presented Mr. Fred B. Humphriss with a chronograph watch, on his departure to take up the position of assistant engineer in the Sunderland electricity works.

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COMPANY NEWS.

Increased Quotations for Electricity Supply Companies' Shares—Growing Demand for Electricity in Yorkshire—Underground Railways Capital Reorganisation Approved.

WITH a slackening of interest in most departments of the electrical share markets, there has been some slight activity in that for electricity supply shares, and the preference descriptions of the Charing Cross, Metropolitan, Westminster and Yorkshire undertakings are all 6d. higher on the week. North Metropolitan preference are 7½d. up, but Newcastle ordinary are 7½d. lower. Elsewhere, Marconi's Wireless shares have recovered to the extent of 1s. 3d., and Eastern Telegraph stock is two points down. Manufacturing shares have been quiet, and General Electrics have eased 3d. We are informed that Ferranti 6 per cent. preference shares have changed hands at 19s. 4½d. Underground Electric Railways £10 ordinary shares at 3½ have lost 5s.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
	Electricity Supply.				
10	Brompton & Kensington Ord.	32/6	32/6	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	90	90	100	67
15	Charing Cross Elec. Ord. (£1)..	45/7½	45/7½	60/-	10/-
4½	" " 4½% C.P. (£1) ..	17/6	17/-	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	48/1½	48/1½	52/6	20/3
6	" " 6% C.P. ..	22/6	22/6	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	59/4½	59/4½	61/3	14/6
6	" " 6% C.P. ..	22/6	22/6	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	13½	13½	13¾	3½
10	Lon. Elec. Sup. Ord. (£1) ..	32/6	32/6	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	36/10½	36/10½	41/6	8/-
4½	" " 4½% C.P...	17/6	17/-	18/6	9/6
7	N'castle & Dist. Supp. Ord. ..	20/-	20/-	21/10½	7/9
7	Elec. Sup. Ord. ..	21/3	21/10½	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	21/10½	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord (£5) ..	16½	16½	15½	3½
15	W'minster Elec. Sup. Ord. (£1)	43/1½	43/1½	48/9	18/-
4½	" " 4½% C.P. (£1)	17/6	17/-	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
	" " 6% C.P...	22/6	22/-	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	134½	134½	123	24
6	" 6% Pf. Stk.	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	70	70	89½	40½
4	" " 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	79	78½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	50½	50½	73½	10
4	" " 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	" " 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	78½	78½	89	65
4	Lon. Un. Trams. 1st Deb. ..	47	47	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	64½	64½	101½	49
5	" " 5% Deb. ..	68½	68½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	63½	64	84½	19
3½	" 3½ Pf. Stk.	64½	64½	88½	40½
3½	" 3½% Deb.	69½	69½	92½	51
3½	Met. Dis. Rly. Ord. Stk. ..	51	51	58	12½
4½	" " 4½% 1st Pref. ..	77½	77½	91	45
6	" " 6% Perp. Deb. ..	112½	112½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb.	65	65	73½	48½
—	Underground Elec. Rlys. Ord.(£10)	3½	3½	5½	2/3
3	Yorks. (W.R.)Trams. Ord. ..	11/6	11/6	27/-	1/-
4½	" " " 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
†3½	Brit. Elec. Transformer 7% C.P.	18/9	18/9	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	67/6	67/6	62/-	26/6
6	" " 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	23/-	23/-	23/4	19/7½
7	" " 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	25/-	25/-	29/-	10/-
‡15	Callender's Cable Ord.	65/-	65/-	85/-	22/-
6½	" " 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	" " 7½% B. Pref...	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)..	11/3	11/3	28/9½	1/11
7½	" " 1st Pref...	21/3	21/3	26/-	5/-
10	Elec. Construction Ord. ..	31/10½	31/10½	30/4	6/7½
7	" " 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	13/9	13/9	29/3	7/3
6	" " 6% C.P... ..	18/-	18/-	21/3	10/6
6	Ericsson Telephones 6% C.P...	22/6	22/6	21/-	12/7½
6	Ferranti 6% Pref.	19/4½	17/9	18/6	16/9
7	" 7% 2nd Pref... ..	18/-	18/-	19/-	13/9
5	" 1st Mort. Deb. Stock..	91½	91½	96½	80½
7½	General Elec. Ord.	28/9	29/-	59/-	13/6
20	W. T. Henley's Ord.	77/6	77/6	86/6	23/3
17	Johnson & Phillips Ord. ..	63/1½	63/1½	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	24/4½	24/4½	37/-	13/1
8	" " 8% C.P. (£2) ..	47/6	47/6	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	28/9	28/9	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	29	20	56/2/6	19½
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb ..	74½	74½	87½	60
10	Eastern Ord. Stk.	189½	191½	213½	113/2/6
3½	" 3½% Pref. Stk.	63½	63½	84/17/6	49
4	" 4% Deb. ..	79½	79½	103½	60
10	Eastern Extension Ord. (£10)..	19½	19½	21½	10/12/6
4	" " 4% Deb. ..	79½	79½	97½	60
22	Gt. Northern Telegraph (£10)..	27	27	42/12/6	19
‖10	Indo-European (£25)	46½	46½	59½	25
—	Marconi's Wireless T. Ord. ..	16/3	15/-	9/16/3	20/9
7½	" Int. Mar.	18/9	18/9	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	18½	18½	23	11/6/3
4	" " 4% Deb. Stk. ..	78½	78½	10	60/2/6

† For half-year to June, 1925. ‡ Plus share bonus.
¶ Plus 3 p.c. in respect of 1921. ‖ Including bonus.

METROPOLITAN ELECTRIC SUPPLY CO., LTD.—Int. div. on ord. shs. at rate of 6 p.c. per annum.

BRISTOL TRAMWAYS AND CARRIAGE CO., LTD.—Intm. div. at rate of 3 p.c., less tax, on ord. shs.

BENN BROTHERS, LTD.—Directors recommend payment of div. at rate of 17½ p.c., less tax, for year ended June 30th, 1926.

WESTMINSTER ELECTRIC SUPPLY CORPORATION, LTD.—Intm. div. at rate of 1s. p. sh., less tax, payable September 1st.

CHARING CROSS ELECTRICITY SUPPLY CO., LTD.—Intm. div. on ord. shs. of West End undertaking at rate of 1s. 6d. p. sh., less tax.

ELECTRICAL DISTRIBUTION OF YORKSHIRE, LTD.—Board has declared div. for half-year of 4½ p.c. less tax, against 3½ p.c. for corresponding half of last year.

NORTHAMPTON ELECTRIC LIGHT AND POWER CO., LTD.—Intm. divs., payable August 21st, 2½ p.c. on 5 p.c. pref. B. shs. and 4 p.c. on ord. B. shs. Div. 1 p.c. will be payable on new ord. B. shs. in accordance with terms of issue.

YORKSHIRE ELECTRIC POWER CO.—Demands for the company's supply continue to grow, although progress has been checked by the dispute in the coal industry. Directors declare int. divs. at rate of 6 p.c. per annum for half-year to June on pref. and ord. cap.

CHADBURN'S (SHIP) TELEGRAPH CO., LTD.—After provision for depreciation, etc., pft. for year to March last is £734, plus £1 445 fwd. No div. recommended, owing to necessity for conserving resources. Improvement in trading has been to a considerable extend due to work outside company's normal sphere of activity.

PETTIGREW AND MERRIMAN (1925), LTD.—Div. up to June, 1926, on 7½ p.c. cum. pref. shs. will be paid on August 16th. In March last the directors announced that, in spite of the acute depression in the wireless industry which the company has had to share with all other companies in that industry, the condition of the company's finances gave no cause for anxiety.

ALUMINIUM CORPORATION, LTD.—Gross pft. for 1925, £53 743, against £73 227, the latter figure including a transfer from reserve not required. After providing for deb. loan and mortgage int., and taking into account £23 990 brought in, debit blce. is £13 734. The disaster to the Eigiau dam made a successful year's trading impossible, but work of restoration has been vigorously carried on, and works are running.

Company Meetings.

UNDERGROUND ELECTRIC RAILWAYS CO. OF LONDON.—At an extraordinary meeting of the company and a meeting of the holders of contingent certificates, on July 29th, the scheme of rearrangement of capital, including the conversion of the £10 ordinary "A" shares and the contingent certificates into one class, was passed by a show of hands. At the class meetings of the holders of the £10 ordinary shares and the 1s. "A" ordinary shares, polls were taken, which resulted in large majorities in support of the scheme.

AGRICULTURAL AND GENERAL ENGINEERS, LTD.—At the meeting last week, Mr. G. E. Rowland, chairman, said the trading of the associated companies, whose products covered a vast range, extending from a split pin to large power plants showed encouraging improvement. The parent company's net balance on revenue account was £52 471, which, in face of the exceptional circumstances the board had had to meet, was fairly satisfactory. The net appreciation of assets, treating the parent company and its associated companies as one concern, was £34 875.

SCARBOROUGH ELECTRIC SUPPLY CO., LTD.—At the annual meeting on July 24th, the chairman, Mr. A. A. Campbell Swinton, said the purchase price of the company's undertaking by Scarborough Corporation was £173 484. After paying a further dividend of 5 per cent., less tax, for the half-year to June, there remained £23 822. The directors calculated that there would be sufficient money to return at least 25s. in the £ to shareholders. It was decided to pay the directors and officials £3 750 as compensation for loss of office, the directors' compensation being equal to three years' remuneration.

ALUMINIUM CORPORATION, LTD.—Mr. Kenneth M. Clark, presiding at the meeting on July 29th, said he was very gratified with the progress made in the restoration work after the

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terrible disaster at their Dolgarrog works. They had been producing metal for several months, and their turnover had been maintained by purchasing metal in the open market. The board believed that the company was once again on the road to a satisfactory result to all its efforts. They had secured a lease from the Norwegian Government, for over fifty years, of a completed water power installation in Norway, where they would be able, under a subsidiary company, to manufacture the aluminium they needed, at a satisfactory cost.

VICTORIA FALLS AND TRANSVAAL POWER CO., LTD.—The Marquis of Winchester, presiding at the meeting last week, said the share capital remained at £3 000 000. Of the first mortgage debentures £84 190 had been purchased or drawn for redemption during the year, reducing the outstanding debentures to £1 500 000. There remained, in addition, £78 023 of these debentures which had been drawn for redemption, but not paid off at the end of the year. With regard to the second mortgage debentures, a further £77 920 had been purchased or drawn for redemption during 1925, leaving £962 080 outstanding. In the case of the second debentures, the bonds drawn for redemption in January, 1926, but not presented for payment amounted to £74 180 12s. A further sum of £50 000 had been added to reserve fund, which now stood at £400 000. Leases and concessions, the company's plant and equipment, and its investment in the Rand Mines Power Supply Co. stood respectively at £1 160 683, £1 659 495 and £1 847 275. The increase of the amount for buildings, equipment and land was accounted for by the heavy expenditure on the new transmission line from Witbank to Brakpan. The year's receipts amounted to £955 517, those in Africa being £843 222. They finally arrived at a net profit of £363 940, after making provision for all contingencies, which was the highest figure they had reached. This had enabled them again to pay the full 10 per cent. on the £2 000 000 preference shares and to raise the dividend on the ordinary shares from 12½ per cent. to 14 per cent. Their load had continually increased; and, from the notifications received, it would still further increase, though it was difficult for anyone to say for how long a period the demands for power by the mining industry would continue to grow. There were satisfactory notifications of further power supplies being required from them; and, in addition, further requirements would, they thought, materialise in the future. At the present time they were entering upon a somewhat exceptional change in the method of obtaining some of the power which they sold. They would take power at cost from Witbank in terms of an agreement entered into with the Electricity Supply Commission of South Africa; but it would take some time before the terms of the agreement are in full operation.

New Companies.

LONGWIN, LTD.—Cap., £1 000. To acquire business of electric lamp merchant carried on by F. Long at 64, Stafford Street, Birmingham.

NEW ROTO SIGN CO., LTD.—Cap., £2 000. Manufacturers of and dealers in electrical or mechanical signs and devices, etc. Reg. office: 106, Fleet Street, London, E.C.

STARKIE AND SPARKES, LTD.—Cap., £1 000. To acquire business of electrical engineers and contractors carried on at 35, George Street, Oldham, by E. Starkie and F. Sparkes as Starkie and Sparkes.

BRITISH RADIOPHONE, LTD.—Cap., £1 000. Manufacturers of and dealers in apparatus relating to wireless telephony and telegraphy, etc. Reg. office: 101, Walmer Road, North Kensington, London, W.10.

C. MORTLOCK, LTD.—Cap., £1 000. To acquire the business of electrical engineer and contractor, carried on at Penge, as "C. Mortlock." A subscriber: C. T. Mortlock, 30, Station Road, Penge, London, S.E.20.

WILLBLOOM, LTD.—Cap., £1 000. Coppersmiths, manufacturers of and dealers in electrical tractors, electric light fittings, wireless and telephone apparatus and accessories, etc. Reg. office: 38, Bishop Street, Birmingham.

ACOCKS GREEN ELECTRICAL STORES, LTD.—Cap., £200. Manufacturers of, agents for and dealers in wireless, heating and lighting, power, telegraphic and telephonic and general electrical products, etc. Reg. office; Station Road, Acocks Green, Birmingham.

BRIDGES-BOWER, LTD.—Cap., £500. Wireless, radio and electrical engineers and makers, importers and exporters of and wholesale and retail dealers in electrical apparatus, machines, instruments, etc. Reg. office: 34, Crutched Friars, London, E.C.3.

VINCO WIRELESS CO., LTD.—Cap., £1 500. To carry on the business of wireless manufacturers; to acquire from Messrs. Richardson and Pearce, sole British manufacturing rights of British Patent No. 223 321 for reception without an aerial, with all other wireless or kindred inventions which either of them may make, for 12 months, etc. Reg. office: 73, Basinghall Street, London, E.C.2.

NEW WORK BY WELLS.

Business Men to Save Civilisation from Ruin and Catastrophe.

IT is now an open secret that "The World of William Clissold," the three-volume novel by Mr. H. G. Wells, which will be published during the autumn, is of vital interest to every English industrialist, great and small, for its theme is nothing less than the salvation of the world by and through business men. After toying with Fabianism and Socialism of many brands, Mr. Wells, now at the very summit of his maturity, comes to the view that the practical buyers and sellers, the practical organisers, are an instrument of destiny that alone can save civilisation from ruin and catastrophe. Here at last, by the pen of one of the two or three really great thinkers of the twentieth century, the business man, who has allowed himself to rank below even the second rate among professors, artists, poets and politicians, is given his true place as the potential leader of the human race.

The publishers, Messrs. Ernest Benn Ltd., announce that Volume I will be published on September 1st, Volume II on October 1st, and Volume III on November 1st. So enormous has been the advance demand that the first large impression ordered of Volume I was oversubscribed weeks ago—nearly two months before publication. In order to avoid delay and disappointment, intending readers should at once send a postcard to their bookseller or library, asking for a copy to be sent them on the day of publication, September 1st. The price of each volume is 7s. 6d. net.

Metal and Chemical Prices.

TUESDAY, August 3rd.

		Price.	Inc.	Dec.
Copper—				
Best Selected ..	per ton	£65 0 0	10s.	—
Electro Wirebars ..	,,	£67 10 0	15s.	—
H.C. Wire, basis ..	per lb.	9 11/16d.	1/16d.	—
Sheet	,,	9 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 1 11/16d.	1/16d.	—
Brass 60/40—				
Rod, basis	per lb.	7½d.	—	—
Sheet, basis ..	,,	9 5/8d.	—	—
Wire, basis ..	,,	9 7/8d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£4 12 6	—	—
Galvanised Steel Wire, basis 8 S.W.G. ..	,,	£13 10 0	—	—
Lead Pig—				
English	,,	£34 10 0	10s.	—
Foreign or Colonial	,,	£33 5 6	7s. 6d.	—
Tin—				
Ingot	,,	£291 17 6	£2 12 6	—
Wire, basis ..	per lb.	3s. 8d.	—	—
Aluminium Ingots ..	per ton	£120 0 0	—	—
Spelter	,,	£34 0 0	—	5s.
Mercury	per bottle	£15 10 0	—	—

Sulphur (Flowers)—Ton £11 10 0 *Sodium Chlorate*—Per lb. 3d.
,, (Roll-Brimstone)—,, £10 5 0 *Sulphuric Acid* (Pyrites, 168°) per ton, £6 15 0
Copper Sulphate— ,, £25 to £25 10 0
Boric Acid (Crystals) ,, £37 *Sodium Bichromate*—Per lb. 3½d.
Rubber—Para fine, 1s. 7½d.; plantation 1st latex, 1s. 6½d. to 1s. 7d.

The metal prices are supplied by British Insulated Cables Ltd.

The Lead Market.

Prices Continue Firm—Arrivals Shorter than Ever Last Week.

JAMES FORSTER AND CO. report that closing prices last Friday were £33 5s. for July and £32 16s. 3d. for October, against £32 3s. 9d. and £32 respectively at the end of the previous week. The market opened strong, prices advancing until £33 7s. 6d. was paid for July and £33 for October. On Wednesday there was a set-back of 10s. a ton, while on Thursday the opening was again 2s. 6d. easier, but a firm tone then set in and there was a recovery of 8s. 9d. per ton from the lowest prices touched. The close was firm at £33 5s. for July, £33 3s. 9d for August, £33 for September and £32 10s. 3d. for October.

The rapid rise early in the week was mainly due to the successive advances of the New York price to 8.65 and to 8.75 cents per lb. This was too fast to be followed by consumers here to any extent, so that values came back 10s. a ton.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BARLOW (L.) AND SONS, Frondeg, Meliden, electricians. £26 19s. 3d. June 29th.

J. AND B. RADIO SUPPLIES, 34, Oxford Street Chambers, Reading. £17 8s. 1d. June 10th.

LAMB AND CO., Ronald Park Avenue, Westcliff-on-Sea, electrical engineers. £20 9s. 11d. June 24th.

MIDLAND PHONE REPAIR SERVICE, 56, Branstone Street, Birmingham, wireless manufacturers. £21 4s. 10d. June 7th.

MORLAND, F. H., 259, Hessle Road, Hull, electrical contractor. £15 4s. 10d. July 5th.

PURCELL AND EDWARDS, 196, Swinton Hall Road, Swinton, Manchester. wireless factors. £20 1s. 2d. June 19th.

Receivership.

WOOD (H. L.) AND SON, LTD.—W. E. Beale, of 1, Worcester Street, Belgravia, S.W., in place of T. Delany, of 88, Fleet Street, E.C., was appointed receiver on July 10th, 1926, under powers contained in first mortgage debentures dated November 17th, 1925.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

ATTAIX, LTD., Southampton, manufacturers of electrical appliances. Registered July 12th, £500 (not ex.) debenture, to S. Rogers, 2, Rotunda Terrace, Montpellier, Cheltenham, butcher, general charge.

BAXTER AND CAUNTER, LTD., London, W., electricians. Registered July 12th, £3 066 13s. 4d. and £1 333 6s. 8d. land registry charges, to G. W. Kettlewell, Rusham House, Egham, electrical engineer; charged on 219, Tottenham Court Road, W., and 8, Alfred Place, W.C.; also registered July 12th, £3 000 and £2 000 land registry charges, to M. Verden, Pinnercote, Pinner retired furnisher; charged on above properties. *£5 000. September 3rd, 1924.

KENT BROS. ELECTRIC WIRE CO. and E. H. PHILLIPS, LTD., London, W. Registered July 17th, £5 500 debentures, part of £20 000 general charge. *£10 000. December 31st, 1925.

RINGWOOD ELECTRIC SUPPLY CO., LTD.—Registered July 17th, £15 000 (not ex.) further charge (inclusive of moneys secured by mortgage dated February 23rd, 1925); charged on Ringwood Mill, etc., Ringwood, with machinery, etc.; also registered July 17th, £15 000 (not ex.) further charge (inclusive of moneys secured by charge dated February 23rd, 1925), to A. J. Abbott, Strathmore, Westby Road, Boscombe, and others; charged on properties at Ringwood; also general charge (subject to prior charges). *£12 204 0s. 4d. June 21st, 1926.

Satisfactions.

BAXTER AND CAUNTER, LTD., London, W., electricians.—Notification has been placed on the company's file that the properties 219, Tottenham Court Road, W., and 8, Alfred Place, W.C., have been released from specific charge contained in the mortgage and debenture registered June 26th, 1924.

BIRKDALE DISTRICT ELECTRIC SUPPLY CO., LTD., London, W.C. Satisfaction registered July 15th, £6 000, registered February 21st, 1905, and May 20th, 1915.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Companies Winding-up Voluntarily.

ADAIR (P.), LTD. W. H. Bevan, F.C.A., 182, Temple Chambers, London, E.C.4, appointed liquidator, July 26th.

BRITISH AUTOMATIC TELEPHONE INSTALLATION CO., LTD. By Special Resolution, July 8th, confirmed July 26th, J. Mangles, 4, Theed Street, Roupel Street, London, S.E.1, appointed liquidator.

BROWN, R. CRANMER, LTD., W. W. Nisbet, 139, North End, Croydon, appointed liquidator, July 16th.

S. M. F. ELECTRICAL SUPPLIES, LTD. By Special Resolution, July 3rd, confirmed July 27th, E. J. Mitton, 43, Oozells Street North, Birmingham, appointed liquidator. Meeting of creditors at liquidator's office, on August 12th, at 11 a.m. This is merely a formal matter, all the creditors having been paid in full.

Bankruptcy Information.

CRAWLEY, Norman Leslie, 90, Three Colt Street, Limehouse E.14, electrician. Receiving order, July 27th. Creditor's petition, First meeting, August 13th, 12 noon, and public examination. October 20th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

DOLLITTLE, John Henry, 17, Park Street, Guildford, wireless engineer, trading as the ZENITH RADIO MANUFACTURING, CO. First meeting, August 11th, 2.30 p.m., 29, Russell Square, W.C.1. Public examination, October 5th, 11 a.m., Guildhall, Guildford.

HAWKINS, Albert Bernard, and HAWKINS, Harold, electrical engineers, 101, Station Hill, Kidderminster, trading as HAWKINS BROS. Receiving order, July 24th. Debtors' petition.

ROBINSON, Henry, 41, Wigan Lane, Wigan, electrician and wireless dealer. Receiving order, July 26th. Debtor's petition.

Notice of Dividend.

TIDSWELL, Herbert, trading as H. TIDSWELL AND CO., 11, Bazaar Street, Pendleton, electrical engineer. First and final dividend, 3¾d. per £, payable August 11th, Official Receiver's Offices, Byrom Street, Manchester.

Bankruptcy Proceedings.

DAVIS (H. E.), LTD., electrical engineers and wireless contractors, 4, South Street, London, E.C. An order for the compulsory winding up of this company was made on May 11th, on the petition of Albert Lee and Co. (1923), Ltd., and the statutory meetings were held on July 27th at the Board of Trade Offices, 33, Carey Street, W.C. A statement of the company's affairs was submitted to the meetings in which the liabilities were returned at £6 974, of which £4 971 are expected to rank, and the assets at £238, after the deduction of £2 000 to meet the claim of the debenture holder and £2 odd to the preferential creditors. A deficiency of £4 732 is accordingly disclosed as regards the creditors. The company was registered as a private company on November 17th, 1924, with a nominal capital of £2 000 in £1 shares, to acquire the business of an electrical engineer carried on by Harry Emanuel Davis, and also to carry on business as wireless contractors, importers and exporters. The first directors were Davis and Mrs. Mildred Caroline Lawrence. The registered office of the company was situate at 4, South Street, and it also occupied a shop at 10, North End Road, Golders Green, where it traded under the style of the Golders Green Radio Stores. The issued capital was 1 002 shares and comprised 1 000 shares issued to Davis under the purchase agreement. The total purchase price was fixed at £3 000, satisfied as to £2 000 by the issue to Davis of a debenture constituting a floating charge on the company's undertaking and assets. On April 12th last Davis as debenture holder, no interest having been paid on his debenture, appointed Mr. W. A. J. Osborne, accountant, Balfour House, Finsbury Pavement, E.C., as receiver and manager, and on the same day an extraordinary resolution was passed for voluntary liquidation with Mr. R. S. Yates, C.A., 2, Victoria Street, Westminster, as liquidator. Afterwards, however, a resolution was passed that the company go into compulsory liquidation. Davis had attributed the failure of the company to depression in the wireless trade early in the present year and to heavy establishment expenses and, in the opinion of the Official Receiver, Davis had in the circumstances drawn in remuneration an amount which was not justified.

ELECTRICITY IN FARMING.

Up-to-Date Methods in Use in New Zealand.

Some interesting notes on milking and performing other farm operations by means of electrically-driven apparatus in New Zealand, are forwarded by the General Electric Co. On the farm particularly referred to, power is derived from the Wairarapa Power Board. A 3 H.P. three-phase motor is employed for driving the vacuum and water pumps through a line of counter shafting; in addition, a 4 H.P. Blackstone engine is installed for driving a 24 in. circular saw bench, and as a stand-by in the event of failure of the electricity supply. The shed is electrically lighted, and a "Magnet" electric kettle is used for tea.

A set of four cups is applied to a cow, and a vacuum of 15/16 lb. is maintained, which draws the milk to the main horizontal pipe.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

240 320 Siemens Bros. & Co., Ltd., and W. G. Patterson. Automatic and semi-automatic telephone systems. (12/11/24.) (Addition to 205 651.)
240 327 M. J. Railing and F. G. Quance. Cord grip for electric lamp holders. (28/11/24.)
240 328 J. Fischer de Tovaros. Bow current-collectors for electric vehicles. (5/12/24.)
240 330 Western Electric Co., Ltd. (Western Electric Co., Inc.). Electric relays. (9/12/24.)
240 338 G. Gourdon. Electrically-operated controlling and distributing device for liquids under pressure. (23/9/24.)
228 868 D. H. Moss. Support for an electro-magnetic sound-reproducer and method of making the same. (9/2/24.)
240 346 G. H. Cookf. Electrical condensers. (21/1/25.)
240 347 W. Schwarzenhaufr and Bingwerke vorm. Geb. Bing Akt.-Ges. Child's electric cooking stove. (22/1/25.)
228 533 H. S. Sawford. Screens for reducing secondary radiation from X-rays. (26/1/24.)
228 947 British Thomson-Houston Co., Ltd. Electromagnetic devices. (9/2/24.)
231 169 International General Electric Co., Inc. Electric oil-switches. (19/3/24.)
240 372 W. Joice. Electric radiators. (21/3/25.)
231 854 J. Ortiz-Escofet, A. E. L. Triana and R. J. A. Triana. Device for starting automatic apparatus wherein the introduction of a coin causes electrically a band such as a cinematographic film to move. (1/4/25.)
231 861 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Electric apparatus comprising a filament of highly refractory material. (5/4/25.)
232 271 Elektro-Stau-Ges. Electrolytic rectifiers or valves. (14/4/25.)
235 573 Kleinschmidt Electric Co., Inc. Telegraph typewriters. (5/7/23.) (Divided Application on 218 643.)
235 576 Kleinschmidt Electric Co., Inc. Telegraph typewriters. (11/8/23.) (Divided Application on 220 280.)
235 879 Reiniger, Gebbert, and Schall Akt.-Ges. Apparatus for supplying electric current to vacuum tubes. (17/6/24.)
236 573 Telegraphie-Ges. System Stille. Signalling and stopping devices for electromagnetic talking-machines. (3/7/24.)
240 509 J. Gogan. Electrical cooking apparatus. (29/5/24.)
240 510 J. H. T. Roberts. Thermionic valve circuits. (29/5/24.) (Cognate Application 22 456/25, a divided Application on 13 182/24.)
240 524 British Thomson-Houston Co., Ltd., and F. P. Whitaker. Dynamo electric machines. (30/6/24.)
240 526 M. B. Bean and W. I. N. Price. Electric power supply systems. (30/6/24.)
240 528 W. Dubilier. Telephone receiver. (30/6/24.)
240 534 Marconi's Wireless Telegraph Co., Ltd., and J. Brown. Wireless telegraph receiving systems. (1/7/24.) (Addition to 199 471.)
240 555 N. H. Clough. Variable inductances. (4/7/24.)
240 558 D. R. Davies and Metropolitan-Vickers Electrical Co., Ltd. Electrical switchgear. (5/7/24.)
240 559 E. W. Kirk. Electrical inductance coils. (7/7/24.)
240 560 A. S. Cachemaille (Westinghouse Lamp Co.). Activated material for electron emission purposes. (7/7/24.)
240 572 N. Japolsky (A. Seleznev (in part)). Method of and apparatus for the provision of radio waves. (12/7/24.)
240 574 E. E. Grover. Safety device for use with portable electrically-operated machines. (14/7/24.)
240 591 G. F. A. Stone. Electrical condensers. (1/8/24.)
240 605 Western Electric Co., Ltd. (Western Electric Co., Inc.). Automatic and semi-automatic telephone systems. (19/8/24.)
240 610 E. E. B. Weigfle and E. Jansz. Electrolytic manufacture of dental plates. (25/8/24.)
230 006 Automatic Telephone Manufacturing Co., Ltd. Telephone systems. (25/2/24.)
232 159 Dr. E. F. Huth Ges. Thermionic tubes. (11/4/24.)
235 831 W. H. Gerns. Apparatus for testing telephone receivers. (21/6/24.)
223 236 British Thomson-Houston Co., Ltd. Solenoid for operating electric contacts. (8/10/23.)
240 649 Macintosh Cable Co., Ltd., and T. H. M. Harvey. Surface wiring for electricity distributing systems. (10/10/24.) (Cognate Application 25 375/24.)
240 658 P. J. Gates. Electric circuits of switchboards adapted for charging accumulators. (17/10/24.)
240 660 J. E. Flesher and E. J. Bangerter. Portable electric lamps. (24/10/24.)
234 435 Deutsche Gluhfadenfabrik R. Kurtz und Dr. Ing. P. Schwarz-Kopp Ges. and Dr. P. Schwarzkopf. Thermionic tubes. (21/5/24.)
225 541 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Electric discharge tubes provided with an incandescent cathode, an anode, and a controlling grid. (27/11/23.)
240 675 L. L. Jones. Variable resistance devices. (27/11/24.)
226 536 Zaidan Hojin Rikagaku Ken-Kyujo. Process of electrolytically depositing an insulating coating of skin on aluminium. (19/12/23.)
236 152 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Manufacture of tungsten powder by electrolysis. (27/6/24.)
240 682 G. Fornaca. Electro-magnetic system for starting internal combustion engines. (19/12/24.)
240 683 J. H. M. Christensen. Telegraphic relays. (19/12/24.)
240 688 R. F. Graham. Crystal detectors for wireless reception. (5/1/25.)
240 691 F. W. Le Tall (Westinghouse Electric and Manufacturing Co.). Electron discharge devices. (7/1/25.)
229 653 Etablissements de Dion Bouton Soc. Anon. Magneto contact breaker cams. (23/2/24.)
240 711 B. Ross. Fine control for variable electric condensers. (18/2/25.)
240 714 J. P. Eckersley. Crystal detector for wireless reception. (20/2/25.)
240 716 G. A. Laughton. Electrical condensers. (21/2/25.)
230 445 Porcelainfabriken Norden Aktieselskabet. Process for local treatment of the surface of electric insulators. (5/3/24.)
230 452 Soc. Industrielle des Procedes W. A. Loth. System for the reception of high-frequency electro magnetic waves or of low-frequency fields. (8/3/24.)
240 721 Johnson and Philips, Ltd., and D. A. S. Porteous. Electric cables. (3/3/25.) (Addition to 230 764.)
240 725 British Thomson-Houston Co., Ltd. (International General Electric Co., Inc.). Systems of electric motor control. (11/3/25.)
232 226 British Thomson-Houston Co., Ltd. Automatic switching systems. (8/4/24.)
240 741 C. R. Jarvie. Variable air condensers for wireless telegraphy. (8/4/25.)
235 151 Felten and Guilleaume Carlswerk Akt.-Ges. Subaquatic electric cables. (7/6/24.)
232 971 I. Zbar. Portable dynamo electric machines. (26/4/24.)
240 762 T. H. McQuinn. Electric water heaters. (25/5/25.)
240 769 E. Picard. Variable condensers for use with high-frequency circuits. (19/6/25.)
214 601 Compagnie Electro-Mecanique.—Method of winding for the improvement of the commutation in electric machines provided with commutators. (16/4/23.)
240 680 A. W. Adams. Two-way telephonic and telegraphic repeater for use without balancing networks. (10/4/24.)
240 890 A. Dilger and Dubilier Condenser Co., Ltd. Electrical resistance. (4/6/24.)
240 895 Western Electric Co., Ltd. (Western Electric Co., Inc.). Contacts for use in electrical apparatus. (11/6/24.)
220 931 Siemens-Schuckertwerke Ges.—Electric driving mechanism for weaving, knitting and like machines. (23/8/23.)
240 897 E. J. Ondoli. Control of electric motors. (13/6/24.)
240 899 N. Lee and Radio Communication Co., Ltd. Apparatus for the reception of wireless signals. (26/6/24.)
226 155 Siemens-Schuckertwerke Ges. Screw-plug electric fuses. (13/12/23.)
226 156 Siemens-Schuckertwerke Ges. Non-interchangeable electric fuses. (14/12/23.)

Applications for Patents.

July 19th.

18 000 J. W. Barber, and Brownie Wireless Co. Electric socket connectors.
18 012 A. Bishop and C. P. Harvey. Electric clocks, etc.
18 020 British Thomson-Houston Co., Ltd., and L. J. Davies. Electron discharge devices.
18 067 J. Buchli. Electric locomotives.
18 045 W. Carpmael (I. G. Farbenindustrie Akt.-Ges.) Apparatus for treating gases, etc. with silent electric discharges.
18 004 H. Halladay-Hope. Apparatus for transmitting drawings, etc. by telephone, etc.
18 014 F. Krupp Akt.-Ges. Electric furnaces. (4/9/25, Germany.)
18 064 M. L. Magneto Syndicate, Ltd., G. Stephens, and E. A. Watson. Interruptors for electric ignition apparatus.
17 999 A. F. Sykes. Damping and controlling electrically operated vibration devices.

July 20th.

18 140 H. J. Camp and C. Watson. Thermionic valve holders.
18 100 H. B. G. Campion and H. E. Fairley. Holders for electric globes.
18 089 F. Eagland. Electric condenser.
18 076 C. A. Fountaine. Wireless aerial.
18 130 General Electric Co., Ltd. Means for securing caps of electric lamps, etc. (22/4/26, Germany).
18 131 General Electric Co., Ltd. Gas-filled electric lamps. (14/4/26, Germany.)
18 117 International General Electric Co., Inc. Gripping devices for electric welding machines. (20/7/25, Germany.)
18 158 K. Nemeth and A. Szanto. Electric accumulators.
18 106 T. L. C. Rogers. Electric boot, etc. cleaner.

July 21st.

18 266 R. W. Buckingham. Electric light fittings.
18 225 Electric Fires, Ltd. and F. L. Newhouse. Electric fires.
18 233 and 18 234 Highfield Electrical Co., Ltd. and F. W. Highfield. Electrical apparatus for testing internal combustion, etc. engines.
18 235 Highfield Electrical Co., Ltd., and F. W. Highfield. Electrical apparatus for testing power transmission mechanism.
18 237 W. A. Maas. Electromagnetic power transmission device.
18 208 J. Mair. Stopping devices for electric lifts.
18 257 Metropolitan-Vickers Electrical Co., Ltd. High voltage direct current electrical systems.
18 231 N. E. Paine. Electric generating apparatus.
18 201 Sieverts Kabelwerk, M. Sieverts Fabriks Aktiebolag. Phase-compensating heavy current condensers. (18/8/25, Sweden.)
18 244 Soc. Francaise Radio-Electrique. Thermionic amplifiers. (22/7/25, France.)
18 237 G. Zambra. Electromagnetic power transmission device.

July 22nd.

18 318 British Thomson-Houston Co., Ltd. Electric motor control. (23/7/25, U.S.A.)
18 319 British Thomson-Houston Co., Ltd., and C. J. H. Trutch. Electric motor control.
18 351 G. Campbell and H. T. Harrison. Indicators for charging secondary batteries. (13/1/26.)
18 352 G. Campbell and H. T. Harrison. Electric batteries.
18 279 H. Clarke and Co. (Manchester), Ltd., and H. Ingham. Radio valve rectifiers.
18 277 F. B. Cox. Electric switches.
18 321 Etablissements Sablyet. Electric furnaces. (22/8/25, Belgium.)
18 363 J. Gernaert. Electric clocks. (22/7/25, Belgium.)
18 334 W. M. Holbeach, and Igranic Electric Co., Ltd. Formers for supporting electric coils.
18 294 J. A. Joyce. Wireless aerial lead-in.
18 281 H. Longton. Electric energy conversion arrangements.
18 370 P. S. McCann and Western Electric Co., Ltd. Loaded conductors.
18 335 G. Mendelssohn. Automatic control of electric lights.
18 365 H. J. Round. Four-electrode valves.
18 313 C. H. Sedgwick. Variable electric condensers.
18 342 Siemens-Schuckertwerke Ges. Electric purification of gases. (23/7/25, Germany.)
18 299 D. Suchostawer. Automatic telephone exchange.

July 23rd.

18 439 D. Anderson and Son, Ltd., and R. O. Child. Treatment of insulating or dielectric materials.
18 422 British Thomson-Houston Co., Ltd. Electric motor control. (30/7/25, U.S.A.)
18 423 British Thomson-Houston Co., Ltd., and H. de B. Knight. Regulation of electric distribution systems.
18 464 W. A. A. Burgess, D. E. Lambert, and A. Reyrolle and Co., Ltd. Electric circuit breaker systems.
18 388 Falkirk Iron Co., Ltd., H. J. Kennard, and A. R. Wood. Electric cooking apparatus.
18 417 W. Graham. Wireless receiving sets.
18 466 C. F. Halsall. Wireless aerials.
18 426 Highfield Electrical Co., Ltd., and F. W. Highfield. Electric rivet heaters.
18 381 and 18 382 F. Thornton, Ltd., and W. H. Thornton. Wireless apparatus, etc.
18 383 F. Thornton, Ltd., and W. H. Thornton. Manufacture of wire for inductance, etc.
18 404 A. W. Walker. Electric game.
18 454 P. H. Waller. Electric display apparatus.

July 24th.

18 504 Automatic Telephone Manufacturing Co., Ltd., and R. W. Tarrant. Electrolytic cells.
18 513 British Thomson-Houston Co., Ltd. Electric welding apparatus. (4/8/25, U.S.A.)
18 520, 18 521 and 18 522 M. E. Elliott. Variable inductances.
18 524 M. E. Elliott. Inductance coils.
18 525 M. E. Elliott. Wireless receiving circuits.
18 507 G. Gualtierotte. Electric heaters for presses, etc.
18 540 J. MacWilliam, and G. H. Shirley. Condensers for wireless apparatus.
18 544 E. C. R. Marks (Akt.-Ges. Brown, Boveri et Cie.) Apparatus for measuring small variations in electric resistance.
18 545 Maschinenfabrik Oerlikon. Double contact device for electrical switchgear. (16/9/25, Switzerland.)

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THE ELECTRICIAN

ESTABLISHED 1861.

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THE ELECTRICAL FUTURE.

THIS year we have no reason to complain, as we have had in the past, of the omission of Papers on subjects of vital electrical interest from the programme of the annual meeting of the British Association. Sir JOHN SNELL is president of Section G (Engineering) and it is not surprising that he should have devoted his address to "The Present and Future Developments of Electricity Supply." In addition Mr. J. M. KENNEDY, who, as is known, was largely responsible for working out the schemes on which the Weir Report was based presented a Paper on "Some Features of the Economics of Electrical Distribution." In this he set out to do for distribution what he has already done for generation. The results, as will be seen from the abstracts which we publish elsewhere in this issue, are a complete summary of the present problems of electricity supply and a pretty clear indication of the methods by which they may be solved. Mr. R. BORLASE MATTHEWS presented a useful paper on "Electric Ploughing," and other more theoretical matters were also dealt with.

To quote Sir JOHN, the present position is that about 7 000 000 000 kWh of electricity are generated in the public supply stations of this country annually. This figure may be expected to increase to 21 000 000 000 kWh within the next fifteen years. If this is accepted as a probable indication of what may happen, it forms a basis on which the necessary engineering system may be planned in an economic and co-ordinated manner. If we consider the electricity that may be consumed at that date for domestic, power and railway purposes separately, it appears that the consumption in the home may reach 1 100 kWh per head per annum or even as much as 2 500 kWh, if electricity is used for heating water. Gas competition must, however, be considered, and an estimate based on present relative rates of increase in the consumptions of electricity and gas show that at the end of 25 years from now the domestic consumption of electricity per annum should be 20 000 000 000 kWh, with a maximum load of 8 000 000 kW. An analysis and extrapolation of the figures available of the electricity consumed in industry indicate that at the same future period the consumption for this purpose will also be about 20 000 000 000 kWh, with a maximum load of 9 200 000 kW. Electric traction should, in addition, provide a consumption of 7 000 000 000 kWh, with a maximum load of 2 000 000 kW, making a total consumption of 47 000 000 000 kWh with a maximum demand of 15 500 000 kW at a load factor of 35 per cent.

To those who will contend that such claims are visionary Sir JOHN replies that the rate of increase of electricity consumption is accelerating and that in the United States the Power Surveying Committee of the National Electric Light Association is working out its estimates on a basis of a per capita consumption of 1 650 kWh per annum as against his figure of 940 kWh. Considering the number of persons per acre in this country and the increasing need for the adoption of modern methods of existence, it cannot be said that these figures are exaggerated. Under the heading of traction they might, in fact, well be higher than those Sir JOHN has set down.

How this state of things is to be dealt with technically and commercially is the next important question. It is obvious that in this country most of the electricity must come from coal-fired stations and that to ensure cheapness of the ultimate product the economy of these must be increased, first by reducing the consumption of coal per kilowatt generated, and second by reducing the capital expenditure per kilowatt installed. The first is a technical matter, which is now being examined from standpoints which are familiar to readers of THE ELECTRICIAN. The second can be realised by concentrating the generating plant required in a few large stations. Incidentally, such a policy makes it easier to try out the many new processes that have been suggested for economising fuel. The result of adopting these two policies in combination should make it possible to generate electricity at 0·3d. or less per kilowatt-hour. Having reached that point in Sir JOHN'S argument we may now combine his remarks on distribution with what Mr. KENNEDY has to say on the same important subject.

The figures we have just given allow us to postulate that it will be possible to deliver electricity to the low-tension terminals of a bulk supply area at a price of 0·4d. per kWh. At present, however, much money is expended between that point and the consumer and the possible methods of reducing this, therefore, merit the close examination that Mr. KENNEDY devotes to them. At present £106 000 000, or about 54·6 per cent. of the total capital expenditure on this country's electricity supply undertakings is invested in the distribution systems and this percentage is almost certain to increase in the future. The revenue obtained per £100 of this capital is decreasing, though the number of kilowatt hours sold per £1 of capital is increasing, but at a falling rate. Stabilisation

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therefore seems likely to occur at about 48 kWh per £1 of capital, so that each kilowatt-hour delivered will have to bear a charge of 0·75d. in addition to the cost of generation. To improve the position it is therefore necessary to increase the amount of electricity sold per £1 of capital invested in the distribution business, especially as no less than 60 per cent. of the total capital charges are allocated to this item. This can best be done, present experience shows, by reducing the price and incidentally by closing stations, whose works costs amount to 1d. and over. This, indeed, is pretty obvious if Sir JOHN's average price of electricity of 0·9d. per kWh is to be attained.

Mr. KENNEDY next gives an analysis of the actual position of a distributing authority starting operations at the present time. It can expect to obtain electricity at £4 per kW of demand plus 0·2d. per kWh sold. To this must be added sums varying from £4 to £14 per kW for converting plant and £20 per kW for low-tension mains and services. About 20 per cent. must be added to the running charges to compensate for losses in distribution. The problem that will have to be tackled in this connection, therefore, is how to increase the existing consumption of 47 kWh per £1 of capital. The obvious way is to adopt a tariff which will enable more electricity to be sold from the present equipment and to see that all future capital is spent so as to ensure the greatest consumption per £1 of capital expenditure. This points directly to the desirability of developing the domestic load, especially among those consumers who use electricity for lighting only. It is therefore the duty of every distribution undertaking to make a systematic investigation of the possibilities of the district served to see by what means more electricity can be sold especially. In this connection an increase in system load factor is important. Further economies, Mr. KENNEDY contends, can also be obtained by increasing the size of areas of distribution. Where concerted action is necessary for such purpose concerted action should be taken. In this way public utility undertakings will serve their own best interests by serving the best interests of their consumers.

These two Papers should leave no doubt in the minds of those who read them of the exact nature of the problems which have to be faced, nor of the broad lines on which those problems can be solved. Much work remains to be done on both the political and technical sides, but a great obstacle is about to be cleared out of the way of one and British engineering knowledge will do all that is necessary on the other. There remains the need of realising that energy and enterprise must be expended in selling electricity, for if that is done, as Mr. KENNEDY says, the only limit to the growth of electricity consumption will be the amount of capital available.

Current Topics.

Southern Railway Electrification.

THE Southern Railway have taken the wise and, compared with the other railway companies, the enterprising course of extending the use of electric traction on their system. They are doing more. They propose to convert the lines now operated on the single phase overhead system to direct current in the interests of standardisation. This will mean that the whole of the old London Brighton and South Coast's suburban area as far as Epsom and the original South-Eastern Company's lines as far as Tattenham Corner and Caterham will be electrified, comprising the conversion of 127 miles of single track, and the equipment for electric operation of an additional 105 miles of track now worked by steam. The total cost will be £3 750 000. The present annual train mileage on the lines affected is 4 416 529 train miles. This will be increased to 7 636 000 train miles, or nearly double, by electrification. This increase in capacity is the great argument for electric traction, and one to which the other railway companies should pay close attention. On the suburban lines radiating from King's Cross and Liverpool Street, for instance, travelling becomes ever more uncomfortable and chaotic because the railway company, even if they had a mind to, cannot run more trains to deal with increasing traffic. Electrification is the only remedy for this state of things, and the electrical industry, who will have the willing co-operation of the public, should impress this on the railways. Looking at it from the most sordid point of view, it means more business, and there is no doubt that, as in the case of the Southern Railway, most of the contracts would be placed in this country.

Industrial Opportunities.

IN an article in the current issue of the "Fortnightly Review," Mr. LEONARD C. HARVEY makes, what he himself calls, some fantastical suggestions for securing labour tranquillity, the reorganisation of trade, the electrification of railways and the solidification of industrial finance and power. When a man applies such an adjective to his own writings he usually expects to receive a more or less polite denial. But before following precedent in the present case it will be well to examine Mr. HARVEY's proposals more closely. He sees that the jealousy, distrust and discontent that exist among employees, is a real weakness in our industrial system, and he, therefore, as the result of past experience, enters the battle on behalf of the worker. The employer, in his opinion, has by misapplying his better education failed to grasp the cause of our industrial stagnation: the inefficient use of our fuel and transport facilities. To settle labour unrest Mr. HARVEY suggests the guarantee of a minimum wage on one side and of loyalty to contracts on the other. To deal with the fuel problem, fifty pits containing coal suitable for distillation should be selected, and national distillation plants installed for dealing with their output. He further suggests that this scheme should be financed by making it inadmissible to pay more than a 10 per cent. dividend for more than three years on industrial securities, and "the immense proceeds of such a financial restriction" applied for the purpose just mentioned and the reorganisation of crippled industries. He puts this forward as an alternative to State aid, to which he rightly objects, but it is very uncertain whether the end he desires could be attained in this way. It would be much better and more feasible for the industries themselves to provide the funds necessary, and we feel sure they will do this when they are assured of the soundness of the schemes proposed.

Low Temperature Carbonisation.

IT is just the uncertainty on this point that is the difficulty. Mr. HARVEY is sure that distillation is going to solve our fuel problem. But there are two opinions on this matter, and we notice that Sir JOHN SNELL holds the other. In his Presidential Address to Section G of the British Association last week he carefully reviewed the possibility of commercially utilising the waste from coal mines, in combination with some form of low temperature carbonisation and the amalgamation of gas and electricity undertakings. To make this possible, he points out, there must be advantages for both sides, and at the present time some scepticism is permissible as to whether this method of treating coal will really be a source of economy in the generation of electricity. Both Sir JOHN and Mr. HARVEY will agree, however, that every method whereby our fuel resources may be economised should be explored and that those which offer some prospect of success should be adopted. Conditions in this country being what they are, it is only in this way that that cheap electricity which again both Sir JOHN and Mr. HARVEY see will provide a solution of our present difficult problem can be obtained.

Electrical Nomenclature.

PROF. HOWE has seized the occasion of the annual meeting of the British Association to make an attack

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on "The British Standard Glossary of Terms Used in Electrical Engineering." The result, as will be seen from another page of this issue, is both instructive and amusing. It is not out of place that such a paper should have been read before the British Association, as that body in the early days had a good deal to do with the difficult work of defining electrical units. Prof. HOWE'S main criticism is concerned with the General Section of the Glossary, which deals with fundamental terms. He objects that the definitions are contrary to current usage, and confusing. He even applies the epithet "hopeless muddle" to one unfortunate definition, while another is described as fallacious. It is not for us to reply to these criticisms; no doubt champions will be forthcoming. And it is certainly unnecessary to support Prof. HOWE, who is perfectly capable of looking after himself. One comment, however, we may make. Definition is one of the most difficult of arts. Everyone knows what a dog is, but everyone if suddenly asked to define one would be in a difficulty. Even WEBSTER can do no better than "a quadruped of genus *canis*," and a biologist would probably be as much annoyed at this as Prof. HOWE is at the B.E.S.A.'s definition of magnetomotive force. Yet the word dog gives all of us a certain conception, and the same is probably true of most of the B.E.S.A. definitions. The object of the glossary, as we see it, is to ensure that a certain thing shall be called by a certain name. For example, that a dog shall be called a dog and not a cat, and, moreover, that the word dog shall not be stretched to include a horse. In a word, it is a glossary, not a dictionary.

A Bribery Case.

A LETTER, which we publish elsewhere in this issue, throws some light on a matter which is guardedly dealt with in the current issue of the News-sheet of the Bribery and Secret Commissions Prevention League. It appears that the borough electrical engineer of Rawtenstall told his Electricity Committee that he had been offered a bribe by a firm who wished to obtain an order from the Council. We should have thought that it was patent to everyone that such a communication was confidential, but the tale leaked out and gathered embroidery as it spread. One of these decorations was that practically all the firms tendering were offering bribes. To deny this is the avowed object of the electrical firms signing the letter which we publish to-day, though we think all our readers will agree that such a disclaimer is not really necessary from them. But more important than this clearing of the characters is the position of the unfortunate official concerned. Assuming that he *was* offered a bribe, what was he to do? If he tells his Committee, as in this case, he is, unless the matter is treated as strictly confidential, subjected to a great deal of personal annoyance and rendered liable to a charge of libel. If he had said nothing, and the suggestion that a bribe was offered had come to the ears of his Committee through other channels, as well it might, he would have been placed in a very awkward predicament. The case only shows that members of local governing bodies do not yet realise that they have a duty to their officials.

Economy—Fuel and Otherwise.

IN our issue of July 30th we published a letter from Mr. F. W. PURSE protesting against the formation of two Institutions, whose object was the attainment of the more economical utilisation of fuel. With that contention, it need hardly be said, we cordially agree. We have often called attention to the unnecessary multiplication of such bodies, the only result of which is to weaken both themselves and others. We are interested to see that the point was mentioned at a meeting of the Institution of Fuel Technology, one of the bodies concerned. Sir WILLIAM LARKE said that the objects of the Institution were to promote the general advancement of the various branches of fuel technology as an end in itself. To do that it was considered desirable to enlist the support of all those who had any interest in fuel and not to limit the membership by any restrictions as to technical or professional qualifications. On the other hand, the Institution of Fuel Economy Engineers—the rival concern—stipulate that the basis of membership shall be some technical or professional qualification. This fundamental difference, therefore, appears: one body is to be concerned with the methods by which fuel may be economised, the other is to undertake the duty of seeing that those methods are applied in practice. These objects are certainly not antagonistic, they are complementary, and weighty arguments can, therefore, be advanced why they should be furthered by one body. If they are not, useful information presented before one may be lost to the other. On the other hand, the technology of fuel economy is not a detached subject, and will no doubt continue to receive attention from such bodies as the Institutions of Electrical and Mechanical Engineers. The result can only be a further waste of effort which is, to say the least of it, unfortunate.

The Newcastle Accident.

THAT the railway accident which occurred outside Newcastle Central Station on Saturday night could have happened at all will come as a surprise to electrical engineers. The facts are that the unfortunate driver of an electrically operated train was by some mishap or other thrown out on to the line and that the train ran on without him for some distance until it was finally brought to rest by colliding with a goods train. On steam locomotives such an occurrence is virtually ruled out by the presence of two men, it being extremely improbable that both of them will become incapacitated at once. The Grantham accident is an outstanding exception. But to drive an electric train does not normally require two men, so that to guard against failure of the human element it is generally understood that arrangements are provided for the return of the controller to the "off" position if the pressure of the driver's hand is released. In this case it appears that this device was fitted, but the London and North Eastern Railway authorities state that the controller handle had been deliberately fastened down. We shall await with interest the evidence at the official inquiry.

The Coal Dispute.

AT first sight the rejection by the miners of the proposals for a settlement put forward in the memorandum of the Industrial Christian Fellowship appears to make the position in the coal industry more complicated, though perhaps not so complicated as it would have been had they been accepted. In fact, however, the air has been cleared slightly. The leaders are for the moment uncertain what to do, but the way is open to them to consider various methods of settlement, and the fact that they are no longer bound by slogans is itself no slight advantage. A delegate conference is to be held on Monday, and it is sincerely to be hoped that this will be a preliminary to the reopening of negotiations. How necessary this is is made clear from the reports presented by representatives of the Federation of British Industries to the House of Commons. These disclose that the poison of the coal stoppage is slowly creeping into all the veins of the industrial body and is gradually producing a general calamity. Speaking broadly, there are three ways in which settlement might be arrived at: nationalisation, the "Bishops'" proposals, and the course taken by the mine owners. The first of these has been pushed into the background and the second has been rejected. The third course remains, and its supporters find their strongest argument in the economic factors the pressure of which must determine the solution. They believe that the parties to the dispute can decide what reward to labour the industry can bear, and that they can settle the terms among themselves. There is undoubtedly a growing body of opinion against State interference with industry. If pursued to its logical conclusion such a policy would mean the repeal of much recent legislation, but that would not necessarily be a bad thing.

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NOTES ON WIRELESS MATTERS

Range and the Heaviside Layer—Validity of Formula Questioned—A Reply to Mr. Eckersley.

By L. B. TURNER, M.A., M.I.E.E.

BY collecting and applying existing propagation formulæ for certain simple limiting conditions, an attempt was made in last month's Notes to indicate how a reflecting layer over the large ranges which are sometimes observed ; and, in particular, to show that it is not necessary to contemplate an accidental temporary lateral guidance or concentration of the waves into a sort of searchlight beam directed upon the receiving station. Cases (*b*) and (*c*) referred respectively to a flat and to a spherical perfectly conducting ground, in each case with a sensibly perfect reflector at a uniform height H above ground—such a reflector, it is believed, being sometimes and for some wavelengths more or less realised in fact owing to a state of ionisation in the rare upper atmosphere.

The validity of the formula for case (*b*), and by implication that for case (*c*) which goes with it, has been called into question.* It therefore seems well to add here the derivation of the formula, and to examine the numerical significance of the more truthful expression which, it would appear, ought to replace it.

Now formula (*c*) has already been given in the theoretical part of the I.E.E. paper by Round, Eckersley, Tremellen and Lunnon† to which references have previously been made ; and in the circumstances we can not do better than reproduce the paragraph in which it is there derived, while taking the opportunity to indicate certain emendations which seem necessary if the reader's equanimity is to be preserved.

Considering the rate of flow of energy through the annulus PQR (Fig. 1) where the electric field strength is E, the authors write as follows :—

" For the energy radiated is

$$\frac{40\,(2\pi)^2\,h^2\,(I_{\text{r.m.s.}})^2}{2\,\lambda^2}\ ^{(1)}$$

Also the energy radiated through the annulus is $E^2/4\,\pi c$ ergs per unit area(2), or $I\,E^{-2}\,10^{-7}/4\,\pi c$ watts(3). The

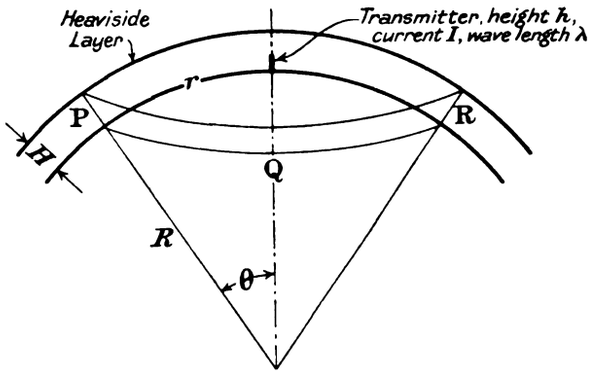

Fig. 1.

area of the annulus is $2\,\pi\,H\,R\sin\theta$, i.e. the energy radiated through the annulus is

$$\frac{E^2 \times 10^{-7}\,R\sin\theta}{2\,c}\ ^{(4)}$$

Equating the two we get :

$$E = \frac{120\,\pi\,h\,I}{\lambda\,[(3/2)\,H\,R\sin\theta]^{\frac{1}{2}}}\ ^{(5)}$$

(1) This is correct, in watts, when I is in amperes, if the 2 in the denominator is deleted.

(2) Ergs per unit area per second, if E and c (the velocity of propagation) are in C.G.S. units.

(3) $I\,E^{-2}$ is, no doubt, a misprint for E^2. Watts per unit area.

(4) Should be multiplied by H, and is then in watts if R and H are in cm.

(5) This follows on equating the two expressions for the watts radiated, corrected as noted at (1) and (4). The unit is V/cm if λ is also in cm.

* In a letter from Mr. T. L. Eckersley, THE ELECTRICIAN, July 23rd, 1926.

† " Measurements made on signal strength at great distances." Journal I.E.E., October, 1925, page 970, end of second column.

On substituting r/θ for R in this expression, it will be seen to agree with the formula (*c*) under discussion.

The foregoing extract establishes the formula on the assumption that the power radiated by the aerial is given by the familiar expression $1\,580\,I^2\,h^2/\lambda^2$ watts. In the presence of the Heaviside layer, however, this assumption is not strictly valid,‡ and the results of a more complete, and much more difficult, analysis are outlined by Mr. Eckersley in his letter to " Nature " of April 4th, 1925, and are also touched upon in the I.E.E. paper (see page 995). In brief, the effect at the receiver appears to be obtained as the sum of a series of multiply reflected rays, such as those indicated in full and dotted lines in Fig. 2. But—to quote from the letter in

Fig. 2.

" Nature "—" in actual practice the interference postulated by the theory is not present, and this may be accounted for by assuming that the layer is a good reflector only for glancing incidence ; in this case it can be shown that only the zero order term remains . . . apart from the direct wave, which, varying inversely as the distance, is negligible at greater distances than a few hundred kilometres."

Using the same units as in the former article, this leads to the expression

$$F = 1{\cdot}88 \times 10^5\,\frac{1}{H}\cdot\frac{h\,I}{\sqrt{\lambda}}\cdot\frac{1}{\sqrt{r}}\,\S \qquad (b^1)$$

which accordingly takes the place of (*b*) in the former article. The corresponding formula in place of (*c*) is, of course,

$$F = 1{\cdot}88 \times 10^5\,\frac{1}{H}\cdot\frac{h\,I}{\sqrt{\lambda}}\cdot\frac{1}{\sqrt{r}}\cdot\sqrt{\frac{\theta}{\sin\theta}} \qquad (c^1)$$

As the distance r grows the fields fall off in the same way as with the former expressions (*b*) and (*c*), so that the main point in the comparison of cases (*a*)—(*d*) is unaffected ; but the absolute values of field strength are altered. In the numerical case chosen for the table, H was 40 km. and λ was 14·1 km. The consequent alteration called for in lines (*b*) and (*c*) of the table is a multiplication of the tabulated field strengths by 0·36 throughout, giving the figures shown below.

FIELD STRENGTHS IN MICROVOLTS PER METRE.

Case.	Conditions.	Distance from Transmitter in Kilometres.				
		1 000	2 000	5 000	10 000	15 000
(*b*¹)	Flat ground ; reflecting layer 40 km. above it.	275	190	120	86	70
(*c*¹)	Spherical Earth ; reflecting layer 40 km. above it.	275	195	130	110	130

Although the analysis, to the results of which Mr. Eckersley has drawn attention, is obviously of great importance when the complicated conditions near the transmitter are under consideration, yet at large distances and with moderately long wave lengths such as that chosen in the numerical example it makes little difference whether the cruder formulæ (*b*) and (*c*), or the more sophisticated expressions (*b*¹) and (*c*¹), are used. With very short wave lengths the formulæ would diverge widely ; but that dark region as yet has been little explored by either experiment or theory.

‡ As Mr. Eckersley points out in the letter referred to. It is a little surprising that he makes no reference in this letter to his own use of the same assumption in the I.E.E. paper.

§ This should be multiplied by an absorbtion factor due to losses in the Heaviside layer, which factor we continue to take as sensibly equal to its limiting value, unity.

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ELECTRICITY SUPPLY DEVELOPMENTS.*

Present and Future Problems—Improving the Load Factor—Output in Fifteen Years' Time—Advances in the Efficiency of Generation.

By SIR JOHN SNELL, G.B.E.

THE rapid and almost universal development of electricity affords an example of the practical application of a great source of power in nature to the use and convenience of mankind with which there is no parallel. In telegraphy, telephony, and especially in wireless telegraphy, the effects on humanity have been incalculable. The aid to the surgeon, the electrical treatment of various diseases, has enormously reduced human suffering. In the almost universal application to all kinds of mechanical requirements the advance has been equally remarkable. Is there any other form of energy which has so many and varied applications ?

These developments have occurred within a comparatively small number of years. There was no general supply of electricity available in any part of this country prior to 1889. The first legislation dates from 1882, but effectively only from 1889. Within the short period of 37 years an electrical supply industry in which £200 000 000 has been invested has been built up.

A.C. *v.* D.C.

In the next section of the address, Sir John traces early developments, recalling the growth of individual efforts, the division of the scientific world into two camps favouring respectively direct and alternating current and the pioneer work of Dr. Ferranti, who was the first to advocate generation on a large scale and transmission by high pressure over an extensive area of supply. Progress is illustrated by a comparison of the ideal put forward by Col. Crompton 32 years ago, with conditions to-day. The ideal cost of production was then put at 1·32d., excluding capital charges, and the average price to the consumer 3d. The load factor was only 20 per cent. and the capital outlay then as much as £125 per kW. At present the average revenue from all classes of consumer is 1.75d., the average station load factor 29 per cent., and the capital outlay £52 per kW. Reference is made to the revolutionary discovery of the practical application of multiphase currents and the persistent and ultimately successful work of Sir Charles A. Parsons on the steam turbine. At the present time reciprocating engine sets represent only 8 per cent. of the total prime movers employed in public power stations and their proportion is decreasing each year.

To-day we find a rapidly increasing growth of output, decreasing costs and widening circles of application. Yet the average load factor throughout Great Britain to-day is still under 25 per cent. A small undertaking supplying a district mainly for lighting purposes may have a load factor of no more than 15 per cent. Much can be done to improve conditions by grouping together undertakings within a large area, having loads of varying character. On the north-east coast, with an area of approximately 1 400 sq. miles, the annual load factor is not far short of 50 per cent. In an "all-electric" house a daily load factor of 44 per cent. has been recorded. Investigations in a large southern area have recently shown that the connections for heating had not noticeably affected the maximum load on the station. The increased service had raised the load factor from 15 per cent. or less for lighting alone to 30 per cent. or more with the comparatively limited application for heating and cooking possible at that time.

In recent Government publications it has been estimated that the total output in Great Britain within the next 15 years may reach 21 000 000 000 kWh per annum (as compared with 7 000 000 000 at present) and even more if an extensive electrification of railways is decided upon. In the next section of the address the author, by considering in turn domestic supplies, industrial power and railway electrification, shows that this estimate is conservative. He foreshadows a possible output divided as follows :—

	kWh in Millions.	kW Demand.
Domestic, etc	20 000	8 000 000
Industrial power	20 000	9 200 000
Railway traction only ..	7 000	2 000 000
	47 000	19 200 000

The aggregate maximum demand is 19 200 000 kW, but an allowance for some diversity should be made, which would probably reduce the maximum demand to 15 500 000 kW, representing an annual load factor of about 35 per cent. This forecast is in a great measure confirmed by the studies of a powerful committee in the United States, which estimated that in 1950 a consumption of 1 651 units per capita would be attained in that country. Whilst an exact parallel with American conditions cannot be made, an average consumption in this country of 940 kWh per capita appears moderate.

Reference is next made to the survey of water power resources in this country carried out by the Water Power Resources Committee in 1918, whose final report was issued in 1921. Of the total surveyed it was considered that 210 000 kW could be economically worked. Parliamentary powers have already been granted for the Lochaber scheme (54 000 kW now in course of construction, the Grampians scheme (estimated to develop 80 000 kW) and for various smaller schemes. For present purposes, and including the important existing works of the British Aluminium Co. at Kinlochleven (23 000 kW) with an annual output of 133 000 000 kWh and those of the North Wales Power Co. and the Aluminium Corporation in North Wales, it may be assumed that at least 400 000 kW could be developed. Suggestions have also been put forward for the utilisation of tidal estuaries, and it is considered that a *prima facie* case has been made out for the development of the Severn Estuary ; a detailed hydrographical survey is now being made. Present data suggest that approximately 260 000 kW, equivalent to at least 1 000 000 000 kWh per annum, could be obtained. It should not be overlooked that a well constructed dam and works will last for centuries, and that wasting effects in the form of turbines and power lines form only a small proportion of the total expenditure. Moreover, of the total cost of electrical energy produced no less than 85 to 90 per cent. represents capital charges. When capital outlay on the permanent assets is redeemed the cost of energy is reduced to a very small figure indeed. This is a factor which is insufficiently appreciated in this country. Other countries more liberally endowed with water-power resources will for this reason benefit considerably a generation or two hence.

Some Technical Problems.

In the final section of the address attention was devoted largely to recent advances in the efficiency of generating electricity. The average thermal efficiency for all public generating stations in this country in 1924-5 was as low as 12·45 per cent. The highest recorded efficiency that year was at the Barton station of the Corporation of Manchester, viz., 19·85 per cent. Corresponding figures for 1925-6 showed that the average thermal efficiency had been raised to 21·48 per cent., with an annual station load factor of 48 per cent. It appears that the Crawford Avenue station of the Commonwealth Edison Company of Chicago has recorded an efficiency of 22·24 per cent., with a station load factor of between 60 and 70 per cent. The steam pressure at Barton is 375 lb. per sq. in., and at Crawford Avenue 550 lb. At other American stations, notably at Philo and Boston, thermal efficiencies of the order of 24 per cent. appear to have been obtained. Sir Charles Parsons has shown that with a steam pressure of 500 lb. per sq. in. and a 97·5 vacuum we may hope to reach a full load thermal efficiency (steam to electricity) of 33⅓ per cent., while with an initial steam pressure of 1 000 lb. per sq. in. 35 per cent. might be obtained. Assuming a boiler plant efficiency of 83 per cent. the equivalent efficiencies (fuel to electricity) are 27·97 at 500 lb. pressure and 29·2 per cent. at 1 000 lb.—which are figures comparable with the best realised results from internal-combustion energies. The development and steady improvement of the steam-using plant is thus proceeding satisfactorily. Boilers are already in commission with an evaporative duty of 300 000 lb. per hour. For pressures of 800 lb. and over it is necessary to avoid riveting, and to adopt a seamless drum. The tendency is unquestionably towards higher evaporative capacities, larger boiler units and higher pressures. The use of pulverised fuel appears to lend itself to these modern developments. It is reported that at the Lake Shore Station in

(*Concluded on page* 184.)

* Abstract of the presidential address to Section G of the British Association at Oxford.

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THE B.E.S.A. GLOSSARY.*

A Protest and a Suggestion—The Necessity for Accurate Terminology—A Sad Confusion of Ideas.

By PROF. G. W. O. HOWE, D.Sc., M.I.E.E.

THE British Engineering Standards Association has recently published through Messrs. Crosby Lockwood and Son a volume entitled "British Standard Glossary of Terms used in Electrical Engineering" (British Standard Specification No. 205—1926). It contains 263 pages and is priced at 5s. In a covering letter dated June 30th, 1926, sent out to the Press, the Association says that "in view of the importance of the British Standard Glossary to all engaged in the electrical and allied industries, it is hoped that you may see your way to giving prominent notice to the new issue." The writer feels therefore that he is furthering the hopes of the B.E.S.A. in giving the volume such prominence as is undoubtedly obtained by discussion in a paper read before the Engineering Section of the British Association. The undoubted importance of the glossary is my excuse for reading this paper and for the criticism which I feel called upon to make.

In preparing the glossary the objects in view are stated to have been :—

(*a*) To standardise and co-ordinate the electrotechnical terms used in the British Empire ;

(*b*) To provide a basis for the British portion of an International Vocabulary, in course of preparation by the International Electrotechnical Commission.

In a circular it is stated that "this glossary has been adopted by the International Electrotechnical Commission as a basis for the arrangement of an International Glossary now in course of preparation by that body."

In view of this no one will underrate the importance of the volume, or question that "the publication by the B.E.S.A. of an authoritative glossary of electrical terms and definitions, the preparation of which was started 20 years ago by the Institution of Electrical Engineers, is an event of some significance." To quote further from the same circular [C.B.(E.L.)694], "The Electrical Industry is one of no mean importance to the world, and the necessity for an accurate terminology becomes greater the greater the spread of the electrical language."

Turning now to the glossary itself, we find that it consists of eleven sections and two appendices. Each section is subdivided into a number of sub-sections ; thus Section I is General, Section II Machines and Transformers, Section III Switchgear and Control Gear, and so on. The sub-sections of Section I are as follows :—Elemental terms ; fundamental electrostatic terms ; fundamental magnetic terms ; derived terms ; units ; technological terms ; apparatus ; mechanical and general terms. I have enumerated these because it is with this general section that my remarks will be mainly concerned and because, in my opinion, it is the most important and the least satisfactory section in the book. I will pass over the opening sub-section which deals with such elemental terms as "atom," "electron," etc., and proceed at once to a review of Sub-section 12, that is, the second sub-section of the first section.

Some Fundamental Electrostatic Terms.

No. 1 202 correctly defines unit charge.

No. 1 204. ELECTRIC FORCE at any point. "The force in dynes which would be experienced by a unit charge of positive electricity concentrated at that point," etc.

No. 1 207. UNIT ELECTROSTATIC TUBE OF FORCE. "An electrostatic tube of force having a cross-sectional area, at right angles to the lines of force and at a point where the electric force is unity, of 4π sq. cm." Now although this has been suggested, and is in some ways preferable, it is not the usual convention according to which the number of lines or tubes of force per sq. cm. at any point is made equal to the electric force at the point. At any point where the electric force is unity, such as on a sphere of 1 cm. radius about a unit charge in a vacuum, the tubes of force should have an area of 1 sq. cm. No. 1 207 would give a single line or tube of force from a unit charge in a vacuum, whereas according to the usual convention 4π lines or tubes of force emanate from unit charge. If it is the intention of the committee to adopt some system other than the usual one, it should be stated, especially in view of the statement in the introduction that "the definitions conform to current usage except when such usage appears to be erroneous or misleading, in which case attention is drawn to the fact."

No. 1 208. ELECTROSTATIC FLUX. "The number of unit electrostatic tubes of force traversing a given surface. The total flux over a surface enclosing a charge is equal to the charge." Here we have a hopeless confusion between two different things, viz., the electric force and the displacement produced by the force. Consider, for example, a concentric spherical condenser, the inner and outer electrodes of which are maintained at a constant difference of potential. No. 1 401 tells us that potential difference "is measured by the work done in moving unit charge of electricity from one point to the other" ; hence since the P.D. is constant, the force on a unit charge in the space between the electrodes will be independent of the permittivity of the dielectric, and the electric force in the space will therefore be unaltered by a change in the permittivity, although the charge on the condenser will be proportional thereto. Since the force is unaltered, the number of tubes of force crossing the dielectric is unaltered and yet, according to No. 1 208 the total flux is the number of unit tubes of force and is equal to the charge.

No. 1 209. UNIT ELECTROSTATIC FLUX. "The electrostatic flux in a unit electrostatic tube of force."

No. 1 210. ELECTROSTATIC FLUX DENSITY. "The electrostatic flux per unit area, normal to the direction of the flux, Symbol : D."

A Hopeless Muddle.

Here again is a hopeless muddle. The symbol D has always been regarded as representing the displacement, i.e., the charge or quantity of electricity displaced across unit area normal to the direction of the displacement, and it is rightly called the electrostatic flux density as stated in No. 1 210, but No. 1 209 makes it all meaningless by confusing the electrostatic flux with the electrostatic force, whereas the relation between them depends on the permittivity of the medium. If a medium has different permittivities in different directions, the resultant electrostatic flux may not even be in the same direction as the electric force. The reason for the confusion is the failure to distinguish between cause and effect. When a material is subjected to a mechanical stress, a strain or displacement is produced, the relation between the stress and the strain depending on the properties of the material. In a somewhat analogous way an electrical stress or electrostatic force produces an electrical displacement or electrostatic flux density in the material, the relation between the two depending on the electrical properties of the material.

Turning from electrostatic terms to the much more commonly employed magnetic terms one might have expected some improvement but one finds the same confusion of ideas. Magnetic force is correctly defined in terms of unit magnetic pole and magnetic flux density is harmlessly defined as the magnetic flux per unit area, but what is one to make of the following :—

No. 1 307. MAGNETIC FLUX. "The number of unit magnetic tubes of *force* traversing a given surface. Symbol : Φ."

This makes the definition of permeability quite meaningless since it is defined as "The ratio of the magnetic flux produced by a given magnetic force in the material or medium to the magnetic flux which would be produced by the same magnetic force in a perfect vacuum." Seeing that the flux is defined in No. 1 307 as the number of tubes of force, the ratio is not likely to change on passing from one medium to another.

No. 1 314. MAGNETOMOTIVE FORCE. "The total of the magnetic potential differences along the whole length of a magnetic line of force." A student of electrical engineering is usually introduced at an early stage of his course to a toroid or anchor ring of iron uniformly wound with insulated wire through which a current is passed, and finding that there is no tendency whatever for the magnetic flux to leave the ring at one point and cut across to enter at another, he wisely conclued in his innocence that all parts of the iron ring are at the same magnetic potential, however large may be the magnetizing current. He is then shown that the magnetomotive force acting around the ring must be $0{\cdot}4\pi$ times the ampere-turns.

* Paper read before Section G of British Association.

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How then can the magnetomotive force be the sum of all the potential differences? Moreover, the definition is misleading in that the path around which the magnetomotive force is determined need not be a magnetic line of force at all.

The trouble really begins at No. 1312, MAGNETIC POTENTIAL DIFFERENCE. "A magnetic condition existing between two points and tending to cause a charge of magnetism to move from one point to the other. It is measured by the work done in moving a hypothetical unit pole from the one point to the other." By what path? Strictly speaking, the potential theory is not applicable when it is possible to follow a path linking current-carrying coils since the work done in moving unit pole from one point to the other depends on the path followed, and it was the student's innocence of this and other troubles such as multi-valued functions that enabled him to conclude that all parts of the ring were at the same potential. Why complicate matters by dragging magnetic potential differences into the definition of magnetomotive force? How much simpler it would be to say that the m.m.f. around any closed path is the work done in moving unit pole once around that path.

No. 1 316. RELUCTANCE of a magnetic circuit. "The ratio of the magnetomotive force acting in the circuit to the resulting magnetic *force*." Surely this is a misprint for *flux*, but the two terms are used in such a manner that it may be intentional. If so, it is confusion worse confounded.

There appears to be some effort made to distinguish beween "magnetic force" and "magnetising force," although what distinction is intended it is difficult to see.

No. 1313. MAGNETIC FORCE. "The force exerted on a unit magnetic pole situated at the point considered."

No. 1315. MAGNETISING FORCE. "The magnetomotive force per centimetre, measured along the lines of force, in the case of a magnetic flux set up by a current of electricity flowing in a magnetising coil. Symbol: H."

An Elastic Term.

The symbol H is thus reserved for the latter force which can only be caused by a current of electricity. Magnetic force has no symbol but is presumably produced by bringing up a magnet near the point. Seeing, however, that MAGNETIC FORCE is "the force exerted on a unit pole," that MAGNETIC POTENTIAL DIFFERENCE "is measured by the work done in moving the unit pole from one point to the other," that MAGNETOMOTIVE FORCE is "the total of the magnetic potential differences along the whole length of a magnetic line of force" and that "MAGNETIC FORCE" is "the magnetomotive force per centimetre measured along the lines of force," it is extremely difficult to discover where any difference between MAGNETIC FORCE and MAGNETISING FORCE can have crept in. Somehow or other, the latter only is designated by H, whereas the former by a combination of Nos. 1306, 1307 and 1309 becomes identically the same thing as flux density, and is designated by B, whilst in No. 1316 it becomes identified with total magnetic flux ϕ. Truly a most elastic term.

No. 1322. Although a matter of little importance we may draw attention to the fact that the definition of ELECTROMAGNETIC INDUCTION covers only self and mutual induction but excludes the induction of e.m.f. due to the movement of magnets in the neighbourhood of coils.

The distinction drawn between magnetic force and magnetising force makes it interesting to note that in No. 1 336, SUSCEPTIBILITY, is "the number obtained by dividing the intensity of magnetisation by the *magnetic force* producing it"; whereas in No. 1 339, MAGNETIC HYSTERESIS LOOP, is "the closed figure formed by plotting the values of the flux density per square centimetre (B) against the *magnetising force* (H)." It would be interesting to know if these distinctions are intended and, if so, on what they are based.

Turning from the so-called fundamental terms—such as excitation and hysteresis loop—to the so-called derived terms—such as potential and electromotive force, we find further difficulties.

No. 1 402. POTENTIAL. "Electrical, at a point. The potential difference between that point and surrounding bodies all of which are assumed to be at an infinite distance therefrom." Whatever does this mean? Seeing that the surrounding bodies may all be at very different potentials, which of them is to be chosen as a basis for the determination of the potential difference? Moreover, the removal of the surrounding bodies to an infinite distance, or indeed any movement of them at all, will generally alter the potential at the point.

No. 1 405. ELECTROMOTIVE FORCE.—"An electric condition tending to cause a movement of electricity in a circuit. It is measured by the sum of the potential differences from point to point round the circuit."

A simple example will serve to expose the utter fallacy of this definition.

On page 14 of a little book intended for second year students and entitled "Exercises in Electrical Engineering," by Prof. Mather and the writer, will be found an interesting problem which I commend to the careful consideration of those responsible for this definition. The pole of a bar magnet is plunged into the centre of an endless ring of copper wire causing a momentary current of 1/20 A to flow in the ring which has a resistance of 1 Ω. Now what is the momentary potential difference between two opposite points on the ring? The student usually begins by multiplying the current by the resistance of half the ring and finds that the P.D. is 1/40V, but, on being asked which of the two points is at the higher potential, his faith in this result is completely shaken, and it generally dawns on him that all points of the ring must be at the same potential. The current flows, not because of any differences of potential, but because of the induced electromotive force. Surely this is a case of electromagnetic induction—No. 1 322 notwithstanding.

Although, strictly speaking, the potential theory is not applicable to the case considered, this example shows very clearly that, in the ordinary sense of the term, POTENTIAL DIFFERENCE is by no means essential to the production of a current of electricity, but ELECTROMOTIVE FORCE is always essential. An analogy will perhaps make this quite clear. Difference of level or even of pressure is not essential to the production of a flow of water, but some form of *Water-motive force* is essential. If a circular canal be cut in a horizontal table and filled with water, a uniform water-motive force can be induced by concentrically rotating a vane rapidly through the air immediately above the water and a current will be produced in the water without any differences of level or pressure. This is very closely analogous to the electrical case considered above and one can see the fallacy of the B.E.S.A. definition from the analogous statement that the total water-motive force is measured by the sum of the pressure differences from point to point round the circuit. There are no pressure differences. Hence the B.E.S.A. will have to devise some method of measuring electromotive force other than the adding up of potential differences from point to point round the circuit. As a matter of fact the electromotive force around any circuit is simply the work done in moving unit quantity of electricity around the circuit.

Something Radically Wrong.

I do not propose to go any further with this detailed criticism of the glossary. I think that I have gone far enough to show that there is something radically wrong with what I regard as the most important section of it; in my opinion the definition of a lamp-holder or of a boiling plate is a minor matter compared with the correct definition of the fundamental conceptions upon which all electrical measurement is based. In making these adverse criticisms I do not wish to undervalue in any way the services of those who have devoted much time and trouble to the preparation of this volume. Having served on one of the Panels, I know the difficulties of obtaining agreement between those who may regard the same phenomenon from different points of view or may use the same word in different senses. If, however, I want an excuse for my protest against the publication of this volume in its present form, I find it in the circular which is sent out with it. "The importance of stabilising and promoting continuous existence to a language is so great that, like other things of supreme importance, such as religion, its value often gets overlooked. That the language of the engineer needs to grow with the growth of knowledge is admitted, but the necessity for making efforts to secure that the meanings of the terms used are as far as possible permanently retained is urgent."

"Mr. T. Carter, in a paper before the Institution of Electrical Engineers, recently remarked, 'Our power to communicate with each other at all is a perpetual wonder. . . . It is as great an insult to a hearer or to a correspondent to be slovenly about our words as it would be if we gave him a picture that we had first slashed into ribbons.'

"The truth is that there are some who use words in a slovenly manner, not realising that by so doing they are insulting their hearers or readers, and entirely overlooking the fact that the slovenly use of words in their technical work is frequently very costly in time, in lawyer's fees, in loss of business and in numerous other ways."

(*Concluded on page* 184.)

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ELECTRICAL DISTRIBUTION.*

Some Fundamental Economic Facts—Production v. the Sale of Electricity—The Finance of Distribution—Teaching the Consumer.

By J. M. KENNEDY.

IN the early years of electrical supply, owing to legal restrictions and technical considerations, it was usual to have the generating station as near as possible to the centre of the load, and in general a system of direct current generation and distribution was adopted. Later, the introduction of the steam turbine has led to the almost universal adoption of alternating current in stations of any size; such stations are now usually situated outside the congested areas of large towns, and on sites where ample supplies of water are available for condensing purposes, a.c. current being transmitted at high voltage into the centre of the town. Approximately 90 per cent. of electricity now generated in this country is in the form of three-phase alternating current at about 6 000 to 11 000 V. Such supplies are largely converted into direct current and sold as such. However, in any new distributing system it is more economical to distribute low tension alternating current, owing to smaller capital outlay and smaller losses in converting plant.

When bulk supplies of a.c. are available, the existing low tension d.c. distribution system has been exchanged for alternating current. In other cases converting plant is used. In others, again, the original d.c. distribution system is being supplemented by an a.c. system.

Electricity Sells Itself.

As a rule, as soon as supplies become available, electricity may be said to "sell itself." Hence the technical staff has hitherto been occupied with the production of electricity rather than its sale. The proposals now before Parliament will enable most undertakings to purchase electricity in bulk more cheaply than they can generate it. Hence many of them will become distributing authorities only. Of the total sum of £194 000 000 invested at the end of 1924–5 in electrical supply undertakings, 54·6 per cent., or £106 000 000 is invested in the distributing side. In future capital spent in distribution will probably form a still larger proportion. A table presented in the original paper shows an annual reduction in the amount of revenue per £100 invested, i.e., increase in revenue is not so rapid as the increase in capital invested. This point deserves investigation. Whilst there has been an actual increase in the number of units sold per £1 of capital there has been a decline in the rate of increase during the last few years. Capital expenditure on distribution is becoming steady at about £21 per 1 000 units sold, and it looks as though sales might become steady at 48 units per £1. Much, however, depends on local conditions. In the case of the larger companies in the West End of London, where street work is very expensive, the figure averages about 31 kWh per £. One company with a big railway supply averages 78 kWh per £, and several big local undertakings in the East End are about the same. For overhead distribution in rural districts at least 60 kWh per £1 of capital is necessary if current is offered at reasonable rates. In the future the load factor of most undertakings should be greatly increased and the electricity sold per £1 should be increased to between 70 and 80 kWh. Conversely the distribution capital per 1 000 kWh should fall from about £21 to between £12 and £14.

The Extent of Demand.

The extent of the demand in many districts depends largely on the price charged. In the original paper this is illustrated by a diagram showing the relationship between number of units sold per head of population and average revenue per unit. For an average revenue of from 10d. down to 3d. per unit the average sales increased from 20 to 60 kWh per head. At 2d. and 1½d. per kWh 110 and 170 kWh per head are respectively sold. No undertakings with average revenue of 1½d. or less are selling under 200 kWh per head. But there are many stations where the works-cost only amounts to 1d. per unit, and in such cases it is obviously impossible to offer electricity to consumers at a price enabling them to make free use of electricity. This is one fundamental argument in favour of concentration of generation in the more efficient stations.

A table is also presented showing the allocation of the total revenue of all supply undertakings in Great Britain in the year 1922–3. It seems probable that in the next few years not less than 50 per cent. of the total revenue will go towards distribution charges as compared with 36·5 per cent. in 1922–3. Approximately £13 000 000 out of a total revenue of £35 500 000 was allocated to distribution, and of this amount 60 per cent. represents capital charges. This, again, emphasises the necessity of increasing the sales of units per £1 of capital invested, if any effective reduction in distribution costs is to be made. At present the number of employees concerned respectively with generation and distribution are about equal. The distribution side may be regarded as having a capital of £106 000 000 and a total revenue of approximately £42 000 000. £26 000 000 has to be paid for raw material (i.e., electricity in bulk). This raw material should be obtained at a fixed charge of say £4 per kW of maximum demand ("fixed charges") and a running charge of say 0·2d. per unit sold ("running charges").

Table I shows how charges for transformation, conversion and distribution are allocated.

The Framing of Charges.

The author discusses, with illustrations, how charges to consumers may be framed. Whilst it is not expedient to charge all consumers on a two-part tariff, the distribution authority must divide up his own costs in this manner. The question next arises how the existing undertakings who are only selling on the average 47 kWh per £1 of capital invested can improve their position. It is probably impossible to reduce such items of expenditure as distribution expenses, management, rates and taxes and capital charges. But a tariff should be adopted which will enable more units to be sold from the equipment representing expenditure already incurred and all future capital should be spent on a policy ensuring the sales of a greater number of units per £1 of capital. It has only recently been realised that the domestic consumer offers one of the widest fields for development. It is obviously more economical to get an existing consumer to purchase for heating and cooking, etc., 50 to 100 times his present consumption rather than to get new consumers to take the equivalent quantity. Tests showing the diversity factor with cooking ranges are quoted. An average small household will use from 5 to 8 kWh per day for cooking and the annual consumption for cooking only may easily reach 500 to 600 kWh per head of those supplied. Even at the high figure of 1d. per kWh this means an expenditure of only 4s. per week, which compares favourably with other methods of cooking. The introduction of electric water heaters would do still more to improve the load factor. Two-way switches can be fitted so that the electric oven and water heater cannot be connected simultaneously. Residential consumers' load factors of nearly 60 per cent. have been recorded with electric equipment of this description. Tariffs should be so framed that consumers with a really good load factor will get the supply at an average price of, say, 3s. 4d. per unit or less. A two-part tariff with a kilowatt and unit charge is hardly applicable to domestic consumers owing to the complication of putting in a maximum demand indicator. The two most successful methods are probably charges based on the floor area of premises supplied or the rateable value of the premises. Percentages varying from 10 to 20 per cent. of the rateable value, with a unit charge of from 1s. 2d. to 1d. per unit are quite common. Most undertakings are now offering supplies to "all-electric" houses at most favourable terms. If electricity is taken for heating, lighting and cooking, the average price per unit works out at well under 1d.

In fixing tariffs for consumers on a.c. systems consideration must be paid to power factor. It is preferable that consumers should be induced to modify or add to their installations in such a way that their power factor approaches unity. In the case of domestic consumers all the important items of equipment are likely to give unity power factor so that this question does not arise. Special study should be given to uses of electricity likely to lead to improvement in the power factor of the district.

It is also not enough merely to decide upon a favourable rate of, say, 3s. 4d. per kWh for certain forms of service; inertia in the minds of consumers must be overcome by means of a sales policy involving advertising, demonstrations and the loan or hire of apparatus.

* Abstract of a Paper read before Section G (Engineering) at the Oxford Meeting of the British Association.

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It is often maintained that owing to the low thermal efficiency of converting coal into electricity it is very wasteful to distribute electric power. But the modern generating station has a thermal efficiency well over 20 per cent., and up to 22 per cent. has been obtained in one of the largest stations. The distribution of energy does not involve any serious losses. Thus, with a generating efficiency of 21 per cent. and 15 per cent., losses in the distribution system, the consumer obtains 18 per cent. of the heat value in the coal. The consumer also has the great advantage that, for whatever purpose he wishes, he can use electricity at a very high efficiency. For heating the efficiency is of the nature of 100 per cent., for power purposes anything from 80 to 90 per cent. This high efficiency, coupled with the ease of control and absence of fumes and ashes, makes electricity one of the most desirable agents for all heating purposes. Again, the large generating station of to-day can use the cheaper classes of coal, costing only 10s. to 15s. per ton, whereas the consumer using coal for domestic purposes has to pay two or three times as much. There are very few, if any, installations at the present time which can compare with a bulk supply of electricity derived from a modern high efficiency generating plant.

However, this matter should not be judged only from the standpoint of coal conservation. It is important that our industrial population should work under the most efficient conditions and that their homes should be equipped with all reasonable aids to labour. By all means let us see that all coal used for electricity production is used in the most efficient manner possible, and this is one of the objects of the Bill now before Parliament. But having done so do not let us hesitate to recommend the use of electricity for any purpose whereby the amenities of life can be improved.

In conclusion, reference may again be made to the change which is coming over the electricity supply industry in the divorcement of generation from distribution—a change gradual but inevitable, due to economic force. Similar specialisation is going on in all branches of science and engineering, and those whose generating stations may no longer be required should not look upon the taking of a bulk supply as a curtailment of their activities, but rather as a setting free of their energies for a more active development of electricity supply.

TABLE I.

CHARGES FOR TRANSFORMATION, CONVERSION AND DISTRIBUTION.

	Rate per kW of Maximum Demand.	Percentage to be added to unit charge.
	£	Per cent.
Main transmission	0·5	3
Conversion to low tension alternating current	0·4	7
Conversion to direct current	1·3	14
Low tension distribution	2·2	9
Allow for management, rates and sundries	0·8	1
Total costs of Distributing Authority for low tension alternating current, excluding cost of bulk supply and without allowance for diversity factor	£3 18s. per kW.	20 per cent.
Total costs of Distributing Authority for low tension direct current, excluding cost of bulk supply and without allowance for diversity factor..	£4 16s. per kW.	27 per cent.

An Improved Miner's Lamp.

AT the meeting of Section I (Physiology) of the British Association on Tuesday Dr. H. M. Vernon and Mr. H. Manley demonstrated an electric miner's lamp which had been evolved with a view to increasing the luminous intensity. Special parabolic reflectors were placed above and below the lamp, the source of light being at their focus. This reduced the scattering and threw more light on the coal face. The top reflector, which was in the form of an inverted cone, improved the intensity by 31 per cent., while the increase due to the bottom reflector was 13 per cent., or a total of 44 per cent. Manufacturers were willing, if the demand were sufficient, to construct bulbs with a narrower neck. This would enable the collar reflector to be raised and the intensity increased to 50 per cent. above that of the present lamp. In this way it would be possible to increase the illumination without raising the weight of the lamp, a course to which the miner objected.

BROADCASTING.

Capt. Eckersley on the Future—Less Government Control.

ON Friday evening, August 6th, Capt. P. P. Eckersley, chief engineer to the British Broadcasting Co., gave a lecture in the Town Hall, Oxford, on wireless and broadcasting, in connection with the meeting of the British Association in that city. Speaking of the future, he referred to the Report of the Government Committee on the organisation of Broadcasting and said that it did not follow necessarily that the B.B.C. would soon be under Government control. In fact, he should say that the undertaking would be less under Government control than at present because the underlying idea was that there should be no privileges, but, on the other hand, there would be no restrictions. In his opinion, only on that basis could broadcasting go ahead. If broadcasting was to be restricted they would be restricting a new art. In the past, it had been an excuse that the income of the B.B.C. had been restricted and he hoped that in the future the Government would see that if people had subscribed towards a service, that money should go towards that service. The company could deal with an income many times greater than its present and deal with it efficiently in the public interest, and it was difficult to understand why a new and growing thing like broadcasting should be restricted.

Technical Policy.

Turning to the technical policy of the B.B.C., Capt. Eckersley repeated that the aim had been to increase the area for the crystal user. In order to carry out this idea to the full, the obvious thing was to increase the number of stations from the present 21 main and relay stations; indeed, to erect 42, but that was not a simple matter. At present, however, the urban areas had been covered in such a manner that 85 per cent. of users could get an uninterrupted programme and the next step was to deal with the country areas. Work upon that was proceeding.

Passing to the problem presented by many stations all over Europe working upon different wavelengths so close together that they cause interference with each other, Capt. Eckersley referred to the work of the Geneva Conference upon allocation of wavelengths and said that this scheme would be put into force on September 15th. At the present moment there were 200 broadcast stations erected or projected and 100 of these stations were to be relegated to common wavelengths, being sufficiently far apart not to interfere with each other. For the rest, every country had been given a certain number of exclusive wavelengths so that they could pursue their own uninterrupted course of development. Nine exclusive wavelengths had been given to Great Britain and for the rest the relay stations here would have to share wavelengths in the way already indicated. This scheme meant considerable sacrifice on the part of all countries, but he regarded it as extremely satisfactory that such an arrangement should have been come to.

The Future of Wireless.

After indicating the new wavelengths for the stations of the B.B.C., which have already been published, Capt. Eckersley visualised the future of wireless in which a combination of wireless and line telephony would enable the whole of the world to be linked up, so that public men in any part, speaking upon world topics, would be heard simultaneously all over the world and that, he added, would be a great factor in maintaining world peace. This prospect of linking up the world by means of wireless and line telephony might be possible in 10 or 15 years. There was no need to stop at linking up various parts of one country; countries might be linked up in the same way and it was there that one of the great possibilities of wireless in conjunction with line telephony was to be looked for. As an instance, he suggested that in the case of this country, a speech could be delivered in London and sent, say, to Poldhu by wire, transmitted thence across the Atlantic by the beam system, picked up on the other side and sent forward by line, and then broadcast by wireless to the people of Canada. In the same way, the message could be sent eastwards partly by wireless and partly by line telephony and distributed subsequently by wireless in South Africa and Australia and the Continental countries also, and in that way the whole world could listen to the important events in any particular country.

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ELECTRIC PLOUGHING.*

Power in Agriculture Mainly for Cultivation—The Economics of the Question—Objects of Ploughing and Possible Systems—The Need for Experiment.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.Inst.C.E., M.I.E.E.

IT is not so universally appreciated as it should be that agriculture requires more power than all other industries combined. Of this, by far the greater portion is required for cultivating the soil.

Not only is ploughing one of the most important and heaviest of farm tasks, but it is also the most expensive item in the arable farmer's bill; in fact, it is more costly than the manure which is used on the land. The economics of the question have arrived at the stage where it is necessary for the engineer to step in. The question of increasing the rate at which the work is carried out, seems to offer the greatest benefit. Results have shown that the cost of the extra power required to perform any cultivation at a higher rate than is usually done to-day, is much less than the amount saved in labour and other costs. It is therefore important to examine what contribution electricity can make towards solving the problem.

Continental engineers have given a great deal of attention to this matter, with the result that there are over 200 electric ploughs in use on the Continent to-day. Successful as these engineers have been, there is still a great deal of research and experimental work to be done, not only in the method of using the electric power, but also in the re-design of the actual implements.

The Horse Problem.

Opposition to all kinds of mechanical power for ploughing is sometimes met with in agricultural circles, on the grounds that it is absolutely necessary to have a number of horses about a farm for hoeing, harvesting and general carting. It is therefore claimed that the introduction of power-driven cultivating machinery, instead of reducing costs, would of necessity increase them, as the keep of the horses would be the same and the mechanical power would only be carrying out the work the horses would otherwise be doing, with the result that the horses would be standing idle for a considerable part of the year, while the machines were doing the work. This would be a strong argument if the work of ploughing could be extended over a long period, and if the horses were only used for this purpose during slack periods, but this is far from being the case. For land to be well cultivated, it is necessary to get the ploughing completed as early as possible in the autumn, and, again, it often occurs in England that long, wet periods are experienced, which delay work on the land, so that it is a great advantage, when a favourable opportunity presents itself, to have something quicker than the horse to carry out the work.

As scientific methods of farming are increased, there will be a still greater need for some quick and cheap method of ploughing, so as to enable the farmer to take full advantage of the new methods. For instance, on the author's farm, where his new system of artificial curing of hay and cereal crops is carried out, the crop is carried within a few hours of cutting and afterwards cured in the rick. One of the advantages of this system is that the field is cleared immediately the crop it cut, and ploughing is begun at once. The enterprising farmer of the future, having adopted these new and efficient methods, will not be prepared to use the horse plough and so lose the valuable time he has gained.

The objects of ploughing are:—(1) To break up, refine and aerate the soil. (2) To conserve moisture and drain off excess water. (3) To bury the weeds and rubbish by turning them under the surface, where they will decompose and provide humus. (4) To liberate the available plant food from the reserve of food constituents which the soil contains and (5) to allow the seed to be drilled at a proper depth and be sufficiently covered. By far the greater majority of the ploughs in the world to-day are of the short breast, broken or digging type, which permit of higher speeds. The rotary cultivator, however, is making rapid progress—there are over 500 in England alone to-day. The efficiency of the present day plough is very low, and its design has been more on a rule of thumb basis than upon modern scientific and mathematical research. The matter is complicated by the fact that the soil has not the uniform characteristics of water or air. On the other hand, the metals employed in the construction of these implements have been developed to a remarkable extent.

There are a number of different systems of electric ploughing in operation to-day, though they practically all fall into one of two classes, viz., tractors or rope haulages.

When electric tractors are connected to the supply mains, one of the main problems is the method of dealing with the feeder cable. Dragging the cable on the ground has not proved satisfactory, as the cable is easily run over and damaged. It is also worn very quickly. Electric tractors fitted with a tram-car type collecting trolley or bow, that picks up the current from a bare overhead conductor have not proved satisfactory, chiefly on account of the trouble in designing the supports so as to maintain sufficient tension on the conductor and at the same time to facilitate progressive movement at the end of each furrow.

The suspended bare conductor, with automatic friction controlled winder on a stationary feeder wagon has been employed in Sweden for some time. The cable runs from a transformer cabin to a special cable trolley, on which a mast is fixed. A bare conductor runs from the mast to the tractor. The overhead line consists of three bare, tough, aluminium alloy strips, spaced apart with insulating material. The trolley is placed at a suitable point for supplying the whole field, and the overhead line is kept at a definite tension by means of a motor on the trolley, which is kept continuously running. The tractor is fitted with a full creeper track. The motor is a 500 V, 15 H.P., three-phase induction motor, and propels the machine at a normal speed of 2¼ miles per hour.

A machine representing a considerable improvement in electric plough design, has been designed by N. Forssblad of Sweden. The main driving motor of the tractor is 30 H.P., three-phase, with controller, and oil switch with overload device. The cable drive is operated by an additional small motor through a friction drive, the motor being provided with a special hysteresis control rheostat. When the tractor is driven away from the source of supply, the cable is drawn out against the friction drive. When the tractor returns, the cable is slackened and as the resistance to the motor is thus removed, the motor comes into operation and winds up the cable. Owing to the hysteresis control, the operation of the motor is automatic, and it does not tend to burn out when it is stationary. A tractor of this type, with three shares, will plough, on an average, six acres per day to a depth of 8 in. The current consumption is about 28 kWh per acre.

Major A. McDowall has recently developed an original form of creeper tractor which falls into this group of automatic cable winders. It has the great advantage of minimum wear on the cable, as it is provided with an automatically movable self-winding supply point. The tractor also incorporates a novel method of side stepping the whole machine, ready for the next furrow.

Electric tractors hauling on a chain laid across the field, anchored at the ends have not proved very popular. They introduce the difficulties of anchorage without removing the weight of the haulages from the soil, as the round-about systems do.

Rope Haulages.

The steel wire-rope electric haulage systems, a number of types of which are described, have a number of advantages over all others when employed as large and very powerful units. The chief of these advantages are that the tractor does not pass over the soil, and the plough is of the anti-balance type, which means a great saving in time as compared with the time taken by most tractors in travelling over the headlands for turning purposes. Where a system of rope haulage is used, double-ended anti-balance ploughs are employed, one set of shares being in operation while the other is in the air, ready to be dropped for the return journey. This avoids any necessity for turning the whole implement at the end of each furrow. The only limiting factor in the length of the furrow, is the distance at which signalling can be conveniently done. In practice, this seldom exceeds 440 yds., owing to mists, slight hills in the land, etc. A double-haulage system, with two single-drum winders, one progressing up each

*Abstract of a Paper read before Section G of the British Association.

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side of the field, is perhaps the most popular type of equipment with farmers, co-operative societies and ploughing contractors. Another very suitable method is to be found on some French farms. It is an anchor-pulley method. The haulage wagon is equipped with a single 60 H.P. motor and two haulage drums, either of which can be operated by the motor while the other pays out the rope. It is stationary at about the centre of one side of the field to be ploughed.

As a result of the author's tests carried out on his own 600 acre farm at Greater Felcourt, East Grinstead, and his investigations in all Continental countries where electrical ploughs are in use, he has concluded that the most suitable equipment for the individual farmer with 150 acres and upwards, would be an electric tractor with a half-creeper track, a storage battery, a trailing cable, an automatic reel on the tractor, and an automatic and movable supply point at the centre of the furrow supplied from the side of the field. The tractor system is preferred because it avoids the work entailed by anchorages. The storage battery will supply the power for moving the equipment from field to field, and it also allows the tractor to be used at other times for general haulage purposes. The creeper track is of special importance, as it avoids the compression of the soil due to the weight of a wheeled tractor, and it becomes possible to reduce the pressure on the soil to less than that due to the weight of a man's foot.

Cost of Ploughing.

The following figures were given in the report of the Institution of Electrical Engineers, Electricity in Agriculture Committee (of which committee the author is a member) as generally accepted British prices for work at about 6 in. deep (according to the nature of the land) :—Steam ploughing, 15s. to 25s. per acre ; tractor ploughing, 17s. 6d. to 30s. per acre ; horse ploughing, 20s. to 35s. per acre.

As there is so little electric ploughing in this country, it is necessary to compare these prices with the contract price for electric ploughing in France. The 1924 prices, according to Hubert vary from 16s. 6d. to 34s. 3d.

The advantages of electric ploughing may be summed up as follows :—

(1) Practically unlimited power is available behind the plough ; thus any obstruction within the power of the plough can be overcome.

(2) Deep ploughing is possible, an important factor in the growth of sugar beet, sugar cane, etc.

(3) The cost per acre for electric power is considerably lower than for the fuel in non-electric types of plough.

(4) Low labour costs as compared with other forms of fuel, *e.g.*, the work of carrying fuel and water is entirely eliminated.

(5) Evenness of ploughed land, which gives a flat surface on which water will distribute itself.

(6) Increase of marketable produce. Prof. Fletcher of the University of California states that on farms where there is no mechanical power, 24 per cent. of the wheat, 67 per cent. of the oats and 44 per cent. of the hay produced are consumed by the working animals.

(7) During favourable weather, whole areas can be ploughed quickly.

(8) When the electric cable systems are used, the ploughed land remains light and aerated, and the machines do not traverse the main portion of the land.

(9) The ploughing load is practically essential in the development of rural electrification ; when combined with threshing it provides a load for about 200 days of the year and the amount of the load is from two to three times that required for all other purposes.

A great deal of arable land is being turned into pasture owing to the high cost of cultivation. This national calamity can be averted by the introduction of the cheaper and more economical electrical method.

From what has been said, it will be appreciated that electric ploughing is a serious proposition which it is well worth while to tackle. Its problems are not so difficult as might at first appear, for much experience has been gained from the electric ploughing work done in other countries under commercial conditions. Thus it is not too much to hope that in this country, provided we take advantage of the experience at our command, we may bring to fruition plans which will undoubtedly serve a turn in the solution of our agricultural problems.

Discussion.

Sir John Snell, opening the discussion, said he was glad to find that Mr. Borlase Matthews disagreed with the view that agriculture did not offer a large field for the application of electricity. Agriculture was, after all, our biggest industry, and anything which would tend to arrest the appalling reversion from arable land to pasture, which was making us more and more dependent upon other countries for our foodstuffs, ought to be assisted.

Mr. W. Coulman Brown (Honorary Judge of agricultural implements of the Royal Agricultural Society) said the author seemed to imagine that ploughing was getting out of date, and that we were moving towards rotary tilling. His experience, however, was that ploughing could not be abolished unless summer fallowing also was abolished, but without summer fallowing it was impossible to keep the land tilled. In his district a lot of arable land was going over to grass, and a lot more would go unless there were cheaper methods of working, brought about by the greater use of electricity or other power. The rotary tiller was a good instrument, but the chief difficulty was that it cost £2 200, so that it was too expensive for farmers to buy.

Capt. R. Butler said that the "Simar" rotary tiller was made primarily for market-gardening work, and he asked if that could be driven conveniently by electricity.

Prof. E. W. Marchant (Liverpool University) expressed admiration of the enthusiasm which Mr. Borlase Matthews had shown in his experiments on the application of electricity to agriculture. His work, in time, would prove of enormous value, because unless experiments of this kind were made by somebody who could really tackle them from the electrical engineering standpoint, there seemed no hope of the full development of electricity in agriculture. Discussing the relative costs of electric, motor and horse ploughing, he said it would appear that savings in cost could be effected in regard to electric ploughing by the co-operation of farmers in the neighbourhood, and if that had not been taken account of in the figures put forward in the paper, it gave electric ploughing a further advantage over other systems.

Mr. J. R. Bond (Examiner in Machinery for the National Agricultural Examination Board) also congratulated Mr. Borlase Matthews on the research work he was doing—not at the public expense. The principles of tillage, he said, were the same, no matter whether horses, tractors, or electric power were used, but there were undoubtedly advantages in possessing a reserve of power so that the work could be done at the right time. The real point, however, was that of cost, and farmers wanted to know whether electric ploughing involved less initial outlay than the systems at present in use.

Mr. J. H. Blackaby (Institute of Agricultural Engineering) suggested that even if ploughing could be done more quickly by electricity the work might not be done so well, so that the yield would decrease, and there would be no gain in the long run.

CORRESPONDENCE.

ELECTRICAL CONTRACTIONS.

[To the Editor.]

Sir,—The article headed as above in your issue of August 6th invites the following :—

A two reception five bedroom house is in course of erection in this district. The architects' provisional amount for lighting and bells is the inadequate sum of £17 (seventeen pounds).

Forty-one firms or representatives have called on the site and interviewed the foreman builder, to be referred to the architects.

Thirty-two of these have been lifted to the fifth floor of the building containing the architect's offices.

Probable Expenditure to Date.

41 tram fares.
41 representatives' time, say, two hours each. Foreman's time wasted, say, ten hours.
32 lift journeys, etc., etc.

As time advances, the successful lowest tenderer will probably carry out a very unsatisfactory job, and in addition to reducing his capital, some wholesalers or factors will be regretfully scanning a creditors' list.

Would "Feeder Box" and some of your readers who so readily blame the contracting section of the industry for want of energy and enterprise please prescribe a remedy for the numerous incidents of the above kind so rampant to-day. —I am, etc.,

H. E. Walker.

Temple Row, Birmingham.

P.S.—After giving away electric irons to secure orders, what can be offered to further debase the industry which should be the grandest and best in the world ?— H. E. W.

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LANGUAGE AND THE METRIC SYSTEM.

[TO THE EDITOR.]

SIR,—I was greatly interested in your editorial in your issue of July 9th on the question of an international language. I am in entire agreement with your views. If we are to have an international language it must be one of the modern languages and not one that is made up like Esperanto or Ido.

I have had on occasion to have translated communications in the foreign press, dealing principally with steam turbine phenomena and problems in the design of a.c. motors for the electric propulsion of ships. I have found great difficulty in getting my translators to give the true meaning of the sentences, so that it can be realised that the difficulties would be still greater if a made up language such as Esperanto was concerned.

There is no question of the want of an international language and my own opinion is that it should be English. I do not say that the English language is the best, but it is in most general use throughout the civilised world.

While therefore it is necessary for each country to retain its own language, English or some other approved language should be learnt by all countries as an international auxiliary language and all technical journals should be printed in one language.—I am, etc.,

CHARLES RETTIE.

Liverpool,
August 7th.

The Rawtenstall Bribery Charge.

WE publish the following letter, which has been addressed to the Editor of "The Bacup Chronicle and Stacksteads News," at the request of the Secretary of the British Electrical and Allied Manufacturers' Association.

THE EDITOR,
THE BACUP CHRONICLE AND STACKSTEADS NEWS.

It has been brought to our notice that in the early part of the year statements appeared in your paper to the effect that a firm or firms tendering for a 6 000 kW turbo-generator contract to the Corporation of Rawtenstall, offered the electrical engineer a bribe in order to influence his opinion in their favour.

We, the only members of the British Electrical and Allied Manufacturers' Association who tendered for this contract, hereby emphatically declare that so far as we are individually concerned, these statements are absolutely untrue.

While making this public disavowal of the charge made against us, we avail ourselves of the opportunity of expressing our appreciation of the decision of the Council to place the order with one of the undersigned firms.

We would ask you to give as full publicity to our denial as you did to the original statement.—Yours faithfully,

For Belliss and Morcom, Ltd.,
(Signed) R. K. MORCOM, Director.
For the British Thomson-Houston Co., Ltd.,
(Signed) W. C. LUSK, Managing Director.
For the Brush Electrical Engineering Co., Ltd.,
(Signed) W. JOHNSTONE, Managing Director.
For the English Electric Co., Ltd.,
(Signed) V. WATLINGTON, Managing Director.
For the General Electric Co., Ltd.,
(Signed) A. H. RAILING, Director.
For James Howden and Co., Ltd.,
(Signed) W. H. HOWDEN, Director.
For the Metropolitan-Vickers Electrical Co., Ltd.,
(Signed) R. S HILTON, Managing Director.

I.E.E. Council for the Coming Year.

Result of the Ballot to Fill Vacancies.

THE scrutineers (Messrs. P. M. Baker, A. Murray Coombs and A. F. Harmer) of the ballot to fill the vacancies which will occur in the Council of the Institution of Electrical Engineers on September 30th, 1926, have reported to the President that 1 420 ballot papers were returned, of which 20 were spoiled, and that the result of the ballot is as follows :—

President: Dr. W. H. Eccles, F.R.S.; Vice-President: Colonel T. F. Purves; Hon. Treasurer: Lieut.-Colonel F. A. Cortez Leigh; Ordinary Members of Council: (Members) Mr. A. C. Cramb, Dr. A. H. Railing, Dr. S. Parker Smith, and Mr. A. J. Stubbs; (Associate Member) Mr. F. W. Crawter. These members were all nominated by the Council. Mr. R. F. Ferguson, who was nominated by a number of non-Council members, therefore failed to secure election.

Electricity Supply Developments.

(*Concluded from page* 177.)

Cleveland, U.S.A., boilers of 30 000 sq. ft. heating surface, fed with pulverised fuel, are maintaining an average efficiency of 90·4 per cent. Suggestions have been made that gas and electricity undertakings should be combined for the purpose of conserving fuel. The author discusses possibilities in this direction, including low temperature carbonisation processes in some detail, but considers that at present the prospect in this direction do not appear encouraging enough to justify a departure from present methods. If, however, the gas industry can show that heat can be supplied to large power stations in the volumes and at rates no greater than the equivalent cost of raw coal, then assuredly electricity undertakings should, in the national interest, give the fullest consideration to such proposals.

The costs of generation per unit of a modern station with an annual load factor of 40 to 50 per cent. would be subdivided somewhat as follows: Coal, 46 per cent.; capital charges, 40 per cent.; other costs, 14 per cent. There seems little doubt that within a few years electricity will be generated at such stations, even with direct firing, at 0·3d. or less per unit. Broadly speaking, transmission costs would add 10 per cent. to the cost of units sent out by power stations, and the cost of bulk supply may be about 0·4d. per unit transmitted. The cost of local distribution causes a considerable addition to the cost of generation and transmission. The present average capital expended in distribution systems is £21 per 1 000 units sold; but in the future, when the bulk of transmission will be by means of alternating current and the simpler static transformer sub-stations, future capital investment in distribution should not exceed £11 or £12 per 1 000 units sold. Assuming an average price of coal of 20s. per ton, the *average* price at which electricity should be available within a few years should be under $\frac{9}{10}$d. per unit. The average cost for lighting may be reduced to 2d. a unit, but consumers in the sparser districts will naturally have to pay more.

Next, there is the prospect of electricity being applied in rural areas. Useful work on the use of electricity to stimulate plant growth has been made on a small scale, and it is hoped soon to apply the method to larger areas. But for the present it is mainly to the better lighting of farm buildings and the applications of power on the farm that we must look for consumption of electricity. In Sweden there are 52 000 farms, representing 40 per cent. of the arable land, which have the advantage of electric service. In Norway 350 out of 645 rural districts possess electrical service, and in Canada great progress is also being made. Many special applications of electricity in farming operations have been recorded by that useful pioneer in this country, Mr. Borlase Matthews. The problem to be solved is the reduction in cost of distribution to these somewhat isolated farms.

The B.E.S.A. Glossary.

(*Concluded from page* 179.)

With all this I quite agree and I therefore protest most emphatically against the unmerited slur which the British Engineering Standards Association has cast upon the fellow countrymen of Faraday, Clerk Maxwell and Kelvin, by giving its authoritative imprimatur to the publication of such a collection of definitions.

The circular which I have quoted above concludes with the statement that "This book is one which should be in the hands of every electrical engineer and student throughout the whole world." It certainly should have been, and might have been, such a book, but as it is, one can only feel sorry for any electrical engineer or student who seeks enlightenment in the opening section.

I would suggest, firstly, that the B.E.S.A. should withdraw the volume from publication until it has been thoroughly revised, and, secondly, that they should issue a notice asking those who have already purchased a copy to delete pages 11 to 18 pending their revision.

In view of the statement that "this glossary has been adopted by the International Electrotechnical Commission as the basis for the arrangement of an International Glossary," I trust that, for the sake of our national reputation, the B.E.S.A. will take immediate steps to recall it.

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E.H.T. OIL CIRCUIT BREAKERS.

Details of a New Heavy Current Type for the Canadian Market—Satisfactory Heat and Tripping Tests.

THE three-phase circuit breaker which we illustrate in Fig. 1 has been manufactured by Ferguson Pailin for the Canadian market. It has a normal current carrying capacity of 4 000 A at 15 000 V. The results of heat test which are

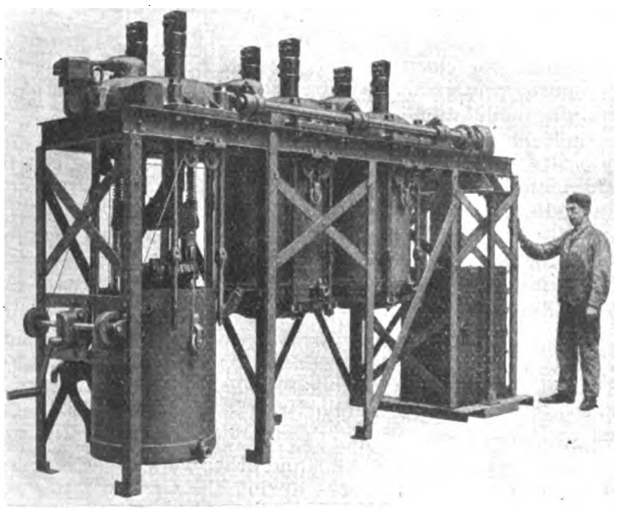

Fig. 1.—View of triple pole 4000 A, 15000 V circuit breaker with one tank lowered, showing raising and lowering mechanism.

given in Fig. 2 show that it complies with the conditions laid down by the B.E.S.A. The circuit breaker comprises three single pole units, mounted on a rigid framework built up of angle and channel iron and adequately braced to resist all distorting forces. Normally, the electrical operating mechanism is housed in a floor mounting structure at the end of the breaker, and a set of wire rope tank raising and lowering mechanism is incorporated in the frame work.

Each single pole unit is provided with a massive dome-shaped top plate of non-magnetic material in order to reduce the eddy current losses. This top plate accommodates the internal operating mechanism and gives ample air space above the oil level. Welded boiler plate is used for the tanks which are cylindrical with dished bottoms. They are fastened to the top plates by steel cradles and down rods, the latter being jointed to allow the cradle to swing clear and the tanks to be removed. A gasket between the tanks and top plate prevents oil throwing. One large capacity vent is fitted to each single

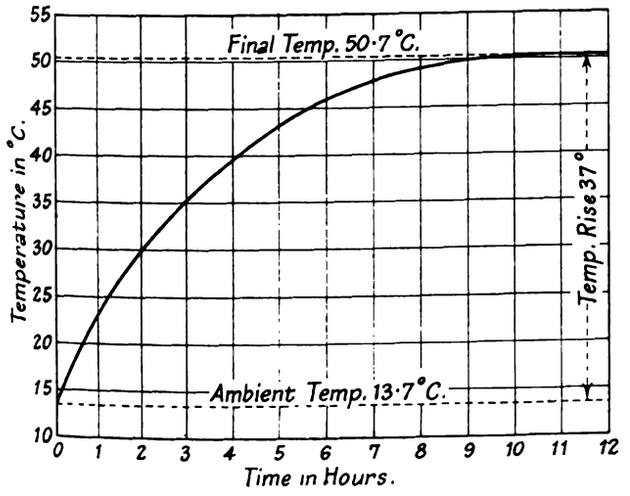

Fig. 2.

pole switch. This is thoroughly baffled and in addition is fitted with an oil and gas separator which returns any ejected oil to the tank when the pressure has subsided.

The terminal bushings consist of heavily bakelised copper tube, provided with ventilating features and fitted with suitable strip connectors at the upper end. The lower end carries the gun-metal casting to which the contact fingers are fixed. Standard contacts of the finger and inverted V bar type are employed. Two contact bars in parallel per phase are used, the apex of the V being truncated to obtain maximum oil circulation. The arcing contacts are of special design and have an extremely large thermal capacity.

As previously mentioned, the operating mechanism is of the internal type but the common countershaft which operates all three poles is mounted externally. A special feature is the design of the accelerating and buffering arrangements whereby, despite the large mass of the moving parts, an extremely high speed of break is obtained without shock or strain on the mechanism as will be seen from an examination of the time-speed chart shown in Fig. 3. Powerful accelerating springs are fitted ensuring a high initial speed. After a portion of the travel has been completed the buffering device comes into operation. This comprises a piston type oil dashpot in which the oil is allowed to escape through two small holes which are partially closed towards the end of the travel, thus increasing the resistance. With this arrangement the moving parts are brought smoothly to rest.

This circuit breaker is designed primarily for motor operation and emergency hand-operating gear is also fitted. The opera-

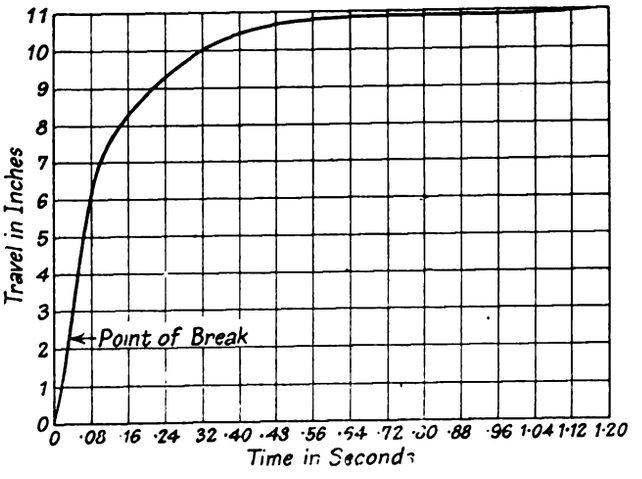

Fig. 3.

ting gear is of the standard Ferguson Pailin type and has been previously described in THE ELECTRICIAN. The circuit breaker complete with operating mechanism weighs approximately 5½ tons.

Books Received.

"The BEAMA Book" (London: Electrical Publicity Bureau). Pp. 144.

"Photometry." By John W. T. Walsh. (London: Constable and Co.) Pp. xxvii+505. 40s. net.

"Britain's Economic Plight." By Frank Plachy, Jnr. (London: Ernest Benn, Ltd.) Pp. 214. 7s. 6d. net.

"Coal and Ash Handling Plant." By John D. Troup. (London: Chapman and Hall.) Pp. viii+148. 13s. 6d. net.

"Condensing Plant." By R. J. Kaula and I. V. Robinson. (London: Sir Isaac Pitman and Sons, Ltd.) Pp. xiii+400. 30s. net.

"Pitman's Electrical Educator." Part 22. Edited by J. A. Fleming, F.R.S. (London: Sir Isaac Pitman and Sons.) 1s. 3d. net.

"Transactions of South African Institute of Electrical Engineers," May, 1926 (Institute of Scientific and Technical Societies, Johannesburg). 2s.

British Standard Glossary of Terms used in Electrical Engineering. (B.E.S.A. Publication No. 505—1926.) (London: B.E.S.A. Publications Department.) 5s. 6d. post free.

"International Critical Tables of Numerical Data, Physics, Chemistry and Technology." Vol. I. By the National Research Council of the United States of America. (New York: McGraw-Hill Book Co.) Pp. xx+415. $12.00.

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NEWS IN BRIEF.

E.C.A. Apprentice Training Appeal—Electric Starters for Motor Cycles—Insuring Hire-purchase Installations—Increasing Indian Electrical Market.

ON the Continent over 200 electric ploughs are now in use.

Liverpool will spend £25 000 on a combined police telephone box and fire alarm system.

Blackburn Town Council is considering a proposal to assist in the wiring of dwelling houses.

Within three or four years Italy's production of electricity will total about 10 000 million kWh.

Blackburn Town Council has voted £100 to the Electric Lighting Service Bureau (N.W. Province).

Walton-le-Dale Council is considering the question of an electrical installation for power purposes at the sewage works.

Notice is given by the Great Northern Telegraph Co. that communication with Peking is totally interrupted.

Preston T.C. is carrying out further conversions from gas street-lighting to electricity. By March next, 500 street lamps will have been so dealt with.

A Berlin telephone exchange just completed, said to be the largest in the world, will provide direct immediate communication between Berlin and Hamburg.

Reduced fare facilities will be available for exhibitors and buyers at the next British Industries Fair, and exhibits will be conveyed back from the Fair at half rates.

The new street lighting system at Lynn, Mass., is expected to make automobile headlights unnecessary, according to the Pennsylvania Public Service Information Committee.

Public demonstrations are being given in the G.P.O., Edinburgh, in the use of the automatic telephone system, which, it is expected, will be brought into use there next month.

At a Rugby inquest on Monday, the death of William Turvey, a B.T.-H. employee, was found to be due to his inhaling acid fumes when the works were closed for the holidays.

Applications are invited for the readership in physics, tenable at King's College, London, with a salary of £500 a year. Particulars are to be had from the Academic Registrar, University of London, South Kensington, S.W.7.

The City of Salzburg has made an issue of £600 000 7½ per cent. mortgage bonds, the proceeds of which, *inter alia*, will be applied to the redemption of Wurttemburgische Elektrizitäts A.G. 7 per cent. sterling bonds, 1923.

A fire in the accumulator room at the King Street, Blackburn, premises of Mr. J. Walsh, electrical contractor, was on August 6th put out by the staff before the arrival of the fire brigade. A number of accumulators was damaged.

Mr. R. Robson, chairman of the E.C.A. Apprenticeship Committee, appeals to members to arrange with local educational authorities for wiring classes for indentured apprentices, so that the boys may sit for the City and Guilds of London examinations next April.

A patented modification in the method of drying stacked crops electrically, adopted at the Oxford Institute of Agricultural Engineering, provides that the air-distributing cavity within the stack shall be curved outwardly towards the base of the stack, and formed with a spherical head.

A representative committee of commercial travellers' associations, including the Electrical Trades C.T.A., proposes to organise a Commercial Travellers' Club for London. Particulars may be had from the secretary, British Commercial Travellers' Club Committee, Anderton's Hotel, Fleet Street, London, E.C.4.

The Warsaw correspondent of the "Financial Times" states that the American-European Utilities Corporation has applied for a concession for the electrification of a large part of Poland, including the district from the Carpathians up to the Vistula and Warsaw, the industrial areas of Lodz, Czenstochowa, Biels and the Coal Basin.

The ancient and picturesque Streatley Mill, at Streatley, Berkshire, which was burned down last week, was used as a power station by the Goring and Streatley Electric Light and Power Co., and is to be rebuilt by the company as its power station, as far as possible in its old form. Meanwhile a supply is being furnished by the reserve plant in the Goring mill, which stands on the opposite bank of the Thames.

An enjoyable three-days' camp was held by the Tyne Electrical Engineers (R.E.) at North Shields.

Dublin Electricity Department is acquiring showroom premises at 39, Grafton Street, for £3 500.

It is suggested in motor cycling circles that an electric starter for motor-cycles would be a popular fitment.

Aberdeen Royal Mental Hospital will proceed at once to inaugurate an electrical department. This will include the recognised methods of electrical treatment and an artificial sunlight installation.

Sheffield Chamber of Commerce has informed the trade associations in the town that, if sufficient firms will exhibit, the authorities of the Birmingham Section of the British Industries Fair will provide a separate building for Sheffield exhibits.

Of electrical appliances, valued at $116 000 000, imported into Canada last year (states the Ottawa correspondent of the "Manchester Guardian") the U.S.A. supplied 86 per cent., Great Britain 10 per cent., and other countries 4 per cent.

A feature of the tenth annual Harper Adams' Poultry Conference on Thursday was a paper by Mr. R. Borlase Matthews entitled "Installing Electricity on Poultry Farms, or the Mechanical Problems involved in the Use of Artificial Lighting in Poultry Houses."

Volunteers who did stoking and other work at the Kingston-on-Thames electricity works during the General Strike were entertained at dinner by the Lighting Committee on July 21st. Letters of thanks and souvenir albums of photographs, taken at the works, were presented to the guests.

Hammersmith (London) Borough Council has accepted the offer of the Sun Insurance Office, Ltd., for the insurance against fire of the wiring and fittings to be supplied by the Council to consumers' premises on the hire and hire-purchase systems. The terms are at the rate of 1s. 6d. per £100 per annum (less 25 per cent. for a five years' contract, less 15 per cent. agency commission).

Electrical installation work for contract No. 2 portion of Bermondsey (London) Borough Council's new baths and washhouses at Grange Road is to be carried out by the Electricity Department, at an estimated cost of £2 044 14s. 4d. Tenders for the work from outside contractors ranged from £2 557 10s. to £1 806, the latter figure being exclusive of drilling and tapping.

A Bombay correspondent of "The Times" says the value of imports of electrical machinery into India in 1925–6, amounted to R.22 200 000, against R.20 200 000 in the previous year, and, if nothing untoward happens, such imports should be doubled in the next five years. Railway electrification is proceeding rapidly, mills are adopting electric driving, and hydro-electric enterprises are increasing.

The South Wales Institute of Engineers will hold an Engineering Exhibition in the Drill Hall, Dumfries Place, Cardiff, from November 24th to December 4th. There will be an Electrical Section, in which motors, switchgear, cables, cranes, telephones, wireless apparatus, etc., will be shown. Particulars may be had from Mr. Martin Price, South Wales Institute of Engineers, Park Place, Cardiff.

Amongst the awards made in the Faculty of Engineering at University College, London, are departmental honours to Mr. A. A. E. Hemmer and Mr. R. C. Mildner for the third and second year courses, respectively, in electrical engineering, while electrical engineering diplomas have been awarded Mr. A. Felton (with distinction), Mr. D. N. Haskell, Mr. M. V. Ramsay (with distinction), Mr. V. R. Vajramushti, Mr. H. L. White and Mr. J. P. Yates.

The Organising Committee of the Public Works, Roads and Transport Congress have decided to offer the following prizes for papers which are submitted for discussion at the Congress to be held in November, 1927:—1st prize, a gold medal and £50; 2nd prize, silver medal and £25; 3rd prize, bronze medal and £10. Papers may deal with electricity, tramways and light railways, or any subject falling within the services covered by the Congress. Applications for rules, etc., should be made to the hon. secretary, Public Works, Roads and Transport Congress, 84, Eccleston Square, London, S.W.1.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

DUMFRIES Town Council has increased the salary of the electrical engineer, Mr. W. Johnston, from £450 to £500 per annum.

Mr. C. A. Vandervell took fifteen firsts, nine seconds, and eight thirds at the Pangbourne and District Horticultural Show last week.

Mr. F. H. De Lattre has just retired from the post of accountant to the Birmingham Electric Supply Department after 34 years' tenure of the position.

Mr. Donovan Touche (a partner in the firm of George A. Touche and Co.) has been elected a director of the Westminster Electric Supply Corporation, Ltd.

Mr. Frank Aulton, traffic assistant in the Walsall Corporation Tramway Department, has been appointed traffic superintendent to the Bombay Electric Supply and Tramways Co,. Ltd.

Epsom Urban Council has decided to increase the salary of the electrical engineer, Mr. H. W. Watts, from £450 per annum to £600, by two increments, one of £100 in August, 1927, and the other of £50 a year later.

Mr. Clarence J. Timms is severing his active connections with the Aluminium Co. of America, and is taking up work as an officer of the General Instrument Corporation, of which he has been elected president and a director.

Mr. William C. Finch, a member of the staff of the Kent Electric Power Co., was married at Rochester last week to Miss L. E. Stevens, of Rochester. The bridegroom received a drawing-room timepiece from the Kent Electric Power Co.

Whilst motoring between Banbury and Oxford, Mr. W. T. Upton, of Hill, Upton and Co., electrical engineers and contractors, of Oxford, was involved in a skid. His car overturned and he was thrown out, sustaining a fractured collarbone.

Mr. Bernard L. Myer, of 51, Oxford Street, Liverpool, who has been during the last four years district manager for Simplex Conduits, Ltd., has now relinquished this position, and has joined the staff of Falk, Stadelmann and Co., Ltd., as resident representative, and will continue to operate from his old address.

The late Mr. W. P. Thompson, founder of the firm of chartered patent agents bearing his name, left estate of the value of £35 304, with net personalty of £22 696. An unusual direction in Mr. Thompson's will was that "My trustees shall after my death keep my body in a warm room until two doctors, after careful and thorough examination decide and certify that there are unmistakable signs of death and decomposition."

Mr. John Biggam (lecturer and research assistant in the department of mechanics and mechanical engineering at the Royal Technical College, Glasgow) has been appointed head of the mechanical engineering department at Robert Gordon's College, Aberdeen, and Mr. Duncan J. M'Kellar (lecturer and chief assistant in the department of electrical engineering at the Royal Technical College, Glasgow), has been appointed head of the electrical engineering department at the Robert Gordon's College.

In the presence of about eighty members of the staff of the Birkenhead Electricity Department, Mr. F. E. Spencer, the new borough electrical engineer, presented to Mr. G. P. Shallcross, who has just retired from that position, a chiming grandfather clock in mahogany on behalf of the staff and employees. Mr. Shallcross, whose portrait is reproduced on our picture page this week, has been associated with the undertaking ever since its inauguration, 31 years ago, and in 1913 he was appointed chief engineer in succession to Mr. W. Wyld.

Obituary.

The following deaths have been announced :—

MR. JOSEPH THOMAS LOWKE, on August 1st, aged 75 years. He was head of the firm of J. T. Lowke and Sons, electrical and radio engineers and contractors, of Kingswell Street, Northampton.

DR. MAXIME MENARD, in Paris, on August 7th, aged 53 years. A prominent French X-rays worker, he conducted the radiology department at the Cochin Hospital. His death was due to paralysis, following over twelve years' suffering directly due to his work.

IN PARLIAMENT.

Electricity Special Orders Approved in the Commons Last Week.

THE House of Commons has approved Electricity Special Orders in respect of the following districts :—(1)Gainsborough urban district, (2) Llantarnam urban district, (3) Baildon urban district and part of Wharfedale rural district, (4) part of Shardlow rural district, (5) Wetherby rural district and part of Wharfedale rural district, (6) Leiston-cum-Sizewell and Saxmundham urban districts and parts of Blything, Plomesgate and Woodbridge rural districts, (7) Bungay urban district, (8) Denby and Cumberworth, Dodsworth, Gunthwaite and Ingbirchworth, Hoylandswaine, Shelley, Shepley, Stocksbridge and Thurlstone urban districts and parts of Barnsley and Penistone rural districts, (9) Denholme, Queensbury, Shelf and Southowram urban districts.

Royal Assent.

On August 4th the Royal Assent to the following Acts of Parliament was read: Tramways Provisional Order Act, Kidderminster and Stourport Electric Tramway Act, Mexborough and Swinton Tramways Act, Guildford Corporation Act, London Electric and Metropolitan District Railway Companies Act, Metropolitan Railway Act, Southern Railway Act, Swindon Corporation Act, Shropshire, Worcestershire and Staffordshire Electric Power Act.

Replies to Questions.

The following are points from recent answers to questions in the House of Commons :—

The number of telephones on the Post Office system working on June 30th last was 1 419 181.

The most difficult localities for wireless reception appear to be in the eastern part of the Pacific Ocean, between Honolulu and Valparaiso.

The whole question of the production of smokeless fuel is discussed in the annual report of the Director of Fuel Research for 192-, which will be published during the autumn.

Men employed on the Lochaber water scheme (at present under contract to Balfour Beattie and Co) on June 30th last numbered 1 276, of whom 481 were from the Highlands.

The Postmaster-General is not prepared to authorise the release of £6 000 out of the unexpended balance of broadcasting revenue retained by the Post Office, to enable the B.B.C. to experiment in radio-physical culture.

It would not be proper, in the Home Secretary's opinion, for him to intervene in regard to the passing of by-laws for the abatement of the noise of loud speakers in gardens or open spaces. It is a matter for local authorities to consider.

The Overseas Trade Department will not take steps to facilitate the placing of orders in Great Britain by the Russian Commission now in this country and empowered to purchase electrical equipment to the value of £2 500 000 for Russian power schemes.

The abolition of spark wireless transmission from ships, which it is stated interferes with broadcast reception, would require international agreement, and it is hoped that it may be possible to achieve this when financial conditions at home and abroad in the shipping industry improve.

In reference to complaints of interference to wireless reception on the south coast by the operation of Morse signalling from the Newhaven station, the Postmaster-General said traffic is exchanged between Newhaven and Dieppe on the 800 metres wave, although the 300 metres wave is used for obtaining the attention of the Dieppe station. Means of reducing the interference are being investigated.

N.A.S.E. Programme.

Preliminary Particulars of Lectures and Meetings for Coming Session.

AN interesting programme of lectures and other events has been planned by the National Association of Supervising Electricians for the coming session, which opens on October 5th with Mr. A. M. Sillar's presidential address.

Papers at present arranged include :—" Hot Water Supply," by Mr. C. G. Nobbs ; "Cables," by Mr. A. J. Tracey ; "The Transverter," by Mr. W. E. Highfield ; " Possibilities of Development of Water Power in Great Britain and Ireland," by Mr. G. L. Addenbrooke ; " Electric Lighting and Electrically-worked Apparatus on Railways," by Mr. Roger T. Smith ; and " The Lighting of Small Towns," by Dr. J. A. Purves. The annual dinner will be held on February 26th.

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IN LIGHTER VEIN.

Random Comments and Reflections on Electrical Topics.

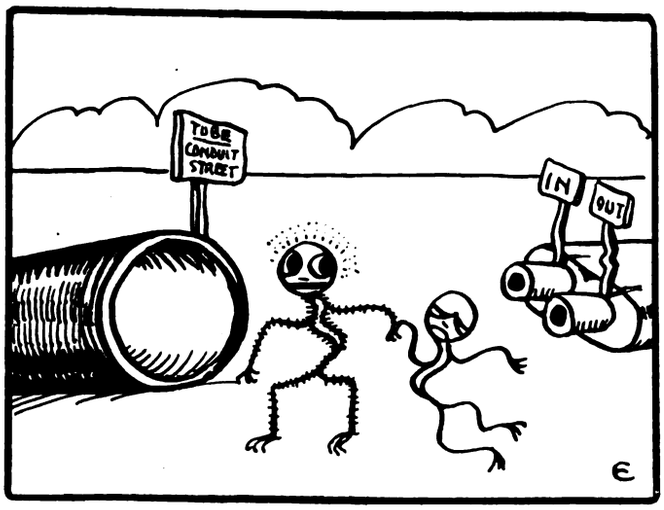
THE modern tendency is to make everything very easy to assimilate. Newspapers, for example, give us our news nicely served up, often with ready-made opinions for us to pass on. We sit in a chair and listen to news, music and other attractive items. Education is served up in a much more agreeable and palatable form, and children have their own newspaper, which gives them information in very simple language.

* * *

Not wishing it to be said that the electrical profession is at all backward in adopting modern methods, we have prepared a first simple lesson for young electrical engineers.

A HAP-PY E-VENT.

Miss AMP and Mr. VOLT went for a walk. Un-for-tun-at-ly they quar-rel-led a-bout the way they should go. Mr. VOLT



Miss Amp and Mr. Volt are seen a-bout to en-ter the Con-duit Street Tube.

pref-fer-ed to tra-vel by tube un-der-ground. This, he said, was simp-lex and saf-er. But Miss AMP want-ed to take a cab-tyre on the sur-face, as she thought it was a much more ea-sy way, as the runs were long-er and the road had not to be tak-en up when a new cir-cuit was laid. Af-ter a dis-cus-sion they a-greed to take the tube.

* * *

In pas-sing the me-ter man Miss AMP was lag-ging be-hind ; and so they had to pay more. This made Mr. VOLT ve-ry an-gry and he said that if it hap-pen-ed a-gain he would con-dens-er to help her on a bit.

* * *

The Con-duct-or ap-pear-ed ve-ry pleas-ed to see them, but be-came ve-ry heat-ed as the line was ov-er-crowd-ed. Far-ther and far-ther they went, un-til poor Mr. VOLT drop-ped sev-er-al times, but Miss AMP re-main-ed quite stead-y. They chan-ged at a way-side junc-tion box, and made their way to the sub-sta-tion where Mr. VOLT cal-led at the bus-bar and went on the boos-ter. This seem-ed to pick him up a lit-tle, and so they con-tin-ued their jour-ney.

* * *

They had man-y ad-ven-tures, ov-er-head, un-der-ground and on the sur-face, and be-came so much attached to each ot-her that they could not keep a-part, so they de-cid-ed to get mar-ried. This they did, chang-ing their name to WATT. May they ev-er mul-ti-ply !

* * *

Good-night, children !

Sequel to Electric Lighting Scheme.

AN interesting application is being made to the Isle of Man Chancery Court concerning money subscribed for the electric lighting of the village of Onchan. To celebrate the Queen Victoria Diamond Jubilee year (1897), money was subscribed for the electric lighting of the village, and the Isle of Man Electric Tramways Co. agreed to light the village, provided £300 were raised. In 1900 the Tramways Company went into liquidation. The question now to be decided is what is to become of the money subscribed.

CO-ORDINATION.

Progress in South-East Lancs—Report of the Advisory Board.

THE annual report of the South-East Lancashire Electricity Advisory Board for the year ended March 31st, 1926, contains interesting information regarding the progress made in co-ordinating electricity supply in that district.

Two bulk supply contracts were entered into during the year, and two others relating to Eccles and Leigh are still under consideration. The former of these presented difficulties, as the technical scheme provided that the supply to Eccles should be furnished by the Lancashire Electric Power Co. Eccles, however, also obtained a price from the Salford Corporation, and submitted to the Board a proposed contract with the latter body. The Board thereupon invited a further offer from the Power Company, being satisfied that the two offers originally made to Eccles were not strictly comparable. This action raised a general discussion as to the procedure to be adopted in future in regard to such matters. It was decided finally that a constituent authority requiring bulk supply should first report the nature of its requirements, and that the committee should define the conditions upon which offers should be invited, the authority then approaching the possible vendors, and submitting the proposed contract in due course to the committee.

A resolution, stating that the committee was of opinion that the supply to Eccles should be furnished from Barton, but that as Agecroft was a possible alternative source, prices should be obtained in addition from the Lancashire Electric Power Co. and from Salford was passed.

The report puts on record that in order that there should be no misunderstanding of the real intention of the Board in matters of this kind, the object of the resolution is to define what is technically the best source for a particular bulk supply. The second stage, the invitation of prices, is, from the point of view of the future development of the district, of secondary importance, though such prices will determine whether or not the authority concerned would be prejudiced by adopting the Board's recommendation.

With regard to the non-electrical areas, the Engineering Advisory Committee has completed its consideration of the demand in all such areas in the district, and it is pointed out that there is no information that there is a demand for a supply, or of a prospect of such supply being remunerative, in any part of the district not at present subject to a distribution order.

E.C.A. Policy.

President on Need of Close Co-operation with Manufacturers and Wholesalers.

IN a message to members of the Electrical Contractors' Association following his installation as President for the coming year, Mr. H. J. Miles says that important as is the need for co-operation between electrical contractors and supply authorities, another equally important direction for progress lies in increasing the degree of co-operation between electrical contractors on the one hand, and electrical manufacturers and wholesalers on the other.

" If " (says Mr. Miles) " slogans were not rather out of fashion, I would formulate ' More and Better Trading Agreements ' as my particular guiding phrase for the coming year. To buy well is to sell well, as we all know, trading terms depend largely upon ' quantity,' and to secure the latter in connection with our trading agreements, each and every E.C.A. member must pull his full weight. Because of this I ask every member to support the recommendations of his Council on every possible occasion. With such concerted trading support, I am certain that many additional trading agreements can be negotiated that will function to the utmost benefit of us all."

Points of View.

An expert is too often a man who takes pleasure in isolating his own problems from those in the co-ordination of which he is engaged.—*M. Clemenceau.*

* * *

It used to be said that the test of civilisation was the amount of soap used, but it might be said now that the test was the amount of electricity consumed.—*Sir Oliver Lodge.*

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given. Unless otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade, 35, Old Queen Street, Westminster, London, S.W.1.

DONCASTER CORPORATION, August 14th.—Electric wiring of 238 houses on Warmsworth Road (South) site. Particulars from Mr. R. E. Ford, housing surveyor, 3, Priory Place, Doncaster.

DUBLIN BOROUGH COMMISSIONERS, August 14th.—Public lighting requirements. Specifications from Supplies Department, Lord Edward Street, Dublin.

BOOTHSTOWN (NEAR MANCHESTER) CONSERVATIVE CLUB, August 16th.—Electric lighting installation. Particulars from the steward.

SITTINGBOURNE AND MILTON JOINT HOSPITAL BOARD, August 16th.—Complete electric lighting installation, for the hospital buildings at Keycol Hill, near Sittingbourne. Specifications, etc., after August 5th, from Mr. T. W. Ellis, 70, Victoria Street, London, S.W.1, or from the Clerk, 76, High Street, Sittingbourne.

SWANSEA CORPORATION, August 16th.—Electric lighting installations, etc., at new Isolation Hospital, Hill House Sketty, Swansea. Specifications from Mr. E. E. Morgan, 3, Prospect Place, Swansea; deposit £3 3s.

INDIA STORE DEPARTMENT, August 17th.—Supply of three electrically driven metre-gauge rope inclines, with gears, ropes, cars and rollers, for Uhl river hydro-electric project. Specification (5s.) from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1.

WORCESTERSHIRE EDUCATION COMMITTEE, August 17th.—Electric lighting installation at Prince Henry's Grammar School, Evesham. Particulars from the County Architect, Mr. A. V. Rowe, 38, Foregate Street, Worcester.

LEWIS HOSPITAL, STORNOWAY, August 18th.—Electric wiring, etc., in connection with extension of hospital. Schedules etc., from G. Gordon and Co., architects, Inverness.

DUNDEE CORPORATION, August 20th.—Supply and erection of six 200 kVA outdoor type transformers. Specification, etc., from Mr. D. H. Bishop, general manager and engineer, Electricity Supply Department, Dudhope Crescent Road, Dundee.

DUNDEE CORPORATION, August 20th.—Supply of e.h.t. three core and l.t. four core and two core paper insulated lead covered and double steel tape armoured cable. Specifications, etc., from Mr. D. H. Bishop, general manager and engineer, Electricity Supply Department, Dudhope Crescent Road, Dundee.

MANCHESTER CORPORATION, August 21st.—Two electrically-driven centrifugal pumps, with switch and starting gears, etc., for the Waterworks Committee. Specification, etc., from the Chief Clerk, Waterworks Offices, Town Hall, Manchester; deposit £1 1s.

BARNES URBAN DISTRICT COUNCIL, August 23rd.—One 3 000 kW turbo-alternator, with condensing plant and auxiliaries. Specification, etc., from Mr. C. S. Davidson, Electricity Works, High Street, Mortlake, London S.W.14; deposit £1 1s.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD., August 23rd.—Supply and erection of a central evaporating equipment at the company's Barking power station. Specifications, etc., from F. C. McQuown, joint manager and secretary, Moorgate Court, Moorgate Place, London, E.C.2; deposit £5 5s.

SALFORD CORPORATION, August 23rd.—Supply and delivery of e.h.t. paper insulated lead-covered cable. Particulars from City Electrical Engineer, Electricity Works, Frederick Road, Pendleton.

MANCHESTER CORPORATION, August 25th.—Supplying and fixing electric goods lift at Victoria Square Dwellings, Oldham Road, Manchester. Specifications from the City Architect, Housing Department, Civic Buildings, 1, Mount Street, Manchester.

METROPOLITAN ASYLUMS BOARD, August 25th.—Re-wiring electric lighting circuits and installing main supply cable at Princess Mary's Hospital, Cliftonville, Margate. Specification, etc., from the Board's Office, Victoria Embankment, E.C.; deposit £1.

BRISTOL BOARD OF GUARDIANS, August 26th.—Electrical fittings for six months. Particulars from Mr. T. S. Lamb, St. Peter's Hospital, Bristol.

STIRLING TOWN COUNCIL, August 26th.—Electrical work in connection with erection of eleven houses and four shops, being the first development of St. Mary's Wynd rehousing scheme. Specifications from Mr. A. H. Goudie, burgh engineer; deposit £1.

LIVERPOOL CORPORATION, August 31st.—Supply and installation of closed circuit code-signalling street fire alarm and telephone system. Specification from the Town Clerk.

VENTNOR URBAN DISTRICT COUNCIL, August 31st.—Schemes for electric lighting installation in main Assembly Hall, stage illumination, and lighting of adjacent rooms at Ventnor Town Hall. Particulars from the Surveyor; suggestions and estimates to Mr. James Wearing, Town Clerk, Town Hall, Ventnor.

SEVENOAKS URBAN DISTRICT COUNCIL, September 1st.—Supply and fixing of electrically-driven syren at the Fire Station, Eardley Road, Sevenoaks. Specification from the Surveyor, Council Offices, Argyle Road, Sevenoaks.

COVENTRY CORPORATION, September 3rd.—Buildings, foundations and subways; eight 15 000 kW turbo-alternators condensing plant and economisers; eight water-tube boilers, complete with induced draught plant, and chimneys; coal and ash handling plant; switchgear; steam and water pipework; crane; and cooling towers. Specifications, etc., from Mr. Geo. Tough, engineer and manager, Electricity Department, Council House, Coventry; deposit £5 5s.

SOUTHEND-ON-SEA, September 3rd.—Twelve months' supply (from 5 000 to 8 000 tons) of fuel oil. Particulars from Mr. A. C. Johnson, deputy borough electrical engineer, Electricity Works, London Road, Southend-on-Sea.

CROYDON CORPORATION, September 6th.—Supply of two 50 000 lb. per hour water tube boilers, etc. Specifications from the Engineer and Manager, Electric House, 38, High Street, Croydon.

INDIA STORE DEPARTMENT, September 7th.—Two 40 kW d.c. oil engine generating sets, complete with cooling plant, switchgear, cables, etc., for Bhatinda power station. Specifications from the Director-General, India Store Department, Branch No. 14, Belvedere Road, Lambeth, London, S.E.1.

STOKE-ON-TRENT CORPORATION, September 7th.—Supply and erection of one 10 000 kW turbo-alternator and condensing plant (contract 2 614); one natural draught cooling tower (contract 2 615); and ironclad l.t. three-phase switchgear (contract 2 616). Specification, etc., from the City Electrical Engineer, St. George's Chambers, Wolfe Street, Stoke-on-Trent; deposit £2 in respect of each contract.

INDIA STORE DEPARTMENT, September 10th.—Supply of power station and switchgear and auxiliary plant, in connection with Great Indian Peninsular Railway electrification Specification (£1) from the Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1.

LONDON COUNTY COUNCIL, September 13th.—Three water tube boilers, with auxiliaries. Specifications from General Manager, L.C.C. Tramways, Victoria Embankment, London, W.C.2.; deposit £3.

ST. MARYLEBONE (LONDON) BOROUGH COUNCIL, September 13th.—Supply and fixing of electric overhead runway for removing house refuse from storage pit to screening plant. Particulars from Borough Engineer, Town Hall, Marylebone Road, London, N.W.1.

BIRMINGHAM CORPORATION, September 21st.—Supply, delivery and erection of plant for refuse disposal and salvage works. Specifications from the Superintendent, Salvage Department, 161, Corporation Street, Birmingham; deposit £1 1s.

Overseas.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

AARHUS (DENMARK) LIGHTING DEPARTMENT, August 17th.—Steam turbo-generator and boiler plant, for new power station. (Reference A.X. 3 371.)

INDIA STORE DEPARTMENT, August 17th.—Transformers for power station in connection with G.I.P. Railway electrifi-

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cation. Specifications (10s.) from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1.

JOHANNESBURG MUNICIPALITY, August 19th.—Overhead tramway equipment, comprising double pull-offs, straight line hangers and insulator pins. (Reference B.X. 2 702.)

JOHANNESBURG MUNICIPALITY, August 19th.—Supply of h.t. switchgear. (Reference B.X. 2 726.)

CHILIAN STATE RAILWAYS, August 20th.—Signals, telegraphs, telephones, etc. (group 36); electric materials for sub-stations, aerial lines and lighting, 1st-zone (group 37). (Reference C. 1 935). Booklets (in Spanish) numbered to correspond with the group numbers, and giving further particulars will be loaned to British firms in the order of application.

JOHANNESBURG MUNICIPALITY, August 21st.—Street lighting material. (Reference B.X. 2 728.)

JOHANNESBURG MUNICIPALITY, August 21st.—Reverse power relays (contract 668). (Reference B.X. 2 725.)

VICTORIAN ELECTRICITY COMMISSIONERS, August 23rd.—Supply of 10 in. diameter disc suspension insulators, with cotton split pin or similar coupling device. (Reference B.X. 2 614.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 24th.—Synchronous condensers (section 18, Waikaremoana). (Reference B.X. 2 608.)

PRETORIA MUNICIPALITY, August 26th.—Equipment for five transformer stations. (Reference B.X. 2 721.)

SOUTH AFRICAN RAILWAYS AND HARBOURS ADMINISTRATION, August 26th.—Material for distribution system in connection with the Cape Town suburban electrification. (Reference B.X. 2 680.)

CITY ELECTRIC LIGHT CO., LTD., BRISBANE, August 27th.—Supply, delivery and erection of one 12 500 kW turbo-alternator. (Reference A.X. 3 085.)

NEW ZEALAND RAILWAYS DEPARTMENT, August 30th.—Supply of slip ring induction 400 V 50 cycle three-phase motors and starters. (Reference B.X. 2 561.)

DEPUTY-DIRECTOR OF POSTS AND TELEGRAPHS, MELBOURNE, August 31st.—Telegraph equipment (schedule C. 109). (Reference B.X. 2 653.)

PERNIK STATE COAL MINES, BULGARIA, September 1st.—Electricity generating plant, consisting of two 4 000 kW steam turbo-generator sets, buildings, etc.

VICTORIAN RAILWAY COMMISSIONERS, September 1st.—Equipment for automatic control of two rotary converters at Seaford sub-station.

VICTORIAN RAILWAY COMMISSIONERS, September 1st.—Automatic sub-station equipment (contract No. 39 287), for Elwood sub-station. (Reference B.X. 2 598.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 2nd.—Electro-pneumatic working of points and day colour light signalling, with alternative current track circuits, in connection with the electrification of the Cape Town suburban railways. Specifications, etc., from the Office of the High Commissioner for the Union of South Africa, Trafalgar Square, London, W.C.2, or from the Chief Railway Storekeeper, Park Station Chambers, Johannesburg; deposit £5 5s.

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, September 6th.—Supply of 66 000 V oil circuit breakers for Barren Jack hydro-electric scheme. (Reference B.X. 2 749.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 7th.—Synchronous condenser for Arapuni power scheme, section 165. (Reference B.X. 2 665.)

DUNEDIN (N.Z.) CORPORATION, September 8th.—(i) Reaction water wheel for direct connection to a.c. generator; (ii) one 3 000 kW, 6 600 V, 50 cycle generator; (iii) four 1 000 kW 6 600/20 000 V, 50 cycle transformers; (iv) switchboards, oil-break switches, disconnecting switches, voltmeters, ammeters and wattmeters, current and potential transformers, etc. (Reference B.X. 2 654.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, September 14th.—Telephonists' telephones and handsets. (Reference B.X. 2 696.)

CONSTANTZA (ROUMANIA) PORT ADMINISTRATION, September 15th.—Supply and erection of eight electric portal cranes. (Reference A.X. 3 399.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 15th.—Supply and installation of electricity distribution system for the town of Luxor, including 6 830 metres of h.t. and 1 210 metres of l.c. armoured cable, 6 transformer cabins, 12 transformers (from 10 to 50 kVA), copper cable, poles, cable boxes, cut-outs, insulators, lamps, etc. (Reference B. 2 737.*)

JOHANNESBURG COUNCIL, September 18th.—Underwriters' wire. (Reference B.X. 2 766.) Supply of 6 600 V truck-type ironclad switchgear panels. (Reference B.X. 2 767.)

SYDNEY CITY COUNCIL, September 20th.—One h.t., d.c. Kenetron valve testing set for underground cables. (Reference B.X. 2 748.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, September 21st.—Switchboard keys, and parts (schedule 26/720). (Reference B.X. 2 699.)

AUCKLAND ELECTRIC POWER BOARD, September 27th.—One 14-ton electrically-operated crane. (Reference A.X. 3 415.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 28th.—Three motor-driven low lift pumps with control apparatus, for Taieri drainage scheme. (Reference A.X. 3 274.)

NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMWAYS (CHIEF ELECTRICAL ENGINEER'S BRANCH), September 29th.—One drag link ash conveyor. Reference No. A.X. 3 432.)

VICTORIAN GOVERNMENT RAILWAYS, September 29th.—Two motor-driven disc grinding machines and necessary equipment. (Reference No. A.X. 3 433.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, October 5th.—Switchboard cords (schedule No. 115). (Reference B.X. 2 747.)

CHRISTCHURCH (N.Z.) DRAINAGE BOARD, October 19th.—Supply and erection of three sets of electric centrifugal pumping plants (contract 26 329). (Reference A.X. 3 215.*)

VICTORIAN GOVERNMENT RAILWAYS, October 20th.—Supply and delivery of rail motor equipment. (Contract No. 39 614. Reference No. A.X. 3 449).

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Supply of 110 000 V transformers for Waikaremoana power scheme, section 17. (Reference B.X. 2 744.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Indoor control gear and switchgear for Waikaremoana electric power development (section 14). (Reference B.X. 2 675.)

Tenders Accepted.

SALFORD CORPORATION.—Massey Bros., tramcar fittings, £18 930.

VICTORIA FALLS AND TRANSVAAL POWER CO., LTD.—Sterns, Ltd., supply of turbine oil.

DARTFORD BOARD OF GUARDIANS.—Mr. W. Bayliss, repairs to electrical installation, £27 15s.

H.M. OFFICE OF WORKS.—General Electric Co., Ltd., supply of vacuum and gasfilled lamps for 12 months.

DUNDEE CORPORATION.—Buglass and Jamieson, electric wiring work at Gas Treasurer's office, £199 4s.

EPSOM URBAN DISTRICT COUNCIL.—English Electric Co., Ltd., two Diesel engines for the electricity station, £12 533.

METROPOLITAN WATER BOARD.—Higgins and Griffiths, electric light installation at receiving office, £82 (recommended).

CHESTER CORPORATION.—Herbert Morris, Ltd., 5-ton travelling crane for proposed sub-station, £74 (recommended).

WARWICK GUARDIANS.—Midland Electric Light and Power Co., Ltd., electric lighting installation at the Institution, £700.

BURNLEY JOINT HOSPITAL BOARD.—R. B. Beattie, electric light installation at the Sanatorium, Marsden Road, Burnley, £487.

CROYDON CORPORATION.—S. Butler and Co., Ltd., electric coal-handling crane, £1 244; R. H. Neal and Co., crane track, £350.

GENERAL POST OFFICE, LONDON.—General Electric Co., Ltd., 150 000 Robertson carbon filament telephone switchboard lamps.

LEEDS CORPORATION.—Flather and Co., Ltd., 50 H.P. 550 V d.c. enclosed motor, with switchboard, switchgear and connections, £130.

HIS MAJESTY'S OFFICE OF WORKS.—Siemens and English Electric Lamp Co., Ltd., supply of vacuum and gasfilled lamps for one year.

DEWSBURY TOWN COUNCIL.—W. T. Henley's Telegraph Works Co., Ltd., cable for feeder from electricity works to Market Place, £816.

PRESTON CORPORATION.—British Imperial Cables, cables, £6 430; English Electric Co., Ltd., outdoor kiosks, £1 600 (both recommended).

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PENNSYLVANIA RAILROAD.—American Brown Boveri Electric Corporation, complete electrical equipment of seven 1B–B1 type locomotives.

SUNDERLAND CORPORATION.—Gee and Brown, machinery and fittings for electric power for the Hallgarth Square establishment (recommended).

FULHAM (LONDON) BOROUGH COUNCIL.—Heenan and Froude Ltd., reconstruction of refuse destructor at the Electricity Works, £39 048 (recommended).

LONDON COUNTY COUNCIL.—Commercial Telephone and Electrical Co., Ltd., electric wiring and fitting at Franklin Street, Deptford, school, £141 5s.

MANCHESTER EDUCATION COMMITTEE.—Harrisons, Ltd., electric light wiring of Cheetham Clinic; E. Sudlow and Co., Ltd., electric light wiring of Ashton Old Road School.

BATH CORPORATION.—Callender's Cable and Construction Co., Ltd., cables for Batheaston, Bathford, Bathampton and West Wilts extensions, £17 140 15s. (Recommended.)

LONDON COUNTY COUNCIL.—Dyer and Young, Ltd., E. Showell and Sons, Ltd., and Yorkshire Switchgear and Engineering Co., Ltd., controller segments, finger tips, etc.

HEMSWORTH RURAL DISTRICT COUNCIL.—Houghton Main Colliery Co., Ltd., wiring 50 houses on Great Houghton estate for electric light, £1 5s. per point, to include plain shades and globes.

BIRMINGHAM GUARDIANS.—Callender's Cable and Construction Co., Ltd., cable system, switchgear, etc., in connection with electric light installation at Monyhull Colony, £3 773; Walker Bros., installation work, £1 400.

LURGAN URBAN DISTRICT COUNCIL.—Swinson's Engineering Co., motor driven pumps, £414 15s.; Curran Bros., switchboard, £302 15s.; F. Reid, Ferens and Co., cables and overhead and underground mains, £2 314 15s.

DURHAM COUNTY COUNCIL.—Devereux, Moodie and Co., electric light installation at Delves Lane new Council school, £147; Gray Bros. (Newcastle), Ltd., electric light installation at Silksworth Senior Mixed school, £178 13s.

SOUTHEND-ON-SEA CORPORATION.—J. R. Wright, 750 kW M.A.N. Diesel engine, £5 800; Belliss and Morcom, re-conditioning and erecting engine, £3 100; Bruce, Peebles and Co., generator, £1 688; Spencer, Bonecourt, Ltd., waste heat boiler, £410;

WEST HAM CORPORATION.—Brush Electrical Engineering Co., Ltd., tram car bodies, £15 200; Hurst, Nelson and Co., Ltd., trucks, £2 520; British Thomson-Houston Co., Ltd., motors, £3 833, sundry electrical equipment £2 509 (all recommended).

HAMMERSMITH (LONDON) BOROUGH COUNCIL.—John Brown and Co., Ltd., spare parts for pulveriser of powdered fuel plant, £144; British Thomson-Houston Co., Ltd., reactors, to be installed between two-phase and three-phase switchboards, £465, plus £72 for an improved type of connection to terminals.

GLASGOW CORPORATION.—Jas. Cormack and Sons, Ltd., two electric fans, including house for same, for M'Lellan Galleries, £172; W. Draper and Co., alterations and improvements on electrical fittings in auditorium of Partick Burgh Hall, £122; R. J. McIntyre, electrical installation in Wellmeadow and Cathcart Road houses, £872 and £406.

LICHFIELD CORPORATION.—Measurement, Ltd., for three-phase electricity meters for one year: 2½ A, £3 19s. 3d.; 5 A, £4 1s. 3d.; 10 A, £4 3s. 6d.; 15 A, £4 12s. 6d.; 20 A, £5 0s. 9d.; 30 A, £5 8s. 3d.; 40 A., £5 14s. 9d.; 50 A, £6 5s. 3d.; Cable Accessories Co., Ltd., 5 doz. lamp standards, £3 18s. 6d. each, and 2 doz. wall brackets, £1 12s. 6d. each.

SALFORD CORPORATION.—British Insulated Cables, Ltd., substitution of three single-core 33 000 V feeder cables for each of the three three-core 33 000 V cables between Agecroft and Frederick Road stations, £4 800; and supply of additional feeder, with three single-core 33 000 V cables and pilot cable, £9 230, including trenching, reinstatement of footpaths, etc.

INDIAN STORES DEPARTMENT.—English Electric Co., Ltd., 400 coils of cable, v.i.r., single core, Rs. 2 900; General Electric Co. (India), Ltd., 2 000 lamps, electric m.f. vacuum type, 225 V, 60 W, Rs. 1 250; J. Stone and Co., 3 000 electric lamps, white sprayed, 24 V 15 W, Rs. 3 094; English Electric Co., Ltd., 965 coils v.i.r. single-core cable, Rs. 6 996; F. and C. Osler, Ltd., 100 d.c. table fans, 16 in., 220 V with blades, guards and regulator, Rs. 5 700; General Electric Co. (India), Ltd., 10 fans, ceiling, "Swan," d.c., 220 V, etc., Rs. 1 095, and 30, "Kingsway," a.c., 60 in. sweep, 230 V complete, Rs. 3 623; Babcock and Wilcox, Ltd., ash-handling plant, Rs. 10 920; Russa Engineering Works, Ltd., 2 000 electric lamps, m.f., gas filled, 220 V, 40 W, Rs. 1 833; Jessop and Co., Calcutta, 99 house service meters, d.c., two wires, 2½ to 10 A, Rs. 2 228; Callender's Cable and Construction Co., 50 house service meters, d.c., two wire, 225 V, 2½ and 5 A, Rs. 1 631; Russa Engineering Works, Ltd., 64 ceiling fans, a.c., "Malabar," 56 in. sweep, 230 volts, 50 cycles, with blades, down rod, regulator, Rs. 7 098, 50 ditto, Rs. 6 100.

HESTON AND ISLEWORTH URBAN DISTRICT COUNCIL.—Enfield Cable Works, Ltd., 6 700 yards 0.75 and 3 350 yards 0.35 cable; Enfield Cable Works, Ltd., £4 197 10s., and £1 031 16s. (recommended); also tendered: British Insulated Cables, Ltd., £4 240 and £1 045; W. T. Henley's Telegraph Works Co., Ltd., £4 241 2s. and £1 045 4s.; Macintosh Cable Co., Ltd., £4 241 2s. and £1 045 4s.; Siemens Bros. and Co., Ltd., £4 241 2s. and £1 048 11s.; W. T. Glover and Co., Ltd., £4 254 10s. and £1 045 4s.; Pirelli-General Cable Works, Ltd., £4 254 10s. and £1 045 4s.; Union Cable Co., Ltd., £4 271 and £1 063; Callender's Cable and Construction Co., Ltd., £4 288 and £1 058 12s.; Enfield Cable Co., Ltd., troughing covers and bridges, 7 in. by 2¾ in. per 3 350 yards, £603 14s., 6½ in. by 3 in. per 3 350 yards, £586 5s. (recommended). Other tenders: Doulton and Co., Ltd., £491 5s. 10½d. and £323 8s. 1d., (to deliver when normal supplies of fuel are resumed); Pirelli-General Cable Works, Ltd., 6½ in. by 3 in., £596 14s. 4d.; British Insulated Cables, Ltd., £614 3s. 4d.; Callender's Cable and Construction Co., Ltd., £621 2s. 11d.; Siemens Bros. and Co., Ltd., £1 046 17s. 6d.; W. T. Glover and Co., Ltd., 7 in. by 2¾ in., £614 3s. 4d.; Macintosh Cable Co., £614 3s. 4d.; W. T. Henley's Telegraph Works Co., Ltd., £614 3s. 4d.; Union Cable Co., Ltd., £622.

£5 5s. for a Word!

Progress of "The Electrician's" Competition to Discover Suitable Title for Contractors.

WHEN we first invited suggestions from our readers for a simple distinguishing title for registered electrical installation contractors we were fully aware of the need for such a title, but were hardly prepared to find, as we have found, that electrical men all over the country, are intensely interested in finding a solution.

Entries for our competition are still coming in in large numbers, and although several readers have submitted the identical words, there is still a very imposing list of names for submission to the National Register.

In view of the desirability of getting any suitable entry adopted with the minimum of delay, it has been decided to fix August 31st as the last day for the receipt of entries, and readers with suggestions to offer are asked to send in their efforts as soon as possible.

The conditions of the competition are quite simple. The prize of £5 5s. will be paid by THE ELECTRICIAN to the reader who invents a word, which, having been submitted to the Editor, and passed on to the National Register of Electrical Installation Contractors, is officially adopted by the organisation as a descriptive title for a registered electrical installation contractor. Competitors may send in as many suggestions as they like, but each attempt must bear the inventor's name and address. The decision of the National Register must be accepted as final.

Business Items.

BLACKBURN Town Council has approved a plan for a lock-up shop in Mill Lane for Mr. Henry Garstang, electrical contractor.

The telephone numbers of the Scott Insulated Wire Co., Ltd., of 44-46, Queensland Road, Holloway, London, N.7, are "North 3408 and 3409."

W. H. Axworthy and Co., electrical engineers, have removed from 43, Old Town Street, Plymouth, to a shop and more commodious premises at 4, Duke Street, Plymouth.

Mr. Charles Jackson, electrical contractor, lately carrying on business as Jackson and Timm, at 11, Silver Street, Whitby, announces that he is now in business on his own account at 7, Hunter Street.

The Associated Telephone and Telegraph Co. announces that, together with a Belgian group headed by the Banque d'Outremer, it has acquired an important interest in the New Antwerp Telephone and Electrical Works. The Associated Telephone and Telegraph Co. is an American corporation backed by leading British and Continental telephone interests.

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ELECTRICITY SUPPLY.

Southwark's £12 000 Rates Contribution—Hastings Co-operates with Contractors in Free Wiring Scheme—£76 000 Douglas Extensions Project.

PROFIT on the Rugby electricity undertaking last year was £4 000.

The Jersey Electricity Co., Ltd., is extending its mains in several districts.

Clitheroe Lighting Committee has decided to light the main streets electrically.

Ealing T.C. is applying for sanction to a loan of £25 000 for mains and services.

The Minister of Transport has confirmed the Brecon Electricity Special Order.

For the past year the net deficit on the Worksop electricity undertaking is £3 388.

Blackpool Corporation is now supplying electricity in bulk to Thornton District Council.

Kettering electricity department has earned a net profit of £3 959 during the past year.

The net profit on the past year's working of the Lytham electricity undertaking was £7 000.

Heston Mains Extensions.

Heston and Isleworth U.D.C. has received sanction to a loan of £12 000 for electricity mains.

Mansfield Corporation's electricity department made a net profit of £6 016 during the past year.

Chester Electricity Committee will create a special reserve fund to meet the cost of battery renewals.

Retford T.C. has applied for a loan of £7 600 for a generating station, and £3 275 for additional generating plant.

Luton T.C. has increased the charge for electricity by 10 per cent. from June 30th last until March 31st next.

Adwick-le-Street U.D.C. proposes to spend over £10 000 on an extension of its electricity supply to the villages of Woodlands and Adwick.

The Pooley Hall Colliery Co. is applying for a Special Order to supply electricity in various parishes on the southern border of Burton-on-Trent.

Southwark (London) B.C. made a profit of £17 844 on its electricity undertaking last year, out of which £12 000 is to be allocated to relief of rates.

The net profit on the Oldham electricity department for the year ended March last was £4 951. The Council has applied for a loan of £50 000 for mains.

The Honiton Electric Light Co. has asked for the assent of Honiton T.C. to the company's application for an Order to supply electricity in the town.

Seaham Harbour R.D.C. has been informed that there is little prospect of the Council's Electricity Supply Order coming into force before November or December next.

An application by the Electrical Supply Corporation, Ltd., to the Electricity Commissioners for a Special Order in respect of the Burgh of Peterhead has been approved by Peterhead Town Council.

The Glamorgan Roads and Bridges Committee has decided to lodge an objection to the proposal of the South Wales Electrical Power Distribution Co. to use overhead electric lines in Cowbridge.

Doncaster's New Scheme.

Doncaster T.C. has applied for loans of £16 950 for a new central distributing scheme, including high pressure mains, transformers, etc., and £35 750 for low pressure cables, etc., for the next two years.

Boston (Lincs) R.D.C. has sealed a contract for the electric lighting of the parish of Skirbeck by the Boston and District Electric Supply Co., Ltd. Skirbeck Quarter P.C. also proposes to adopt electric lighting.

Sheerness U.D.C. has arranged with the Sheerness and District Electric Supply Co. to supply electricity to the new sewage pumping station. The Council will pay £700 towards the cost of the cable extension.

Retford T.C. is applying for a loan of £10 875 for its electricity department, and is also asking the Electricity Commissioners to consider the question of granting the balance of the original application—viz., £6 832.

The Leicestershire and Warwickshire Electric Power Co. proposes to supply electricity in certain parishes in the Tamworth rural district. The Pooley Hall Colliery Co. is also seeking powers to give supplies in the district.

Tunbridge Wells T.C. has adopted the borough electrical engineer's recommendation that it should extend the capacity of the boiler house both as regards the boiler plant, coal storage and handling plant at an estimated cost of £31 000.

Hastings T.C. has applied for loans of £7 000 for house services and £1 000 for transformers. The Council has adopted a scheme for installing, through local contractors, wiring not exceeding six lights per house free of initial cost to the consumer.

At the request of the employees, approval has been given by Portsmouth Electricity Committee to the formation of a works committee, whose function shall be to consider any grievances which may occur, and in cases of necessity interview the management thereon.

Pudsey Corporation has decided that the charge for electricity for domestic purposes shall be 15 per cent. on rateable value, plus 1d. per kWh. The Council is borrowing £10 000 for extensions of the electricity undertaking. The net profit on the electricity undertaking last year was £2 272.

Reference to a proposed scheme whereby the use of electricity would be extended amongst consumers who would not take a supply of electricity without some financial aid, was made at a meeting of Hawarden R.D.C. The chairman said it was not the intention of the Council to make profit out of the scheme.

The Altrincham Electric Supply Co. has informed Bucklow R.D.C. of its intention to apply for an Order to supply Northenden, Northern Etchells, part of Bagley, Ringway, Styal, Ashley, and the remaining part of Dunham Massey. It was announced recently that Manchester Corporation was taking steps to supply the parishes named.

Harrogate and Ripon Developments.

Harrogate T.C. is about to apply for an Order to supply electricity in Knaresborough Outer, Plampton, Follifoot, Little Ribston, Spofforth, Stockeld, Kirkby Overblow and Rigton. The Council is opposing the application of Electrical Distribution of Yorkshire, Ltd., to supply in Ripon and district. Ripon C.C. has decided to apply for an Order to establish an electricity undertaking of its own.

Douglas (Isle of Man) T.C. is applying to the Tynwald for a loan of £76 000 for extensions at the electricity works. It is proposed to instal an oil-driven 1 000 kW set, at a cost of £26 377, and the balance is made up of sums for mains and substations, switchgear, crane extensions, motor generator, building extensions, mains and services for a year, and balancer booster, and £19 000 expended on new services since the last loan was granted.

Liverpool Electricity Committee has considered the question of electricity supplies to new housing estates. The average annual consumption per house is from 90 to 100 kWh, costing £1 17s. 6d. to £2 1s. 8d. If the Committee had to pay the whole of the capital outlay a loss would ensue. The Committee therefore recommends that, until further arrangements are made, each committee should pay 50 per cent. of the cost of laying mains, etc., to housing estates.

From October next the following reduced charges will obtain at Lytham St. Annes:—Lighting, flat rate from 6½d. to 6¼d. per kWh; maximum demand rate from 7½d. and 4½d. to 7¼d. and 4¼d.; heating and cooking flat rate from 1½d. to 1d.; prepayment meters, lighting from 7½d. to 7¼d.; heating and cooking from 2d. to 1¾d. Power (industrial), the combined system of domestic charge, signs and shop window lights (after hours) and water heater rates remain unchanged.

Major C. B. Grace, engineer and manager of the Weald Electricity Supply Co., of Hawkhurst, attended a recent meeting of Hailsham P.C. and asked the Council to support the company's application for authority to supply electricity in Hailsham. The company is already taking a bulk supply from Tunbridge Wells and supplying certain districts in Kent and Sussex. If the Hailsham supply is undertaken by the company a bulk supply will probably be taken from Eastbourne. The Council decided to offer no objection to the scheme.

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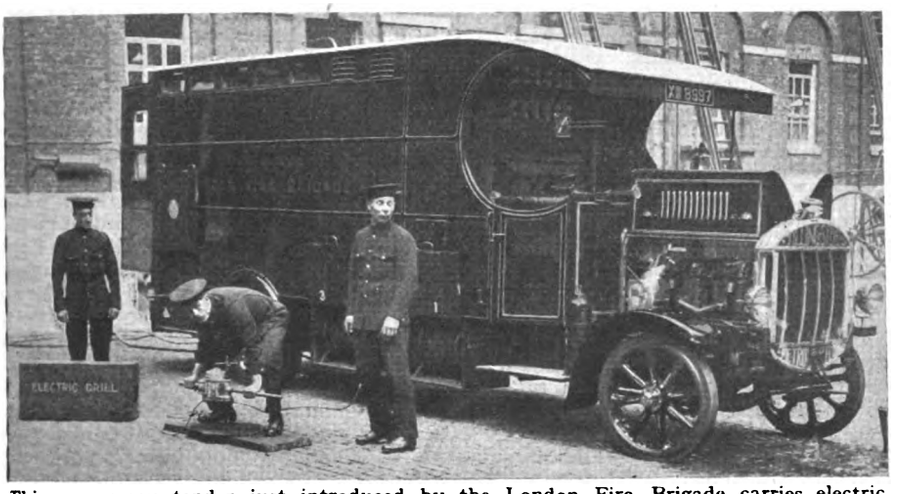
ELECTRICAL NEWS IN PICTURES



This emergency tender just introduced by the London Fire Brigade carries electric drills for cutting through metal obstructions at fires.

Mr. G. P. Shallcross, who has received a presentation from the electricity works staff on his retirement from the position of borough electrical engineer of Birkenhead. He is succeeded by Mr. F. E. Spencer.

The possibilities of portable wireless receiving sets for use at the seaside should not be overlooked by radio traders during the holiday season. In American seaside resorts many portable sets are to be seen on the beach.

A train on the City and South London Railway passing through the stripped and partially dismantled section of the south-bound running tunnel encircled by the new junction tunnel at Kennington.

The wreckage of an electric train which collided with another train at Newcastle. The driver fell out of his cab some time before the accident, which would not have happened but for the fact that the safety control device had been deliberately rendered inoperative.

Mr. W. Maton, a Hythe wireless dealer, with his "wireless exchange" by means of which he transmits radio programmes over the telephone wires to subscribers' houses. The Post Office authorities are to investigate the legality of the enterprise.

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WIRELESS NEWS.

New Book Describes Efficacy of Wireless Apparatus on Aircraft.

A BOOK entitled "De Palos al Plata" has just been published by Major Franco and Captain Ruiz de Alda. It describes their flight on the Dornier Wal seaplane "Plus Ultra" from Palos in Spain to Buenos Aires, and the authors refer to the important part played in the venture by the Marconi wireless apparatus on the machine. In the course of the book it is stated that after the direction finder picked up the wireless stations of Las Palmas and Teneriffe, the bearings showed the airmen that they were on the right course. The remainder of the flight was effected with Las Palmas acting as their wireless beacon, while they listened to Teneriffe every quarter of an hour in order to check their position by means of intersection. The direction finder saved Major Franco from making a considerable detour to ascertain his position, such as would have been necessary had the machine not been so equipped, for Las Palmas was wrapped in fog. On the longest and most hazardous stage of the flight—across the South Atlantic from Porto Praia to Pernambuco, a distance of 1 800 miles—the Marconi apparatus rendered constant intercourse with ships possible, and it was in continuous use for that purpose. Communication was effected with two ships, the D.T.C. "Arthus," German, and an English vessel. Discussing the technical lessons and experiences of the "raid" the authors say: "Wireless telegraphy has assisted us in such a manner that in future it should be considered indispensable for flights over the sea or deserted lands." Of the accuracy of the navigation of the "Plus Ultra" by direction finder, they say: "Direction finder navigation to within three degrees equals the accomplishment of an efficient dead reckoning and even of good astronomical navigation. It avoids any possible error that may be made in dead reckoning and it is the best guide for reaching land."

Television Licences Granted.

Licences for the operation of wireless television apparatus have now been granted by the Post Office to the company which has taken over the Baird "Televisor," which was fully described and illustrated in THE ELECTRICIAN some time ago. This is the first television enterprise in the world, and regular transmissions are now taking place on a wavelength of 200 metres between the company's offices at Motograph House, St. Martin's Lane, London, and Green Gables, Harrow, the company's experimental station.

Wireless in Brief.

Although appointments have been made to the board of the new British Broadcasting Corporation the Government desires that no announcement of the names of the members shall be made until the autumn. It is stated that neither Lord Reading nor Lord Eustace Percy is to be chairman.

Demonstrations at Lulworth by the 23rd (London) Armoured Car Company indicate remarkable possibilities for the use of wireless telephony for facilitating the operation and control of tanks and armoured cars.

The progress of Miss Ederle's Channel swim was reported by wireless, a tug equipped by the Marconi International Marine Communication Co., Ltd., with a Marconi ½ kW quenched spark set enabling frequent reports to be sent by the direct Marconi service to America.

It is officially announced that the executives of the Manufacturers' Federation of the N.A.R.M.A.T. and of the Society of Radio Manufacturers have formally adopted the draft "Constitution, Regulations and Bye-Laws" of the proposed Radio Manufacturers' Association. The draft will be submitted to members at meetings to be held on September 6th.

The Lead Market.

Prices Easier Consequent on Lack of Buying Interest.

IN their lead market report dated August 7th, James Forster and Co. state that there has been an easier tendency throughout the week, and prices closed at the lowest at £32 11s. 3d. for August, £32 8s. 9d. for September, £32 7s. 6d. for October and £32 5s. for November.

Most of the transactions were for forward delivery, speculators buying and selling large quantities. Consumers have shown little interest, and, with no support from dealers, it was not surprising to see easier prices. The American market is still firm and the official price has been put up another 15 points to 8.90 cents per lb.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

A START will be made next month on the electrification of the Brazilian Central Railway.

Burnley Tramways Committee recommends the extension of the tramlines at the bottom of Brunshaw.

Blackpool Corporation has sanctioned a loan of £15 660 for six covered tramcars and six toast rack cars.

Oldham Tramways Department has placed in service recently three new cars, and nine others will be added shortly.

The Walsall tramway and omnibus undertaking has made a net profit of £16 464 on the past year's working, although important concessions have been made in regard to fares.

The Falkirk and District Tramways Co., Ltd., will replace the present trams by single-deck Pullman coaches, fitted with upholstered seats and capable of a speed of 30 miles per hour.

Out of the Yarmouth tramway profits for the past year, £3 000 is being placed to renewals fund and £1 995 is carried forward. A motion to devote £1 000 to relief of rates has been rejected.

Chester Tramways Committee's accounts show that the past year was a record since the electrification of the undertaking 23 years ago. Traffic receipts were £24 645 and the gross profit was £8 699.

At Blackpool Town Council's meeting on August 4th, objection was raised to the suggested application for powers to borrow £10 059 for a double tram line from Talbot Square to Swain Street, in place of the present single line, and the question was referred back for further consideration.

A further electrification scheme, to cost about £3 750 000, is to be undertaken at once by the Southern Railway Co. Altogether, 232 track miles are to be equipped on the d.c. third rail system, i.e., 127 single track miles of existing overhead electric system and 105 single track miles at present worked by steam.

A claim has been made by the directors of the Aberdeen Suburban Tramways Co. against Aberdeen Town Council for over £30 000 in respect of alleged damage to track and loss of trade caused by the operations in connection with the extension of the Corporation's water works on Deeside. The Council has remitted the claim, without comment, to the Finance Committee.

An electric train collided with a goods train at Newcastle last Saturday, but only five people were slightly injured. It was later discovered that the driver fell from the train, the latter continuing its progress until the collision owing to the fact that the "dead man's handle" had been deliberately rendered inoperative. A view of the wrecked train is given on our picture page.

Metal and Chemical Prices.

TUESDAY, August 10th.

			Price.	Inc.	Dec.
Copper—					
Best Selected	..	per ton	£65 0 0	—	—
Electro Wirebars	..	,,	£67 5 0	—	5s.
H.C. Wire, basis	..	per lb.	9 11/16d.	—	—
Sheet	.. ..	,,	9 11/16d.	—	—
Phosphor Bronze—					
Wire (Telephone) basis		per lb.	1s. 1 11/16d.	—	—
Brass 60/40—					
Rod, basis	.. ..	per lb.	7½d.	—	—
Sheet, basis	..	,,	9¼d.	¼d.	—
Wire, basis	..	,,	10¼d.	¼d.	—
Pig Iron—					
Cleveland Warrants		per ton	£4 12 6	—	—
Galvanised Steel Wire, basis 8 S.W.G.	..	,,	£13 10 0	—	—
Lead Pig—					
English	.. ..	,,	£34 0 0	—	10s.
Foreign or Colonial		,,	£32 15 6	—	10s.
Tin—					
Ingot	.. ..	,,	£298 12 6	£6 15 0	—
Wire, basis	..	per lb.	3s. 9d.	1d.	—
Aluminium Ingots	..	per ton	£120 0 0	—	—
Spelter	.. .. ..	,,	£34 0 0	—	—
Mercury	.. ..	per bottle	£15 10 0	—	—

Sulphur (Flowers)—Ton £11 10 0 *Sodium Chlorate*—Per lb. 3d.
,, (Roll-Brimstone)—,, £10 5 0 *Sulphuric Acid* (Pyrites, 168°)
Copper Sulphate— ,, £25 to £25 10 0 per ton, £6 15 0
Boric Acid (Crystals) ,, £37 *Sodium Bichromate*—Per lb. 3½d.
Rubber—Para fine, 1s. 6½d.; plantation 1st latex, 1s. 6⅝d. to 1s. 7½d.

The metal prices are supplied by British Insulated Cables Ltd.

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COMPANY NEWS.

Holiday Slackness on Electrical Share Market—Further Inquiry for Siemens Shares—City of London Company's Dividend Maintained.

WITH the holiday season in full swing, business on the Stock Exchange has been of restricted dimensions, and in the departments for electrical shares, supply, traction and manufacturing, very few changes are recorded in our usual comparative list of price quotations. Practically the only feature has been the further inquiry for Siemens shares, which, on top of the half-crown rise a fortnight ago, have advanced a further 1s. 3d., bringing the quotation up to 30s. General Electrics have regained the threepence they lost last week. Marconi's Wireless shares have not got over the passing of the dividend and have lost last week's recovery of 1s. 3d., being back at 15s. Ericsson Telephones preference, at 21s. 3d., are also 1s. 3d. lower.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest
	Electricity Supply.				
10	Brompton & Kensington Ord.	32/6	32/6	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	90	90	100	67
15	Charing Cross Elec. Ord. (£1)..	45/7½	45/7½	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	48/1½	48/1½	52/6	20/3
6	,, ,, 6% C.P. ..	22/6	22/6	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	59/4½	59/4½	61/3	14/6
6	,, ,, 6% C.P. ..	22/6	22/6	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	13½	13½	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	32/6	32/6	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	36/10½	36/10½	41/6	8/-
4½	,, ,, 4½% C.P. ..	17/6	17/6	18/6	9/6
7	N'castle & Dist. Supp. Ord. ..	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	22/6	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord (£5) ..	16½	16½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	43/1½	43/1½	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
	,, ,, 6% C.P...	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	134½	134½	123	24
6	,, ,, 6% Pf. Stk.	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	70	70	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	78½	79	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	50½	50½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	78½	78½	89	65
4	Lon. Un. Trams. 1st Deb. ..	47	47	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	64½	64½	101½	49
5	,, ,, 5% Deb. ..	68½	68½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	63½	63½	84½	19
3½	,, 3½ Pf. Stk.	64½	64½	88½	40½
3½	,, 3½% Deb.	69½	69½	92½	51
3½	Met. Dis. Rly. Ord. Stk. ..	51	51	58	12½
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	112½	112½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb	65	65	73½	48½
—	Underground Elec. Rlys. Ord.(£10)	3½	3½	5½	21/3
5	Yorks. (W.R.)Trams. Ord. ..	11/6	11/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
†3½	Brit. Elec. Transformer 7% C.P.	18/9	18/9	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	67/6	67/6	62/-	26/6
6	,, ,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	23/-	23/-	23/4	19/7½
7	,, ,, ,, 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	25/-	25/-	29/-	10/-
‡15	Callender's Cable Ord.	65/-	65/-	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref...	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)..	11/-	11/3	28/9½	1/11
7½	,, ,, 1st Pref...	21/3	21/3	26/-	5/-
10	Elec. Construction Ord. ..	31/10½	31/10½	30/4	6/7½
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	13/9	13/9	29/3	7/3
6	,, ,, 6% C.P... ..	18/-	18/-	21/3	10/6
6	Ericsson Telephones 6% C.P...	21/3	22/6	21/-	12/7½
6	Ferranti 6% Pref.	19/4½	19/4½	18/6	16/9
7	,, 7% 2nd Pref... ..	18/-	18/-	19/-	13/9
5	,, 1st Mort. Deb. Stock..	91½	91½	96½	80½
7½	General Elec. Ord.	29/-	28/9	59/-	13/6
20	W. T. Henley's Ord.	77/6	77/6	86/6	23/3
17	Johnson & Phillips Ord. ..	63/1½	63/1½	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	24/4½	24/4½	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	47/6	47/6	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	30/-	28/9	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	29	29	56/2/6	19½
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb ..	74½	74½	87½	60
10	Eastern Ord. Stk.	184½	184½	213½	113/2/6
3½	,, 3½% Pref. Stk.	63½	63½	84/17/6	49
4	,, 4% Deb. ..	79½	79½	103½	60
10	Eastern Extension Ord. (£10)..	19½	19½	21½	10/12/6
4	,, ,, 4% Deb. ..	79½	79½	97½	60
22	Gt. Northern Telegraph (£10)..	27½	27	42/12/6	19
‖10	Indo-European (£25)	46½	46½	59½	25
—	Marconi's Wireless T. Ord. ..	15/-	10/3	9/16/3	20/9
7½	,, Int. Mar.	18/9	18/9	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	18½	18½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	78½	78½	10	60/2/6

† For half-year to June, 1925. ‡ Plus share bonus.
¶ Plus 3 p.c. in respect of 1921. ‖ Including bonus.

WASTE HEAT AND GAS ELECTRICAL GENERATING STATIONS, LTD.—Intm. div. 1½ p.c., payable, less tax, Aug. 31.

TYNESIDE ELECTRICAL DEVELOPMENT CO., LTD.—Intm. div. 3 p.c. on pfd. ord. shs., payable, less tax, Aug. 31.

CITY OF BUENOS AYRES TRAMWAYS CO. (1904), LTD.—Div. 1s. 3d. p. sh. (at rate of 5 p.c. per annum), less tax, for three months ended June 30th, payable August 17th.

RADIO CORPORATION OF AMERICA.—Gross income for quarter ended June 30th, $7 655 438; surplus profits for period, $82 020. For six months to June 30th, surplus amounts to $1 870 531.

WARD AND GOLDSTONE, LTD.—Net pft. for year ended March, 1926, £6 388, plus £19 912 brt. in. Divs. paid September and March on pref. at 7 p.c. per annum, less tax, and on ord. at 7 p.c. per annum, blce. fwd., £18 739.

CITY OF LONDON ELECTRIC LIGHTING CO., LTD.—Div. on acct. of distribution for year on ord. shs. of 1s. per sh., being at rate of 10 p.c. p.a., for half-year ended June 30. Div. will be subject to income tax at 4s., and will be paid on September 25. Last year's div. same.

WESTERN UNION TELEGRAPH CO.—Rev., including divs. and int. for six months ended June 30th, $66 492 828, agst. $60 088 373; total exes., $58 194 605, agst. $51 835 873; int. on bonded debt, $1 168 599, agst. $1 167 590; net income $7 129 624, agst. $7 084 910.

COMPANIES STRUCK OFF THE REGISTER.—The following joint stock companies have been struck off the Register:—Broadcast Wireless Co., Car Electrical Service, Electricans, Expert Electrical Co., Manchester Wireless Installation Co., Wilton Wireless Co., Wireless Telephones.

NORTH METROPOLITAN POWER STATION CO.—It is announced that the Treasury is willing to guarantee to the company the principal and interest of £1 000 000 for 30 years for the erection and equipment of the contemplated generating station at Brimsdown. The power station will be leased to the North Metropolitan Electric Power Supply Co.

ENFIELD CABLE WORKS, LTD.—Rept. states pft. before charging dirs.' fees and deprecn. is £116 644, which with balce. brot. in makes £150 723, or £141 006 less the above-mentioned charges. Div. for yr. on cum. pref. shs. absorbs £15 000 and dirs. recommend fin. div. at rate of 15 p.c. on ord. shs. (making 20 p.c. for yr.), to reserve, £40 000, and to carry fwd. £38 404.

WELSBACH LIGHT CO., LTD.—Mr. J. R. Yates, presiding at the meeting last week, said steady expansion had taken place during the past year in the company's electrical trade, particularly lines which were their monopoly, such as the Kern electric fires and the Handiheater. This branch of the trade should become more important in future years, when the effects anticipated from the Government Electricity Bill made themselves felt.

New Companies.

H. A. COOPER, LTD.—Cap., £1 000. Electrical and general engineers, etc. Reg. office: 6-8, Lime Street Square, London, E.C.3.

WM. POOL, LTD.—Cap., £500. Electrical engineers, wireless dealers, etc. A subscriber: W. Pool, 72, St. Peter's Avenue, Cleethorpes.

FLETCHER, TAYLOR AND CO., LTD.—Cap., £3 000. Electrical engineers, manufacturers of and dealers in electric light fittings, etc. Reg. office: Station Works, Murton, near York.

JORDAN AND PARTNERS, LTD.—Cap., £2 000. To carry on electrical and other businesses, etc. Solicitors: W. T. Hick and Co., Broad Street House, New Broad Street, London, E.C.2.

MAISONETTE, LTD.—Cap., £1 000. Electricians, workers and dealers in electricity, motive power and light, etc. Reg. office: Viaduct Works, Viaduct Street, Ardwick, Manchester.

PERAK RIVER HYDRO-ELECTRIC POWER CO., LTD.—Cap., £1 000 000. To enter into an agreement in the terms of Appendix "A" to a preliminary agreement, dated December 12th, 1925, between H.H. the Sultan of Perak and Sir C. A. Montague Barlow, Bt., P.C. (acting as attorney on behalf of Sir W. G. Armstrong, Whitworth and Co., Ltd), an agreement between the company, the Malay and Eastern Power Development Co., Ltd., Gideon Murray Master of Elibank, Sir Montague Barlow, Col. B. C. Lockhart-Jervis, L. J. Abrahams and H. S. Waite, and an agreement with Everard Fielding, to generate, store, use, transform, transmit, measure and distribute electrical power, to supply the same to governments, towns, corporations, collieries, works, mines, railways, tramways, etc. Solicitors: Mayo, Elder and Co., 10, Drapers Gardens, London, E.C.2. (Public company.)

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BENN BROTHERS ANNUAL MEETING.

The Company's Biggest Development—Year's Good Results—Bouverie House Service for Customers.

PRESIDING at the annual general meeting of Benn Brothers, Ltd., on August 6th, Sir Ernest J. P. Benn, Bt., said it was a pleasure to welcome shareholders in general meeting for the first time in Bouverie House, the new home of the company.

The year of which he had to submit a report had been an anxious period, because it had seen the biggest development in the history of the company. A comparison of the balance sheet with that of a year ago showed that its entire character had changed. They had come through the great scheme of housing the trade Press in adequate, proper and sufficient premises, and here they were, with that period over, feeling very happy about it.

They had also had anxieties in the matter of the general strike, and were still feeling the effects of the prolonged coal stoppage. But for the general strike, this year would have surpassed any year in their history in profits.

In the board's view, however, the general strike was going to help them. They were in an industry in which they had to deal with perfectly organised labour. They had in the publishing business 31 trade unions which for years past had been putting demands forward, some of them quite proper, and others improper. But they had always had this big stick with which they could beat the publishing firms: if their demands were not acceded to, the papers would not come out. The general strike had cleared that difficulty right away. Publishers now knew they could cease for a week or two and still live—that their goodwill and copyright did not go.

Before dealing with the balance sheet the chairman said there was a great deal of discussion in the newspapers about the facts of industry and the necessity for telling everybody all there was to know about those facts. In his experience, the trouble was to get anybody to take the remotest interest in such details. It was difficult to get shareholders really to understand the figures that were put before them. The directors had always prided themselves on the building up of that great business and publishing to the world all the facts there were to know about it. He had himself, in a personal and private capacity, gone further, and proclaimed to the world the intimacies of his domestic affairs in "The Confessions of a Capitalist."

In regard to Bouverie House, he would like to recognise, on the shareholders' behalf, their indebtedness to the architect, Mr. Campbell Jones, and the contractors, Huntington and Co., who were responsible for putting up that great ornament to Fleet Street and the City of London. The board had in mind first the comfort of the staff. They were also anxious that Bouverie House should be used for the convenience of their customers. They wanted to see more use made of the Publications Hall, and wished to get those with whom they were associated into the habit of using that magnificent place. He was very pleased that the hope he expressed last year had really been fulfilled, and that they had got the finest series of trade papers in the world, housed in the finest offices of their kind in the world. Sir Ernest concluded by moving the adoption of the report and accounts, and that a dividend at the rate of 17½ per cent., including the interim dividend of 6¼ per cent., less tax, be paid in respect of the year ended June 30th, 1926. Mr. H. P. Shapland seconded the motion, and the resolution was carried unanimously.

TRADE PUBLICATIONS.

Details of Catalogues and Dealer-Helps Issued by Manufacturers.

A STOCK list of two and three-phase, single phase motors and d.c. motors and dynamos can be obtained from Higgs Motors, Witton, Birmingham.

A comprehensive illustrated list (No. 19) of electricity meters, motors, time switches, cables, wires and electrical accessories is obtainable from Robert Hornby and Co., Ltd., 7, Carlisle Street, Dean Street, London, W.1.

Metro-Vick Supplies, Ltd., Trafford Park, Manchester, have issued a new trade catalogue S.P. 7 128/2, illustrating Silverstone glass ware for electric lighting in plain and ornamental patterns and in the forms of bowls and urns.

Supplies of an attractive illustrated folder (No. 390 D.) on Sterling loud speakers can be obtained from the Marconiphone Co., Ltd., 210-212, Tottenham Court Road, London, W.1. Marconiphone amplifiers are dealt with in another folder (No. 428 A).

A handy little book entitled "Specifications Do Count," on the Delco-Remy coil ignition, can be obtained from Delco-Remy and Hyatt, Ltd., 111, Grosvenor Road, London, S.W.1. It is stated that this system of ignition has been supplied to more than 7½ million motor vehicles.

In addition to their 68-page illustrated catalogue of electric light accessories (list 434), the Sun Electrical Co., Ltd., 118-120, Charing Cross Road, London, W.C.2, have issued lists No. 435 relating to Cookes' improved hole cutter, and No. 436, revised prices of electric switch and fuse gear.

Paddle-Wheel Fans ("P" type) are described in a booklet (K. 25) issued by the James Keith and Blackman Co., Ltd., 27, Farringdon Avenue, London, E.C.4. These fans, which are especially useful for removal of textile and other dust, can be driven by belts or directly by electric motors or steam engines.

A folder on "Features of Houghtons' Service for the Radio Dealer" is issued by Houghtons, Ltd., 88-89, High Holborn, London, W.C.1. It is stated that Houghtons' General Radio Catalogue contains details of 3 000 lines to sell, without any buying risk, and 1 200 illustrations. We have also received another folder "About our Service," and a supplement to Houghtons' "Radio News" containing revised prices of two to four valve receivers, amplifiers, loud speakers, battery chargers, coils, transformers, etc.

The Louis C. Eitzen Co., 280, Broadway, New York, send us a leaflet setting out the advantages claimed for Pynolag protection tubes for pyrometers. These tubes, which are said to have practically no heat lag, are manufactured by the Industrial Welded Products Co., Newark, N.J.

The Igranic Electric Co., Ltd., 149, Queen Victoria Street, London, E.C.4, has issued (price 1s. net) a multi-circuit folder giving a theoretical and pictorial diagram of nine tested circuits, and describing alternative methods of tuning and reaction which increase the possible combinations to 39.

Newtons' Dynamo Works, Taunton, send us their latest illustrated catalogue describing Newton d.c. motors and special S.T. type voltage transformers for wireless and motor car battery charging. Specifications, prices and results of tests are given. Baxter and Caunter, 219, Tottenham Court Road, W.1, are the London agents.

A metal-edged hanging sheet advertising Benjamin correct lighting equipment is to hand. Lamps for outdoor and industrial lighting and numerous patterns of Benjamin reflectors and glass bowl fittings, adaptors, etc., are illustrated and explained. Dealers can obtain this sheet from Benjamin Electric, Ltd., Tottenham, London, N.17.

The Boreas tyre pump is described and illustrated in a folder issued by Lacy-Hulbert and Co., Ltd., Boreas Works, Beddington, Croydon. The compressor is built on to a 1 H.P. totally-enclosed electric motor, flexible leads are dispensed with, and it is claimed that a 36 by 6 in. tyre can be inflated to 76 lb. in less than three minutes.

Ferguson Pailin Ltd., Higher Openshaw, Manchester, have sent us the following new catalogue sections: No. 25 S1, on "C" and "D" oil immersed circuit breakers, 11 000 V, for cubicle or panel mounting; No. 166 S1, on "CV" and "DV" totally enclosed metal-clad oil immersed switchgear, 11 000 V, for single busbar systems; and No. 166 S2, on switchgear types "CVD" and "DVD" for duplicate busbar systems.

Marconi's Wireless Telegraph Co., Ltd., Marconi House, Strand, London, W.C.2, send us leaflet No. 1 055 on the Marconi 25-40 Watt Portable Station, Type S.A.1. This outfit includes a short wave transmitting and receiving set designed for portable use. The total weight of the equipment, including transmitting and receiving unit, rotary transformer and h.t. battery, l.t. battery, spares and aerial rod and earth mat supplied in a case with carrying strap, is about 155 lb.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

CHESHIRE (P.) AND CO., Water Street, Middleton, electricians. £30 8s. July 7th.

JAMIESON, John M., 3, The Arcade, Richmond, electrical contractor. £15 0s. 10d. June 25th.

J. AND B. RADIO SUPPLIES, 34, Oxford Street Chambers, Reading, wireless dealers. £21 12s. 8d. June 30th.

SHEPPARD (S. C.) AND CO., 15, College Parade, Salisbury Road, Kilburn, electrical contractors. £32 4s. 10d. July 6th.

WALTON, Arthur Heppel, 82, Avenue Chambers, Southampton Row, W.C., electrical sign manufacturer. £50 14s. 10d. May 4th.

Receivership.

MIDDLESBROUGH STEEL TUBE AND CONDUIT CO., LTD. J. H. Anderson, of Middlesbrough, was appointed receiver on July 27th, 1926, under powers contained in trust deed dated December 22nd, 1920, and on July 31st, 1926, under powers contained in trust deed dated October 17th, 1925.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

AUTO-BULBS, LTD., London, W.C., manufacturers of electric lamps. Registered July 20th, debenture, to Bank; general charge. *——. January 22nd, 1926.

AUTOMATIC COIL WINDER AND ELECTRICAL EQUIPMENT CO., LTD., London, S.W. Registered July 28th, £3 547 10s. debentures, to F. B. Larkworthy, Coopers Bridge, Bramshott; general charge. *——. March 20th, 1925.

BIRKDALE DISTRICT ELECTRIC SUPPLY CO., LTD. Registered July 15th, £25 000 debentures (filed under section 93 (3) of the Companies (Consolidation) Act 1908), present issue £1 000; general charge; also registered July 20th, £21 000 debentures, part of £25 000; general charge. *£9 000 issued to bankers as collateral security. June 16th, 1926.

Satisfaction.

LLANGOLLEN AND DISTRICT ELECTRIC LIGHT AND POWER CO., LTD. Satisfaction registered July 28th, £200, registered October 5, 1917.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*

ENGLISH ELECTRIC WIRING AND FITTINGS CO., electrical engineers, 161, West Street, Sheffield. A meeting of the creditors of the above was held recently, when the debtors' solicitor reported that the liabilities totalled £1 168, of which £718 was due to the trade and £450 to private loan creditors. The assets were estimated to realise £304, from which had to be deducted £20 for preferential claims, leaving net assets of £284, or a deficiency of £884. It was stated that under certain circumstances the private creditors would not press their claims. The partners in the business were Messrs. H. T. Hall and A. A. Loveday, who commenced trading together in March, 1922. There was no partnership deed, but they were equal partners, and introduced approximately £125 each as capital. The drawings had been moderate. The debtors had some good contracts on hand in connection with housing schemes, and they were desirous of completing them and carrying on the business. The solicitor further stated that some little time ago the debtors required further capital, and decided to convert the business into a limited company. Negotiations were entered into with a third party, in connection with which a sum of £2 000 would be found as capital and preference shares issued, but the matter fell through. Then creditors began to press and the present meeting was called. On behalf of the debtors an offer was made of a composition of 10s. in the £, it being stated that monthly instalments of not less than £30 would be set aside for distribution *pro rata* amongst the creditors. Eventually a resolution was passed agreeing to accept the debtor's offer of 10s. in the £, payable by equal instalments at 4, 8, 12 and 15 months, subject to the cash creditors postponing their claims, and the last instalment to be satisfactorily guaranteed. It was also decided that the arrangement should be carried through under a deed of composition to be executed to Mr. C. Turner, of Messrs. Poppleton, Appleby and Turner, Sheffield, and that failing the carrying out of the scheme a deed of assignment should be executed.

M'ELENY, Charles, trading as M'ELENY AND RUSSELL, electricians, 26, East Shaw Street, Greenock. This debtor has granted a trust deed for the benefit of his creditors at large, in favour of Henry Burt, chartered accountant, 17, West Blackhall Street, Greenock.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Companies Winding-up Voluntarily.

MIDLAND ELECTRIC MANUFACTURING CO., LTD. A. A. Miller, Waterloo Street, Birmingham, chartered accountant, appointed liquidator, August 5th. Meeting of creditors at the offices of Gibson and Ashford, of 39, Waterloo Street, Birmingham, chartered accountants, on Monday, August 23rd, at 12.30 p.m.—NOTE.—This notice is purely formal due to reconstruction as a public company, and all creditors will be paid in full.

JENNER LIGHT AND POWER CO., LTD. R. H. McKerrow, chartered accountant, 153, Worple Road, Wimbledon, S.W.20, appointed liquidator, July 30th. Meeting of creditors at the Institute of Chartered Accountants, Moorgate Place, London, E.C.2, on Wednesday, August 18th, at 12 noon; creditors claims by September 20th.

Bankruptcy Information.

BARNES, George Craven, electrical engineer, Regent Electrical Works, Royal Street, Barnsley. Receiving order, August 3rd. Debtor's petition. First meeting, August 18th, 10.30 a.m., Official Receiver's Office, County Court Hall, Regent Street (Eastgate entrance), Barnsley. Public examination, August 19th, 10.30 a.m., County Court Hall, Regent Street, Barnsley.

WALKER, Malcolm Montague, trading as THE WALKER BAILEY ELECTRIC CO., engineers, Clydeside Works, Stanley Street Lane, Kinning Park, Glasgow, S.1. A petition has been presented at the instance of Veritys, Ltd., engineers, Aston, Birmingham.

Partnership Dissolved.

JONES (E.) AND CO. (Ernest JONES and Frank Humphrey TURNER), electrical and radio engineers, 1, Cateaton Street, Manchester, by mutual consent as from April 30th, 1925. Debts received and paid by E. Jones.

Bankruptcy Proceedings.

MUNDAY, Edison Douglas Stuart, 272, Lake Road, Portsmouth, electrical engineer. The public examination of this debtor was held on August 9th. The statement of affairs showed liabilities, expected to rank, of £200, and assets of £51. Debtor attributed his failure to insufficient profit to meet living expenses and a loss on the sale of effects by auction. He commenced business in July, 1922, with £200 capital, his savings. The business was unsuccessful, his profit being insufficient to meet his business and household expenses. Creditors began to press and an execution was levied for £16. Debtor had to sell his stock, etc., and he estimated that he lost £85. The examination was closed.

PATTERSON, Sam, 55, Aberdeen Walk, Scarborough, Yorks, electrician. The statutory meeting of creditors was held last week. The statement of affairs showed gross liabilities of £555, of which £551 was expected to rank, and net assets of £55, or a deficiency of £496. Debtor attributed his failure to bad trade during the past three months, pressure by creditors, and want of capital. The case being a summary one was left with the Official Receiver as trustee of the estate.

RENNIE, John George Fowler, electrical engineer, 19, Bridge Street, Andover. The public examination of this debtor was held last week at Salisbury. According to the statement of affairs the liabilities were estimated at £724, with assets of £203, a deficiency of £521. It appeared that the debtor commenced business on his own account in August of last year, with a capital of £100 and no experience in buying stock. He drew £2 10s. a week, while other expenses made a total of £5 2s. weekly. He believed that at the commencement he made sufficient to cover the expenses, but later he had to meet competition in the neighbourhood. After some questions had been put to the debtor the examination was closed.

SELLERS, Harold George, trading as R. SELLERS, 72A, Spital Hill, Sheffield, electrical engineer. The statutory meeting of creditors was held last week, the deficiency being returned at £210, and debtor attributing his failure to insufficient business to provide a living and lack of capital. The matter was left with the Official Receiver as trustee of the estate.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

240 906 H. V. Higgitt and Eastern Telegraph Co., Ltd. Means for correcting or minimising distortion of signals in electric telegraph systems. (5/7/24.)
240 909 A. S. Cachemaille (Westinghouse Lamp Co.) Manufacture of electron-emitting material and apparatus. (7/7/24.)
240 910 G. H. Collins and H. F. Collins. Automatic cut-out for use with electrically-heated appliances. (8/7/24.)
240 917 H. Ingham and H. Clarke and Co. (Manchester), Ltd. Variable resistances for wireless and other purposes. (9/7/24.) (Cognate application, 9 462/25.)
240 918 Burndept, Ltd., L. J. Hunt and C. F. Phillips. Electron-valve holders. (9/7/24.)
240 919 H. E. Nichols and C. H. Chase. Portable electro cardiographs and the like apparatus. (9/7/24.)
240 920 E. T. Fisk. Method of an electronic valve for modulating electric currents. (9/7/24.)
240 927 A. Ransome and Co., Ltd. and P. S. Robinson. Electrically-driven high speed spindles applicable for use with woodworking machines. (11/7/24.)
240 937 A. J. Jung. Adapters, connectors, or the like for lamps or other appliances employing electric current (15/7/24.)
240 944 General Electric Co., Ltd. and A. C. Bartlett. Electrodes for electric discharge tubes. (23/7/24.)
240 946 J. Sutter. Means for bringing terminals of an electric circuit. (24/7/24.)
240 953 Igranic Electric Co., Ltd. and A. H. Curtis Induction couplers or high-frequency transformers. (28/7/24.)
240 954 Westinghouse Brake and Saxby Signal Co., Ltd. (Union Switch and Signal Co.) Apparatus for supplying high-frequency alternating electric current from a low-frequency source. (28/7/24.)
240 962 Hotpoint Electric Appliance Co., Ltd. and F. W. Leevers. Electric radiators. (6/3/25.)
240 963 H. Wade (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). Electric discharge tubes having more than three electrodes. (1/8/24.)
240 971 J. A. Kuyser and Metropolitan-Vickers Electrical Co., Ltd. Dynamo-electric machines. (7/8/24.) (Addition to 220 362.)
240 980 J. A. Crabtree. Electric switches. (28/8/24.)
240 981 L. Barrett. Means for recharging an accumulator in apparatus requiring supplies of current. (28/8/24.)
240 982 Cable Accessories Co., Ltd., F. H. Reeves and A. Crawford. Electric switches. (30/8/24.)
240 983 Igranic Electric Co., Ltd., A. H. Curtis and G. F. Dandridge. Dial indicators for radio instruments. (1/9/24.)
222 507 Dr. H. Meusser. Electric condensers. (29/9/24.) (Convention date not granted.)
240 996 Siemens Bros. and Co., Ltd., and H. E. Humphries. Electric contacts. (1/10/24.)
241 001 H. Bowyer. Crystal detectors for wireless telegraphic and telephonic apparatus. (6/10/24.)
241 014 Oldham and Son, Ltd., G. H. Darby and W. D. Wilde. Galvanic batteries. (20/10/24.)
224 233 British Thomson-Houston Co., Ltd. Contact caps for electric discharge devices. (30/10/23.)
241 026 E. B. Stephenson. Electrical connectors. (1/11/24.)
239 155 Siemens-Schuckertwerke Ges. Controlling-gear for electric vehicles having apparatus operated by compressed fluid. (30/8/24.)
241 043 E. R. G. Greville and F. W. Read. Batteries of the type employed in electrotherapeutic treatment of physical ailments or disabilities. (26/11/24.)
226 227 Soc. Francaise Radio-Electrique. Radio-communication systems. (13/12/23.)
241 050 Western Electric Co., Ltd. (Western Electric Co., Inc.). Electron discharge devices. (20/12/24.)
228 130 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Devices for cooling electrodes for discharge tubes. (24/1/24.)
231 179 Le Fer Soc. Anon. Electrolytic manufacture of iron. (24/3/24.)
231 878 S. Sacerdote. Electric heat accumulators. (2/4/24.)
232 980 Hazeltine Research Corporation. Electric discharge devices for converting electric power. (5/7/23.) (Divided application on 10 121/24.)
232 995 British Thomson-Houston Co., Ltd. Electric arc-welding machines. (28/4/24.)
241 125 R. Graef. Method of cooling the electrodes in ozonisers. (22/5/25.)
241 133 J. J. V. Armstrong (Naamlooze Vennootschap W. Smit and Co.'s Transformatorenfabriek). Automatic voltage regulation of alternating-current circuits, particularly for welding machines. (13/6/25.)
241 141 W. Guy Pell. Electrical heating elements. (9/12/24.) (Divided application on 29 587/24.)
237 614 Suddeutsche Telefon-Apparate-Kabel-Und Drahtwerke Akt.-Ges. Method of manufacturing electron-emitting cathodes. (24/7/24.)
238 211 Westinghouse Electric and Manufacturing Co. Electrical frequency filters. (9/8/24.)
241 241 R. W. Cousins. Starting apparatus for electric motors. (14/4/24.)
241 247 R. W. Bill and H. Heath. Electric switches. (10/6/24.)
241 251 Piepmeyer and Co. Kommandit-Ges and N. Geila. Apparatus for detecting and determining the position of stretches of underground of different electric conductivity. (12/6/24.)
241 257 H. Green. Low-frequency thermionic amplifiers. (9/7/24.)
234 036 Automatic Telephone Manufacturing Co., Ltd. Impulse transmitters for use in telephone or like systems. (15/5/24.)
241 280 G. H. Scholes, F. J. Pearce, and G. H. Scholes and Co., Ltd. Jointing compositions for use in jointing and connecting electric cables and conductors. (17/7/24.)
241 284 F. B. Dehn (E. G. Buff Manufacturing Co., Ltd.) Electric switches. (17/7/24.)
241 287 Automatic Telephone Manufacturing Co., Ltd., J. E. Ostline, and W. O. Passmore. Automatic or semi-automatic telephone systems. (17/7/24.)
241 289 C. S. Franklin and E. Green. Valve generators of electrical oscillations. (17/6/24.)
241 294 A. D. Shutter. Coating of electrical conductors. (19/7/24.)
220 608 M. L. Toulv. Arrangements for increasing the frequency of electric currents. (18/8/23.)
241 296 J. W. Kirkland (Allgemeine Elektricitats-Ges). Connections for three-phase current transformers. (19/7/24.)
241 301 Siemens Bros. and Co., Ltd. and W. G. Patterson. Testing arrangements for selector with self-drive used in automatic or semi-automatic telephone systems. (22/7/24.)
241 310 Igranic Electric Co., Ltd. and J. H. Abbink-Spaink. Electric switches relays and the like. (26/7/24.)
241 316 British Thomson-Houston Co., Ltd., and H. C. Heath. Mechanical relays for electric switchgear and other purposes. (30/7/24.)
241 322 Midland Electric Manufacturing Co., Ltd., and W. L. Barber. Electrical fuses or cut-outs. (5/8/24.)
241 327 Western Electric Co., Ltd. Telegraph signalling systems. (7/8/24.)
241 356 English Electric Co., Ltd. and F. D. H. Bremner. Blow-out arrangements for electric switches. (12/9/24.)
241 368 Western Electric Co., Ltd., (Inc.). Carrier-wave working over high-tension lines. (3/9/24.) (Divided Application on 222 104. Patent of addition not granted.)
241 371 R. E. Barbour. Tuning-coils used in connection with wireless telegraphy and telephony. (29/9/24.)
241 376 S. A. Stigant, A. E. Holliman, and Johnson and Phillips, Ltd. Electrical transformers. (4/10/24.)
241 378 British Thomson-Houston Co., Ltd., and L. Rigg-Story. Electric switches. (9/10/24.)
241 379 H. H. Berry. Supports for electric resistances. (10/10/24.)
241 383 D. Macadie. Electric inductance coils. (16/10/24.)
241 390 British Thomson-Houston Co., Ltd., and G. O. Watson. Starting devices for electric motors. (21/10/24.)
241 391 English Electric Co., Ltd., and J. E. Calverley. Direct-current dynamo-electric machine groups. (22/10/24.)
225 505 Telefunken Ges. fur Draht-lose Telegraphie. Thermionic oscillation generators. (19/12/23.)
241 397 A. V. le Duc. Electric ignition indicators. (10/11/24.)
241 406 E. W. Timmis. Means employed for repeating the condition of electric lamps. (18/11/24.)
241 417 M. J. Huizinga. Electric signalling system. (17/12/24.)
229 281 Maschinenfabrik Oerlikon. Construction for mounting pole-pieces on the rotors of electrical machines. (15/2/24.)
241 439 E. Schrack. Grid electrode for electron-discharge tubes. (16/2/25.)

Applications for Patents.

July 26th.

18 602 A. Massey-Allwn and R. B. North. Magneto-electric machines.
18 552 J. E. Bailes. Electrical apparatus.
18 597 British Thomson-Houston Co., Ltd. Remote-control switching systems. (5/8/25, United States.)
18 598 British Thomson-Houston Co., Ltd. Electric responsive devices. (5/8/25, United States.)
18 566 S. O. Cowper-Coles. Electrodeposition of metals.
18 632 International Law Agency. Electric advertising device, etc. (25/7/25, France.)
18 610 A. Klotz. Electro-therapeutic light apparatus.
18 670 Metropolitan-Vickers Electrical Co., Ltd. Electric motor control systems. (13/8/25, United States.)
18 661 F. Pink. Wireless receivers.
18 585 F. B. Shaw, T. W. Simpson and J. B. R. Swan. Electric batteries.

July 27th.

18 735 W. T. Arnberg. Apparatus for treatment of organisms with electric current. (29/7/25, Sweden.)
18 749 C. R. Forth. Contact plugs for electric connections. (27/7/25, Germany.)
18 752 A. C. Jessup. Electrolytic manufacture of magnesium, etc. (29/7/25, France.)
18 764 Landis et Gyr Soc. Anon. Electricity meters. (30/10/25, Switzerland.)
18 765 Landis et Gyr Soc. Anon. Electricity meters. (30/10/25, Switzerland.)
18 928 B. H. Leeson. Electric remote-control systems.
18 828, 18 836, 18 843 A. Reyrolle and Co., Ltd. Electric circuit breakers.

July 28th.

18 806 H. Armstrong. Electric switches.
18 844 H. N. Beddoe. Wireless receivers.
18 839 British Thomson-Houston Co., Ltd. Electric measuring and timing devices. (10/8/25, United States.)
18 834 J. H. Brown. Electric connectors, etc.
18 848 L. V. Chenoweth. Petrol-electric power-transmission systems.
18 843 N. Cooke. Electric circuit-breakers.
18 827 Grierson, Ltd. and R. Grierson. Electrical installations.
18 813 I. F. Hall and E. H. Sauvage. Telegraph relays.
18 835 Halliwell-Shelton Electric Corporation. Electric driers. (25/2/25, United States.)
18 778 G. B. Handley and C. H. Parsons, Ltd. Electric switches.
18 865 C. R. Hardy and Hart Accumulator Co., Ltd. Secondary electric batteries.
18 842 R. J. Kenny. Dynamo-electric generators.
18 864 F. J. Lawson. Electric welding machines. (27/8/25, United States.)
18 828, 18 836 B. H. Lefson. Electric circuit-breakers.
18 853 Siemens-Schuckertwerke Ges. Enclosed switches for polyphase current. (1/8/25, Germany.)
18 808 C. Tempest. Electrically-heated fish-frying pans.
18 815 G. A. Wood. Electric switches.

July 29th.

18 951 A. Allen and R. B. North. Magneto-electric machines.
18 968 R. H. D. Barklie. Electric condensers.
18 915 A. C. Huddlestone and G. Nunn. Electric lamps, etc.
18 928 A. Reyrolle and Co., Ltd. Electric remote-control systems.
18 881 H. T. Short. Carrier for electrical accumulators, etc.
18 965 Siemens und Halske Akt.-Ges. Selectors for telephone installations. (21/8/25, Germany.)
18 970 F. G. Warburton. Electrically-driven paper machines, etc.

July 30th.

18 986 C. C. Armstrong. Electric stoves. (3/8/25, United States.)
19 060, 19 061 J. H. E. Baker, A. M. Searle, Standard Telephones and Cables Ltd. and E. P. G. Wright. Automatic, etc., telephone circuits.
19 020 British Thomson-Houston Co., Ltd. Temperature responsive relays. (10/8/25, United States.)
19 021 British Thomson-Houston Co., Ltd. Circuit protection. (20/8/25, United States.)
19 022 British Thomson-Houston Co., Ltd. Dynamo-electric machines. (11/8/25, United States.)
19 065 A. H. Clackson. Thermionic valve holder.
19 007 M. Freedman. Insulating holders for inductance, etc., coils.
19 064 C. C. Gow and Morgan Crucible Co., Ltd. Electric resistances.
19 043 Harland Engineering Co., Ltd. and F. G. Warburton. Electrically-driven paper machines, etc.
19 016 E. W. Hill and G. F. Shotter. Maximum-demand meters for alternating current.
19 057 A. C. Jessup. Electrolytic production of metals. (5/8/25, France.)
19 054 King Manufacturing Corporation. Thermionic valve, etc., holders. (30/7/25, United States.)
19 030 P. H. A. van Lis, Naamlooze Vennootschap Hengelosche. Portable electric transformer outfit.
19 041 Metropolitan-Vickers Electrical Co., Ltd. Arc-rupturing devices. (8/9/25, United States.)
19 012 H. P. O'Reilly. Electromagnetic sound recording and reproducing machines. (17/9/25.)
19 026 J. S. Peirse. Thermionic valve, etc., holders.
19 047 D. G. Rogers and J. W. Ross. Electric switches.
19 067 J. Rutherford and J. Rutherford and Co., Ltd. Telephone head-piece.
18 983 D. S. B. Shannon. Wireless transmitters.

July 31st.

19 121 H. G. Bartholomew and R. R. Recorini. Electric motors.
19 083 British Insulated Cables, Ltd. Electric fans, etc., motors. (30/6/25, France.)
19 091 J. E. Gaitney and J. H. Tucker and Co., Ltd. Electric ceiling rose.
19 125 D. C. Gall and H. Tinsley. Electric transformers.
19 112 J. W. F. Lamont. Electric aim-indicating devices for firearms, etc.
19 085, 19 087 S. Lofwe. Thermionic tube. (1/8/25, Germany.)
19 086 S. Loewe. Wireless receivers. (1/8/25, Germany.)

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The Electrician.

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ELECTRICAL ACCIDENTS.

IN reviewing the Annual Report of the British Engine Boiler and Electrical Insurance Co. a year ago we expressed the hope that it would soon be found possible to include among the monographs that form part of this volume one on an electrical subject. The amount of electrical plant which is being used increases every year. Most of it, thanks to careful design and good manufacture, works well. A small proportion does not, and the result is unfortunately sometimes loss of life or injury and nearly always loss of time and money. Breakdowns, however, have this advantage—that they teach the manufacturers and users something, for they either state or assist in the solution of problems, so that future progress is made the easier. It has been the practice of the British Boiler and Electrical Insurance Co. to publish articles which sum up the results of this experience and it was because these are so valuable that we made the above suggestion. We are glad, therefore, to see it has been adopted and that this year a thesis on "Resistance, Capacity and Inductance in Parallel" by Mr. L. W. SCHUSTER has been published.

At first sight such a subject may seem remote enough from the matters with which the company concerns itself, and that supposition is strengthened by a hurried glance at the article. But second thoughts lead to a change in opinion and it is easy to realise that here we have a discussion of very important fundamentals. It is not too much to say that all electrical circuits can be resolved into resistance, capacity and inductance in parallel, and that some of the disturbing phenomena that occur on transmission lines, which are ever becoming longer, and generating stations, which are ever becoming larger, can only be explained by going right back and considering all the factors that make up these circuits. Investigators in all countries are paying close attention to these important matters and we are glad to be able to add Mr. SCHUSTER'S name to the list. Theoretical as such investigations may seem, they are in truth of the highest practical value.

As usual, the report proper is divided into a number of sections which deal respectively with the various classes of plant with which the company have to do. Several cases of turbo-generator breakdown are mentioned. One of these was due to steam leaking from the sealing gland at the exhaust end of the turbine and being drawn into the generator. Here it condensed on the end windings and caused the string binders holding the wood distance pieces between the end turns to perish and break. This gradually led to a movement of the connectors which, being damp owing to the leaky steam, inevitably caused a short circuit. This failure is not one against which it is easy to provide on the electrical side. In another case vibration caused chafing of the conductors and breakdown, while in a third the shunt coils failed owing to their being insulated with a number of layers of millboard cemented together with sulphur cement. This became loose owing to vibration and attacked the untinned copper. This failure was due to faulty design, but it is only fair to add that the machine was installed as long ago as 1903.

In dealing with other electrical machinery, the report points out that a frequent cause of breakdown on direct-current machines is the accumulation of conducting dust behind the commutators. These deposits consist of dust from the carbon brushes or of other conducting matter, which first settles on the commutator and is then rubbed off by the brushes. It is finally conveyed by air currents to the spaces between the risers, the outer surfaces of projecting parts of the inside V rings, and the underside of the end windings and other parts lying behind the commutator. It is also justly pointed out that such occurrences can be avoided by careful attention to certain points in design and by seeing that the machine is blown out regularly, preferably by compressed air.

No less than five cases of breakdown due to dust accumulation are described, of which some mention may be made here. In three of these dust was the only cause, and expense could have been saved had more care been paid to its removal. The fourth case relates to a 25 H.P. slip ring induction motor in which short circuits developed, resulting in some of the windings being burnt through. This failure was caused by carbon dust from the brushes collecting on the front end winding and as the usual interturn cotton covering was omitted from one of the bars in each slot, the dust readily allowed arcing to be set up. It is pointed out that the practice of leaving bars bare in a wound rotor is not satisfactory and, even if a double thickness of insulating covering be provided so that the insulation between turns is sufficient when the winding is clean, dust may easily set up leakage and cause short circuits.

Unsatisfactory design was responsible for five rotor or armature failures. In one of these the end windings of the rotor on a 750 B.H.P. induction motor had sprung outwards owing to the absence of support preventing the

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binding bands being pulled tight when the machine was being wound. Unsupported flexible cables were also used for connecting the windings to the slip rings so that it is not surprising that trouble occurred. Looseness in essential parts and fastenings is another prevalent cause of breakdown, as is such careless workmanship as leaving metal parts in the machine.

Some trouble was caused by the formation of flats on slip rings and an interesting theory on this subject has been advanced by Mr. P. HUNTER-BROWN. The wear on a slip ring arises from three causes—mechanical abrasion, a burring action and a quasi-electrolytic effect. The last results in a transference of metal along the ring surface in the direction of the current flow. In the case of a revolving field alternator this generally results in the negative ring being worn considerably more than the positive, the wear, however, being distributed evenly round the ring. In the cases considered, as the instantaneous value of the current flowing between a brush and ring is continually varying, wear due to the second and third effects will not be uniform and the quasi-electrolytic effect would only cause wear during half the cycle when the current is flowing from the ring to the brushes.

It should be noted that these post-mortems apply only to a very small proportion of the machines in use and there is no reason to suppose that either British design or workmanship is bad. It is also worth mentioning that the breakdowns seem generally to occur on the smaller machines, some of which are undoubtedly old and worn out. This goes to show that useful lessons have been learnt and that reliability in the broadest sense is increasing every year.

Current Topics.

A Bit of Mystery.

AN article in the recent issue of " The Times " contains some information about Chiswick House which will stimulate even the least historically and archæologically inclined. This mansion will, it is hoped, be turned into an art gallery, and if this is done it will at least restore it " to the purpose it was built for." It was planned in 1727 by the third EARL OF BURLINGTON to accommodate his Titians and Vandycks, and later on, when it had passed by marriage into the hands of the Cavendish family, it had nurseries added for the baby of the magnificent GEORGIANA, Duchess of Devonshire. CHARLES JAMES FOX died there, and it was visited in 1814 by the EMPEROR OF RUSSIA, the KING OF PRUSSIA and GENERAL BLUCHER. KING EDWARD, when Prince of Wales, was a tenant for some years and KING GEORGE learnt gardening there. Readers of THE ELECTRICIAN must not suppose that we are giving all this information to fill this page in a month that is always rather lean in electrical news. The fact is that, according to the article, by a recent arrangement " with the Joint Electricity Authority, Chiswick District Council is to receive Chiswick House and its grounds in return for 45 acres of the Duke Meadows." Our readers will wonder, as much as we did, how so much ancient splendour came into the hands of so mundane a body as a Joint Electricity Authority. We have tried to find out, but we have been politely informed that " it is confidential." It is certainly a bit of a mystery. Can the J.E.A. have been going into the house agency business?

Outdoor Switchgear for London.

ON another page of this issue we describe what is, so far as this country is concerned, a novel installation. This is the outdoor switchgear which has been manufactured by Ferguson Pailin for the Brimsdown generating station of the North Metropolitan Electric Power Supply Co. Though the use of outdoor sub-station equipments is becoming fairly common in this country, and outdoor switchgear for generating plant is employed in other countries, notably the United States and Norway, this is the first example of such equipment being used in the British Isles. It receives an added interest from its nearness to London. The best design of switchgear to employ in modern generating stations is still very much a matter of opinion, and the decision reached in each particular case is determined as much by personal predilection and economic values as by technical superiority. In the more orthodox generating stations, which are now being built, both the armoured clad gear and the cubicle enclosed equipment are finding a place. It cannot be said that the balance has come down in favour of one or the other, still less that one or other is likely to disappear at an early date. Outdoor switchgear has, of course, the obvious advantage that a certain expenditure on buildings is saved, though this is a factor which should not be allowed to assume undue prominence. Supporters of both or all three classes of design have an interesting and difficult task in front of them: that of proving that the equipment they favour is better than any other. On a purely technical basis it is likely that it will be a long time before this is possible.

America Through English Eyes.

THOSE who contend that interconnection of generating plant is not necessary in this country will not derive much satisfaction from the letter by Mr. TITUS G. LE CLAIR which we publish in our correspondence columns to-day. He takes us to task for holding the opinion that Americans " identify progress with mere size," and points out that the generators in use to-day are not so large in proportion to the size of the total system as they were twenty years ago. Moreover, the *raison d'être* of these large units is that by interconnection of systems they can be kept fully loaded practically throughout the twenty-four hours, and that the load is growing so rapidly that their capacity may be absorbed in a single year. Indeed the reserve capacity is not much in excess of 15 per cent.—a figure which is comparable with the 10 per cent. of the Weir report. The curves which Mr. LE CLAIR sends us, which we also reproduce, teach an additional lesson. They tend to indicate that while the cost of electricity in this country as given by Mr. HUGH QUIGLEY in the article we published in THE ELECTRICIAN of June 18th, 1926, is considerably higher than it was in 1913, the present cost of electricity in the United States is not above the figure of that year, nor has it ever risen to that figure, while the relative cost of living is 70 per cent. higher. We feel, however, there is an explanation for that position which it is only right that we should publish. The war, while largely increasing the consumption of electricity, left an aftermath of depression and overwhelming taxation with which we are still struggling. Industrialists, however desirous they may be to do so, have not been able to introduce improvements, even when, like electrification, they confer considerable benefits. That we have made such progress as we have with our power load is to our credit rather than otherwise.

Science and Universal Languages.

A RECENT note in these columns on the proposal that Esperanto should be used for drawing up summaries of the articles which appear in the world's technical journals has aroused a certain amount both of comment and protest. Last week Mr. CHAS. RETTIE supported our view that technical matter is not one of the few things that do not suffer by translation and suggested that, while a universal language is certainly needed, English should be chosen for the purpose. In favour of this suggestion it may be remarked that English is the primary language of many millions of the earth's inhabitants, and the secondary language of a good many more. Even so, we do not recede from our position that, unless extreme care is taken, a translation from say German into English will not be as good as the original, and may even be misleading.

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To insure against this three conditions are necessary. The original author must state his case clearly. This is by no means universal with original authors. The translator must have a good knowledge both of the original language and the subject with which the article deals. He must also be able to write in the language into which he is translating. It may be possible—it is not easy—to fulfil these conditions, but we still maintain that it will be easier when the languages are natural and not artificial. In all cases, moreover, there is the added difficulty of vocabulary. Scientific and technical knowledge is growing rapidly, and new terms are constantly being invented, not always with the greatest care. But when the two languages concerned are natural it is nearly always possible to find a word or phrase in one which conveys the correct meaning of the word or phrase that is to be translated. But before this can be done in an artificial language invention has to be called in and the result, as Mr. E. H. TURLE has pointed out, is not always satisfactory.

The Newcastle Accident.

THE evidence given before Major G. L. HALL at the Ministry of Transport inquiry into the accident at Newcastle confirms the view that the occurrence was not due to any failure of the electrical equipment. Several witnesses stated that the "dead man's handle" was tied down with handkerchiefs, and all agreed that such a thing had never been heard of before. We need not inquire here why the unfortunate driver, who sacrificed his life to his folly, should have gone to the trouble of putting a device, which was installed both for his own protection and that of the passengers, out of action. But the incident does emphasise the need for a modification in the design, so that tampering with much-needed safety equipment may be impossible in future. It may be added that on the London Tube Railways there is an additional safeguard, for if for any reason a train over-runs signals at danger, as happened in this instance, automatic train stops on the track come into action and bring the train to rest.

Superconductive Copper.

IT is a little extraordinary that considering the large part which "losses" play in the generation, transmission and utilisation of electricity, a part which is often reflected in the balance sheet, that so little attempt should have been made by electrical engineers to reduce that class of these phenomena which it conveniently described as unavoidable. KELVIN long ago showed that the conductivity of copper increased with its purity, but though the results of his work have been generally accepted it is only quite lately that any attempt has been made to improve upon them. Copper, as is known, is crystalline in structure, and it therefore occurred to Dr. DAVEY to investigate theoretically whether an increase in the size of the crystals would have favourable effects on the conductivity. Theory indicated that it would, and that copper consisting of one crystal should be 14 per cent. more conductive than ordinary polycrystal. On another page of this issue we give some account of the experiments which were undertaken to discover whether this deduction held good in practice. It was found that the conductivity of single crystal copper decreased 13 per cent. after it had been converted into polycrystal copper by mechanical treatment. The result is probably due to the resistance at the boundaries of the crystals. There are obvious practical difficulties in the way of manufacturing and employing single crystal copper at present. But it is interesting to learn that Dr. DAVEY is now able to make single crystals 2 in. in diameter and 18 in. long. Further progress will be watched with interest.

The British Association Meeting.

THE meeting of the British Association at Oxford can be written down as a complete success, both generally and more particularly as regards electrical matters. The PRINCE OF WALES in calling attention to the debt which the nation owes to science, a debt which, like the National Debt, will always increase in amount, did good work and engendered a feeling of optimism and expectancy about the future which, even if it leads to no spectacular results, will be all to the good. Lord BALFOUR recalled that the last meetings of the Association at both Oxford and Cambridge had been quickly followed by important discoveries. Sir OLIVER LODGE suggested that the next great advance would be an extension of the method of science into the realms of the spiritual. It will be remembered that he dealt with the same subject in his Presidential Address in 1913, and in commenting on it in THE ELECTRICIAN, we said that this was a subject on which we must take up an attitude of agnosticism in the true sense of the word. Nevertheless, we added, the subject, if there is truth to be found in it, is surely of the greatest interest, and nothing is to be gained by meeting it with a barrier of unreasoning intolerance. Whatever attitude is adopted let it be scientific. That equally well expresses our views to-day. But whether we take precedent or prophecy as our beacons one thing is abundantly clear, that a combination of science with the everyday affairs of the nation is essential for the continuance of our civilisation. In this connection the scientific method of attack is most valuable. Regard is paid only to facts. Theories are convenient enough, but when once facts disprove them the mildest scientist becomes a thoroughgoing iconoclast. In the large world of affairs there are many problems to solve. Is it too much to suggest that they might be solved by attention to facts and that nostrums and slogans and policies, far from lightening our darkness, only tend to obscure it still more.

The B.E.S.A. Glossary.

WE do not know what reception Prof. HOWE thought that his Paper on the "B.E.S.A. Glossary" would receive, but the actuality must have been much milder than his expectations. Even Mr. WHARTON and Mr. GOOD admitted error, and ascribed the failure to collective effort, which we have always known could not fight battles, and we now learn cannot write glossaries. Mr. GOOD made the useful point, however, that there existed wide difference of opinion, and this was emphasised by Prof. FORTESCUE'S written communication. Prof. CRAMP, however, rubbed it in that the definitions mentioned by Prof. HOWE were not the only ones that were hopelessly wrong. He made necessary appeal for the need of distinguishing carefully between the Faraday tube and the Maxwell tube and for sticking to one or the other, once the choice had been made. His suggestion that every single term on the first eleven pages of the glossary should be marked "deprecated" though a little cruel, seemed to be in accordance with the general sense of the meeting.

Some Coal Figures.

THE decision of the delegate conference of the Miners' Federation to empower the Executive to enter into negotiations with the owners and the Government will, it is to be hoped, lead to satisfactory results. That the Federation would have for their own sakes to relinquish the policy of negation which has so far seemed to them to be best was obvious from the unrest in the various mining districts, the drift back to work which is occurring in certain parts of the country and not the least from the bare statement in the "Ministry of Labour Gazette" that from May 1st to July 31st the aggregate number of working days lost was about 66 000 000 millions. The effect of the stoppage is shown in another way by the trade returns for July. In July 1925 imported coal was valued at £718, in July 1926 this figure had risen to £4 148 000. The quantity received amounted to 2 319 657 tons at an average price of 35s. 9d. per ton as against 360 tons in July 1925. On the other hand the total exports fell by £7 563 000, coal being responsible for £4 457 000 of this decrease. It is obvious that this state of affairs cannot be indefinitely continued. On the other hand we are glad to note that the electrical exports reached the satisfactory figure of £1 620 444, the highest during recent months, and £320 693 more than for the corresponding month of last year.

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MEASURING SMALL ALTERNATING CURRENTS.

The Duddell Thermo-Galvanometer—Some Modifications for H.T. Work—Points in the Selection of Instruments—Choice of Valves.

By E. H. W. BANNER, M.Sc., A.M.I.R.E., A.Inst.P.

FOR measuring alternating currents of the order of amperes there are various commercial indicating instruments available. With currents of less than an ampere several laboratory methods are available, and two or three instruments which will read as low as only a few milliamperes. These latter instruments are not usually possessed by the radio experimenter and an arrangement which uses thermionic valves and has for an indicator an ordinary moving-coil milliammeter is often useful, and is more generally accessible.

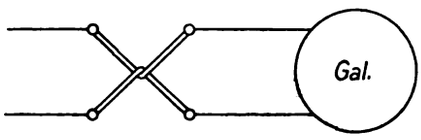

Fig. 1.

The instruments that are used are mainly thermal ones, that is, they operate with the heating produced by the current to be measured. Probably the most sensitive type is the Duddell thermo-galvanometer. This is a moving-coil galvanometer with the coil, generally of one turn only, connected to a tiny thermo-couple which is placed very close to a heater which carries the current to be measured. This is suitable for several microamperes or a few milliamperes, but its expense precludes its use by the average experimenter. A cheaper arrangement consists of an ordinary moving-coil galvanometer, reflecting if for low ranges, or pivoted for higher currents, which is connected externally to a thermo-junction.

Except for low ranges it is possible to use an ordinary moving-coil voltmeter or ammeter if the series resistance, or the shunt, respectively, can be disconnected, and if the moving-coil is suitable. (For further information see the writer's article on "Increasing the Range of D.C. Measuring Instruments," in "Experimental Wireless," February, 1925.)

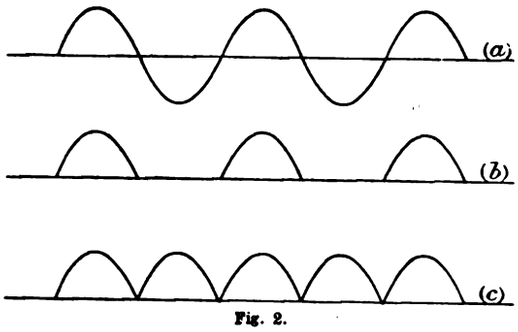

Fig. 2.

The thermo-junction for the above may take either of two forms. For comparatively rough indications where accuracy is not required it can be an open junction, consisting of a cross of two wires; copper and constantan being suitable materials. Fig. 1 shows the general style of the junction. For more accurate work the junction must be in vacuo, as air currents cause unsteadiness. The exhausting of the air also renders the junction much more sensitive.

The method to be described is not new, and is used extensively for measuring currents in high tension circuits.

It has several modifications which are suitable for several classes of circuit. In the case of an ordinary crystal detector, an alternating e.m.f. of assumed sinusoidal waveform is applied to the combination of detector and telephones. The resulting current through the 'phones is unidirectional, and not alternating, the rectification being termed half-wave. Fig. 2 (a) shows an incoming sinusoidal wave of constant amplitude (or in fact any alternating current of high or low frequency), (b) shows half wave rectification, such as is produced by a single rectifier, either crystal or thermionic, and (c) full-wave rectification which is produced by either two or four rectifiers, but not by one alone. A single rectifier cannot therefore be used directly in an alternating current circuit to measure current, as one half of the wave is suppressed. If two rectifiers are used back-to-back the other half of the wave is passed through the circuit, but not through an instrument in series with either of the rectifiers. If the current is truly sinusoidal it is immaterial which half of the wave is measured, but the mean current in the line is twice the reading on the instrument. If an asymmetrical waveform such as Fig. 3 is to be measured an instrument must be used in each half of the wave.

The current from a spark coil or Ruhmkorff coil is of this nature, except that it is more peaked. Where this is to be used for X-ray generation and other purposes where unidirectional current only is effective, a circuit containing two rectifiers and two instruments will read both the forward, or useful, current and the reverse current. Further, a rectified alternating current, either half or full wave rectified, is not necessarily the same as a direct current in its effect.

With d.c. the heating due to the current is proportional to I^2 and the electrochemical effect is proportional to I.

and $$I_{mean} = \frac{1}{2\pi} \int_0^{2\pi} i\,dt.$$

If the rectified a.c. is read on a moving-coil instrument the "electrolytic" value of the current will be read, that is, a

Fig. 3.

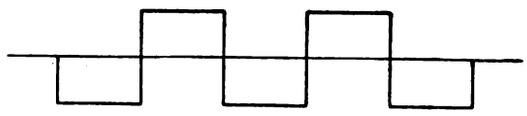

Fig. 4.

reading of the same value as that of a direct current reading the same quantity will have the same electrolytic effects.

Battery charging is an example of this case. The reading of the a.c. is in this case the "mean" value, and not that read on any suitable alternating current instrument such as a moving-iron ammeter. The latter type of instrument will read the r.m.s. value, and is that corresponding to the heating effect of the current.

For a rectangular wave such as shown in Fig. 4 the two are equal, and so their ratio is unity. For all other wave forms the r.m.s. value is greater than the mean, and so the ratio r.m.s. to mean is greater than unity. In electrical design this ratio is called the form factor, and for sinusoidal currents its value is 1·11.

With these considerations it is easy to see that if two instruments are put in series on a rectified a.c. circuit, one being moving coil and the other moving-iron, the readings will not be the same. (The rectangular wave is not obtained in practice, except when a direct current is periodically reversed by switching in some manner.) If the ratio of the two readings is measured, an appoximation to the wave form can be determined by reference to a list of form factors to be found in books on alternating currents, if this is required.

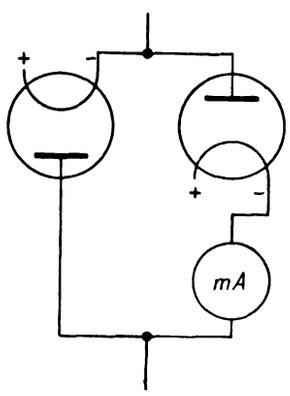

Fig. 5.

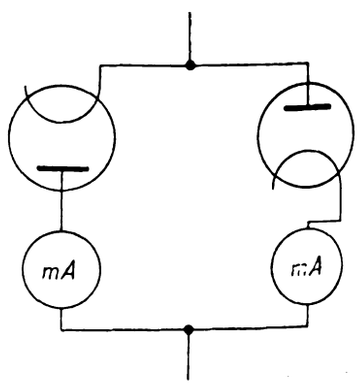

Fig. 6.

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With regard to the use of an instrument for a particular circuit, a moving-coil instrument should be used if the rectified supply is for battery charging and a moving-iron, or other square-law instrument, for heating and other work, i.e., supplying valve filaments. In either case the power in the circuit is EI, where E is the voltage across the load and I the current read on the appropriate instrument.

Finally, if it is only required to read a small alternating current which is below the range of the moving-iron instruments (several milliamperes) the current can be measured either half by two rectifiers, or by using four rectifiers the full-wave current can be read. The reading is the mean value, as a moving-coil indicator is used.

Fig. 5 shows a means of measuring a small current. The rectifiers must be capable of giving an emission greater than that to be measured, and if ordinary three-electrode valves are used the anode and grid must be connected together.

Two separate filament batteries are required, it must be noted. The instrument may be either moving-coil or moving-iron, as described above, depending on the nature of the circuit, if of sufficient current to operate a moving-iron milliammeter.

It must be noted that the line current may be as shown in Fig. 2 (*a*) and although the instrument receives impulses as in Fig. 2 (*b*) the line current is still sinusoidal, unlike the case of the crystal detector and telephones, where one-half of the wave is suppressed—if rectification is perfect.

Fig. 6 shows a two-instrument method of measuring currents of waveforms such as that of Fig. 3. Equality of readings shows that the waveform has a loop area above the zero line equal to that below it, but not necessarily symmetrical. In Fig. 7 two instruments are used for determining the waveform; one is a moving-coil and the other a moving-iron instrument.

With alternating currents from supply mains the reading of the moving-iron instrument will be very nearly 1·11 times that of the other. In each case only one-half the line current is being measured, as we have now only one-half of the wave passing through the instrument, unlike the case of Fig. 6, where each half is read on an ammeter, and the total current is the sum of the readings. Finally, Fig. 8 shows how one instrument can be used to read the total mean current.

Three filament batteries are necessary, and one has to supply twice the current of the other two. This circuit is for measuring currents of the order of a few milliamperes, which are below the range of instruments other than the laboratory instruments described earlier.

It is essential to connect the filaments as shown in the figures, or circulating currents will flow which will give a reading on the instruments when no alternating current is flowing.

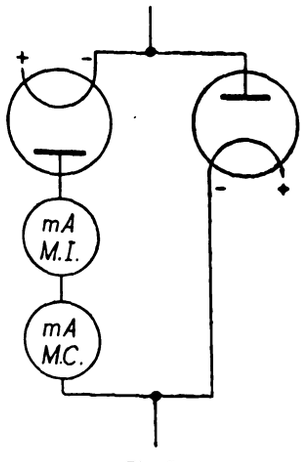

Fig. 7.

M.I.—Moving-iron or other square law instrument.
M.C.—Moving-coil instrument.

When setting up the circuits an ordinary alternating current instrument can be inserted directly in the leads and its reading compared with that of the rectifier instruments. This is only possible for currents of the order of twenty milliamperes or more.

A practical point is in the selection of valves. Power valves such as the LS5 (Osram) give a considerable emission and may be used for circuits of the order of 20-30 milliamperes. The filament current is rather high, and two or three filament accumulators are expensive.

If dull emitter valves are used it is possible to use dry batteries, thereby greatly reducing the first cost of the set. The DE5 is a dull emitter power valve suitable for measurements up to several milliamperes.

For very small currents, using a sensitive moving-coil instrument, or a galvanometer, dull emitters requiring only 60 milliamperes are avilable, these are very economical of battery power. If dry-cell valves are used it will often be

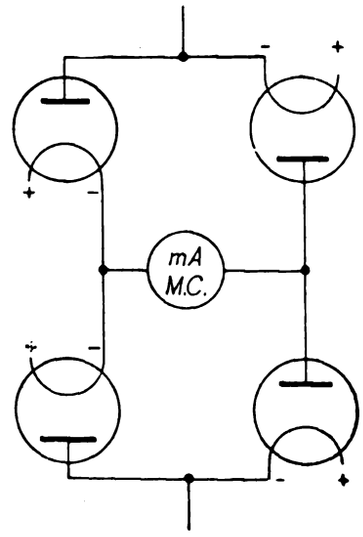

Fig. 8.

found possible to rig up the circuit of Fig. 8 without any additional outlay. Any of the above arrangements are practically free from inductance and capacity and so may be used at supply, audio or radio frequencies, except radio frequencies of extreme frequency (very short waves), when the valve capacities would be appreciable. The impedance, however, is not negligible, and the introduction of the measuring instrument rectifiers may modify completely the characteristics of a circuit.

It must be remembered, though, that any measuring instrument reading very small currents has a high resistance, and frequently the above methods are the only practicable ones when laboratory instruments are not accessible and the current to be measured of the order of microamperes or milliamperes. No difficulty is experienced in producing moving-coil galvanometers for very small fractions of a microampere.

Recapitulating briefly, the uses of the various circuits are as follows :—

A. Measuring form factor, when the current is over about 20 milliamperes. Fig. 7.

B. Measuring the mean or the r.m.s. current in each half of an asymmetrical wave (as Fig. 3). Fig. 6.

C. A combination of the above.

D. Measuring half the mean or r.m.s. current on a sinusoidal waveform—such as supply mains when the current is less than can be read on an a.c. milliammeter.

E. Measuring the mean current of a sinusoidal wave, reading the full mean current on one instrument, when the current is lower than can be read on an a.c. instrument. Fig. 8.

Range : a few microamperes or even less if a sensitive galvanometer can be obtained, up to 20-30 milliamperes.

Electrical Refrigeration.

A paper entitled "Small Refrigerating Plants" was read before Section G (Engineering) of the British Association by Prof. C. F. Jenkin. A number of small refrigerators such as would be suitable for shopkeepers and domestic use were exhibited. The paper mainly consisted of a description of this equipment. Those which possess electrical features have already been dealt with in THE ELECTRICIAN. The author also indicated the essential features of the vapour-compression and absorption types of plant, and referred to the total heat-entropy charts for the principal refrigerants—viz., ammonia, sulphur dioxide, ethyl chloride and methyl-chloride. A theoretical paper on "The Carbonic Acid Refrigerator and the Cooling of the Working Fluid" was subsequently read by Prof. E. H. Lamb.

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STATION DESIGN IN THE MELTING POT.

Combined Low Temperature Carbonisation and Combustion Apparently the Only Features Certain to Emerge.

By DAVID BROWNLIE.

A FEW years ago, say when the war started, hardly anyone could have predicted the enormous advance in steam power generation technique that we have witnessed during the past six or seven years, and especially the fact that to-day the whole design of the condensing steam turbine driven station is in the melting pot.

For example, the boiler, much more important and difficult in this connection than the power generator for utilising the steam, has followed almost until a year or two ago what may be termed a perfectly natural and obvious, although somewhat rambling and unscientific, course of evolution. Starting with Savery in 1698, who could not find craftsmen to construct his copper boilers of any practical size to stand say 50 lb. pressure, the large kettle type of steam generator appeared, working at about 1 to 2 lb. pressure in conjunction with the "Newcomen" atmospheric engine, which resulted eventually in the "egg ended," the "haystack" and the "wagon" boilers generally working at not over about 6 lb. pressure.

Boiler Evolution.

Then Richard Trevithick in 1797 completely revolutionised steam generation practice by inventing the high pressure "Cornish" internally fired cylindrical boiler and working at 25 lb. pressure, subsequently raised to 50 lb. and over. From this was a very short step to the "Lancashire" boiler, gradually raised in pressure until to-day 160 to 200 lb. is a common figure. At the same time we have witnessed the evolution of the water tube boiler so as to increase the rate of circulation, an idea at least a century old, and this enabled pressures of 200 lb. with 600 deg. F. superheated steam temperature to become standard practice in ordinary power stations. During the last ten years the increase in size, complexity, and pressure of what is still the same general design of water tube boiler has been amazing and to-day in the United States we have single units of 30 000 sq. ft. heating surface and over, that is 300 000 lb. per hr. normal evaporation and 550 to 650 lb. pressure.

Instead of the comparatively simple boiler, superheater, and mechanical stoker, with combustion chambers 6 or 7 ft. high, there has evolved a vast erection, sometimes stretching up to 100 ft. above the floor level, the height of many a factory chimney. Some of the additions are radiant heat superheaters, secondary superheaters for reheating the steam between stages, steam purifiers, feed water economisers, both steel and cast iron of special design, air heating, hollow air cooled and water cooled brickwork, water cooled steel tube side and back walls in series with the boiler, water screens (in the case of pulverised fuel firing), automatic control based on the flow of steam in the pipes, as distinct from the pressure- and various other equipment in bewildering array. All this has happened in the endeavour to evaporate water as fast as possible from a unit heating surface and maintain the efficiency of both the combustion and the rate of heat transmission.

What is the Next Stage?

However, what may be termed this standard design of scientific though bloated boiler plant is now, by a natural stage of evolution, apparently reaching the end of its long reign, and will eventually follow the example of those prehistoric monsters on land and sea, weighing 50 or 100 tons apiece, who, millions of years ago, "evoluted" themselves into oblivion and were replaced by smaller and more efficient types. What will be exactly the next stage in steam generation plant remains to be seen, but it will certainly be in the direction of what may be termed well thought out and direct acting simplicity. Thus we have now the steam generator in the form of a complete box of tubes forming the combustion chamber fired by pulverised fuel, with tangential mixing of the flames and gases with an enormous rate of evaporation per sq. ft. of heating surface resulting in a comparatively small unit and elimination of all kinds of complexities. Also instead of steel forgings 4 in. thick and weighing about 100 tons so as to work at 1 000 lb. of pressure and over, while still retaining the present standard design of water tube boiler, we seem to be going in the direction of simple generators on the coil tube principle in which steam is formed under the actual critical conditions of say 3 200 lb. pressure and 706 deg. F. without ebullition, that is the absorption of radiant heat.

Other revolutionary methods of steam generation will be familiar, and it is very likely also that before long the metallurgist will evolve a steel or other alloy at a reasonable price that will enable steam to operate continuously at say 1 000 deg. F. (540 deg. C.), so that the present super-power station conditions of 350 to 500 lb. pressure and 725 to 750 deg. F. temperature are already in transition. Some recent experiments at the Gennevilliers station, Paris, are of the greatest interest in this connection. One of the turbines was designed for 320 lb. pressure and 705 deg. F., but advantage was taken of the fact that the new boilers with pulverised fuel firing would if necessary give much higher temperatures and pressures of steam than was anticipated, to run the turbine with steam temperatures as high as 914 deg. F. Thus, for example, out of a total run of 580 hr., 240 hr. were above 750 deg. F. and 135 hr. were over 775 deg. F. Also a special series of runs were undertaken at 800 deg. F. and over, representing 75 hr. altogether of which 22 were at more than 840 deg. F. Finally, at the end of the run, 5 hr. were at 880 deg. F. and 2 at 900 to 914 deg. F. In spite of this, however, the turbine showed no sign of deterioration and was put back into service again under the ordinary conditions. Although we are not told the condition of the superheater this episode is only another example of the fact that the generation of the steam is the most difficult part of high pressure and temperature work.

Steam Turbine Progress.

The steam turbine seems to be equally in the melting pot, at any rate as regards size. For example, the Commonwealth Edison Co., Chicago, have now orderd for their Crawford Avenue station, operating at 600 lb. gauge pressure and 750 deg. F., a 90 000 kW turbine, although in November, 1924, the 60 000 kW set in operation at the same station was one of the largest in the world, while incidentally in 1903 the Commonwealth Edison Co. also had the record turbine of that day, a 5 000 kW unit erected at the Fisk Street station. It is only a year or two ago that 35 000 kW was regarded as about the maximum for a turbine and now we are given to understand that a 160 000 kW set is to be constructed for the Hell Gate station, New York, which will bring up the installation to 445 000 kW. This 160 000 kW unit is to be on the compound reaction principle, consisting of a single flow high pressure element operating at 1 800 revs. per min., driving a 75 000 kW generator, and a double flow low pressure element at 1 200 revs. per min. driving an 85 000 kW generator.

With regard to reheating the steam between the stages the efficiency of the turbine may of course be extended by further developments in this field, although the limit has nearly been reached in the way of bleeder heating the feed water to minimise the latent heat of steam loss in the condenser. At the same time however one would like to hear much more with regard to the exact results being obtained on continuous running with reheating equipment, and the real net savings obtained after making due allowances for the extra capital outlay, interest, depreciation, and maintenance.

Also even steam turbines may pass to smaller sets again, running at say 1 500 lb. pressure and over, at 20 000 to 50 000 revs. per min., to say nothing of the possibility of eliminating steam and water altogether and using mercury instead.

With regard to preventing the most serious loss of all in ordinary steam power station practice, that of say 50 to 55 per cent. of the total heat of the coal in the cooling water of the condenser, very considerable developments have been made in both the United States and Germany, and for this reason alone it is by no means clear that the present practice of choosing the site of a station mainly according to the cooling water conditions is the best policy.

Further, we have even no guarantee at all that power from coal or other fuel will continue to be obtained through the medium of steam. Obviously, the great development of pulverised fuel technique brings the solid fuel engine or turbine nearer the stage of a practical proposition. Naturally

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the ideal would be to explode the pulverised fuel in an engine cylinder or turbine casing, and experimental work with a pulverised fuel engine has been in progress in Germany for over four years past, and it has already been found that the abrasive effect of the residual ash on the cylinder lining and piston is much less than anticipated. Work in this field is also stated to be in progress in the United States, and the struggle for supremacy at no very distant date may be between steam generation at several thousand pounds pressure, pass-out turbines, and sale of low pressure steam or hot water, and the direct use of pulverised fuel in a turbine or Diesel engine.

Unscientific Methods.

Out of all this welter of ideas and achievement there would seem to emerge only one very definite feature, that we cannot go on much longer burning raw coal as fuel. Whatever type, size and pressure of steam generator be employed, and whether mercury is substituted for water, or a pulverised fuel engine or turbine adopted, does not alter the fact that it is a grossly unscientific proceeding to consume raw coal for power production and use as mere fuel in one form or another all the valuable products that can be extracted. It is a matter for the future whether this is to be accomplished by low temperature carbonisation, using the term in the broadest sense, by hydrogenation and the direct production of liquid fuel, or by synthetic fuels from methane and other products obtained by the total gasification of the coal.

With ordinary low temperature carbonisation methods, the 8 000 000 tons of coal burnt per annum in the electricity station boiler plants of Great Britain alone corresponds to the production every year of about 20 000 000 gallons of motor spirit, 120,000 000 gallons of low temperature tar, and 53 000 tons of sulphate of ammonia with the consumption of 9 600 000 tons of coal instead of 8 000 000 tons and the production of 6 750 000 tons of smokeless fuel. We cannot, for example, go on indefinitely with single electricity stations burning 500 000 tons of raw coal per annum, and consuming about 1 250 000 gallons of motor spirit and 7 500 000 gallons of low temperature tar in the process. Certainly therefore the combination of low temperature carbonisation of the coal in front of the boiler, separation of the oils, and, if necessary, the sulphate of ammonia, and the combustion of the residual carbonised fuel and the gas would seem to be one of the next stages in standard water tube boiler practice. This, of course, can be carried out on two general principles : (1) Carbonisation of the coal in the ordinary slack or lump condition in conjunction with travelling grate mechanical stokers, and (2) carbonisation in the pulverised condition and the burning of the residual finely divided fuel at the burners along with the residual gas. As regards combined low temperature carbonisation and mechanical stoker practice, two of the best known processes are those of the Julius Pintsch A.G., of Berlin, and Merz and McLellan in Great Britain, the latter using highly superheated steam as the heating agent, and the former hot gases from the combustion chamber, both on the internal mechanically continuous principle.

The Pre-heating Idea.

The idea of pre-heating coal in direct conjunction with general furnace operation is of very ancient origin, dating back at any rate to John Price, of Sunderland, in 1870, but as regards combined low temperature carbonisation and combustion for power station practice, it is not generally known that Mr. George Wilkinson proposed to carry this out at Harrogate electricity station in 1917, his British patent of the year being prior to the British patent of Julius Pintsch A.G., although the latter presumably had already been at work on the subject in Germany. Drawings and specifications for the installation at Harrogate were got out, the plant consisting of one water tube boiler, retort, condensers, and other accessories, and the orders were actually placed, but at the last moment the Government refused to give a priority certificate for the purchase of the steel and in consequence this valuable and interesting work was abandoned. The Wilkinson method was to have embodied a vertical, mechanically continuous retort, on the lines of the Pintsch and Merz and McLellan processes, with combined internal and external heating by means of the hot furnace gases. The Julius Pintsch A.G. have had a most extensive large scale experience on the subject and following upon their first plant erected in 1919 at the municipal electricity station of Lichtenberg, near Berlin, operating two "Steinmuller" boilers, they have to-day nine plants in operation in Germany, Norway, and the Prinzengrube and Trauscholdsegen colliery districts of Upper Silesia, chiefly started up in 1922.

Perhaps of most interest at the moment, however, is the "McEwen-Runge" process of low temperature carbonisation of pulverised coal, in connection with which a very large plant with a calculated throughput of 200 tons of coal per 24 hours has just been started up at the well-known Lakeside station, Milwaukee. The results are of course not yet known, but much experience has already been obtained since 1924 with a large scale experimental retort erected at Lakeside on the single stage principle approximately 31 ft. high and 12 in. diameter.

The carbonisation of pulverised coal is also an old idea, dating back to Thomas Russel Crampton, of London, in 1868, the practical pioneer of the electric cable, pulverised coal firing, and the "balanced" steam locomotive, as well as one of the founders of the Institution of Electrical Engineers. Other earlier workers in the field of pulverised coal carbonisation are John A. Yeadon and T. Whittaker, and Prof. Vivian B. Lewes, but McEwen adopted internal heating, itself not new, with the definite object of combined low temperature carbonisation and combustion in conjunction with water tube boilers.

CLASSIFICATION OF PATENT SPECIFICATIONS.

IN a Paper on the "Classification of Patent Specifications," read before Section G of the British Association, Dr. A. P. Thurston said that patent classification has to achieve various somewhat conflicting objects, i.e., (*a*) to enable a manufacturer or individual to ascertain whether he might manufacture or use an article or process with impunity; (*b*) to enable a manufacturer or individual, in the event of receiving a threat of an infringement, to ascertain what his chances were if he fought the action; (*c*) to enable an inquirer to ascertain the whole existing public knowledge of any art or manufacture; (*d*) to enable an inventor or his agent to claim as much as possible under his patent; (*e*) to enable the staff of H.M. Patent Office to protect the public by seeing that no more was claimed than was permissible, i.e., that the claims were novel; (*f*) to enable a manufacturer or individual who found that his competitors had obtained patents to demonstrate the invalidity of such hostile patents or to restrict their scope.

Patent classification should obey the basic laws of classification, e.g., (*a*) it should proceed from wide headings to narrow headings, from terms of great extension and small intention to terms of small extension and great intention; (*b*) it should be adapted to admit interpolations; (*c*) the characteristics chosen for sub-divisions of any one class or sub-class must be consistent throughout that class or sub-class; (*d*) the headings must be mutually exclusive; (*e*) the terminology used must be consistent, the meaning of terms being invariable throughout.

Patent classification was a classification of subject-matter rather than of literary material, and the subject-matter was available generally in penny numbers. Therefore, it was not necessary to follow another law of book classification, namely, to allot a book to the nearest heading of the classification that would wholly contain it. The American schedule obeyed this rule, but the British schedule, in which every sub-division was self-contained, and in which there were no "superior" and "inferior" headings, did not.

The British System

The system adopted by the British Patent Office was, in the author's opinion, a superb achievement. It had been in daily operation for over twenty years, i.e., from January 1st, 1905, and had enabled searches to be made with precision and accuracy. In the existing British classification every specification was indexed thoroughly for all matter of interest, whether claimed or not, and appeared in the indices under all relevant sub-headings. This was not the American or German practice. Each class or sub-class was specifically defined by the headings appearing under it, and the references from it to other classes. There were no "see also" references. The published classification and allotment of cases under it was exactly that used by the examining staff. This was not so in the U.S.A. office, where repeat copies were placed in the official search files, that were met only by cross-references in the printed key. This was not so also in German practice. The British classification was based upon construction or structure, and not upon application. Nevertheless, the classification bore marks of its evolution from a classification based upon industries or application.

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SUPERCONDUCTIVE COPPER.

Some Theoretical Considerations and Practical Developments—Dr. Davey's Experiments—An Increase of 13 Per Cent.

FROM A CORRESPONDENT

A SEARCH for more highly conductive materials has been going on for many years in order to diminish the energy losses in electrical conductors. It is well known that silver is the metal having the lowest resistivity, but its cost has naturally prevented its industrial application. The use of copper has long been settled practice but in the early days of electrical transmission it was used in a more or less impure condition, and the wire showed considerable differences in conductivity from specimen to specimen, even as much as in the ratio of 2·5 to 1. Kelvin was the first to recommend the employment of pure copper for use in connection with transatlantic cables, as he had found that the conductivity increased with the degree of chemical purity. In spite of the well known economic advantages as regards the saving in tonnage of copper, the increased radius of transmission or the possible increased loading of existing cables which would arise from any process capable of increasing the conductivity of pure copper, the matter seems to have rested there ever since, until Dr. W. P. Davey took up the work of determining the electrical properties of single crystals of copper.

Incidentally it was established by Dr. Kammerlingh Onnes in his cryogenic laboratory at Leyden that at temperatures approaching absolute zero metals tend to become "superconductors" so that a current once started appeared to continue indefinitely, but obviously the discovery was without practical significance.

It is reported that Dr. Davey's experiments resulted from theoretical considerations and calculations which showed that a single crystal of copper should possess a conductivity 14 per cent. greater than that of ordinary polycrystal copper.

Producing Large Crystals.

There are two ways of producing large single metal crystals, viz., the liquid metal in cooling is made to solidify as a single crystal or the small normal crystals may be converted into a single crystal by a process of critical deformation followed by heat. The latter method is the one which has been adopted for producing large crystals of aluminium and iron, but the former was utilised by Dr. Davey working on the lines of Dr. P. W. Bridgeman's crystal growing experiments. Davey succeeded in cooling the molten copper in an electric furnace so slowly that only one crystal was formed from the whole of the melt in a cylindrical mould. The first single crystals of copper of commercial purity were grown to be of ½ in. diameter and 6 in. long.

The crystal lattice of copper is a face centred cube like that of aluminium, and in the case of Davey's crystals it was found that a cubic axis was always parallel to the axis of the crystal, i.e., the 100 plane lay in the axis.

The electrical conductivity was therefore measured in the direction of a cubic axis, and it was found that the specific conductivity of the single copper crystals at 20 deg. C. was $0{\cdot}662 \times 10^6$ Ω per cub. cm. It is interesting to note that in spite of the smallness of the quantities measured, viz., only 36×10^{-5} V and 18×10^6 Ω the accuracy is stated to be one-quarter of 1 per cent.

The crystal was then hammered and swaged, and by this means converted into polycrystal copper which was annealed in hydrogen for 30 minutes at 800 deg. C. In this condition the specific conductivity was found to be $0{\cdot}584 \times 10^6$ Ω per cub. cm. or the resistivity had increased 13 per cent.

The specific conductivity of ordinary annealed polycrystal copper is $0{\cdot}578 \times 10^6$ Ω per cub. cm.

Changes in Resistivity.

In ordinary copper the arrangement of the small crystals is quite haphazard, and therefore Davey's results indicate that the resistivity of cubic crystal is different in different directions. It has been stated that it is expected to find that the conductivity along another axis is even 60 per cent. greater than the value for pure polycrystal copper, but unfortunately the growth of crystals along any desired axis cannot be brought about at will. As Bridgeman first demonstrated, crystals grown from the liquid phase show a tendency for one orientation to be more favourable to growth than others, so that even if a number of crystals start, that crystal will survive which is most favourably situated.

As mentioned above, in copper the 100 plane lay in the axis. Most single crystals of aluminium favour a position near the 110 axis, whilst in single crystals of iron and aluminium-zinc alloy the 110 axis is avoided.

It may be mentioned, however, that in experiments on molybdenum, tungsten and also aluminium, no difference in electrical resistivity was found along different crystallographic planes. In the first place, however, tungsten and molybdenum crystals have body centred lattices and it is also difficult to conceive of as large an error as 13 per cent. in Davey's measurements.

Apart from the resistance of crystals in different directions the matter may be looked at in another way. In experiments on single crystals the properties of the metal are measured apart from those of the crystal boundaries. Mechanically the crystal boundaries are stronger than the crystal, and it is thought that the amorphous material in the crystal boundaries may offer a greater resistance to the passage of electrons the flow of which constitutes the current, than a continuous regular arrangement of atoms which occurs in the single crystal.

It will be recalled that single crystals of copper can be bent double with great ease—they probably possess no primitive limit of proportionality—whereas an effort is required to restraighten them. The bending has transformed the large crystal into a mass of smaller ones.

The difficulty of manufacture of single crystals of copper and their instability under bending strain mentioned above, indicate that some time may elapse before commercial advantage can be taken of their super conducting qualities. It can hardly be doubted, however, that we are at the beginning of a great development in the metallurgy of copper and that in view of the inherent practical utility of single crystal copper wire its production on a commercial scale can only be a matter of time.

As indicating the progress which is taking place, in a recent communication from Dr. Davey he says that he has now got to the point where he can make single crystals of 2 in. diam. and about 18 in. long.

Steam Turbines on Varying Loads.

IN a paper on "The Distribution of Pressure in Impulse Steam Turbines at Varying Loads," which was read before Section G of the British Association, Mr. W. J. Kearton pointed out that the nozzle areas in impulse steam turbines were determined in the process of design so as to bring the ratio of blade velocity to steam velocity in each stage as near to that value which ensured maximum efficiency as economic conditions would permit. At partial loads in steam turbines of normal design, and also under the very variable conditions in turbines of the mixed pressure and heat-extraction types, the nozzle areas were no longer correct and the distribution of pressure and hence of heat drop in the various stages became very different from that which existed at the economical load.

The paper outlined a method whereby the actual pressure distribution might be calculated. The pressure distribution in a nozzle was largely a function of the cross-sectional area at different points along the nozzle axis, and might be determined readily. In a turbine, however, the velocity of the steam was a discontinuous function. The method made use of (*a*) a curve showing the actual total energy available by expansion from the initial to any given pressure, (*b*) a curve showing the approximate specific volume of the steam at any pressure, and (*c*) the equation of continuity. The calculation was by a step-by-step process beginning at the exhaust pressure.

The paper illustrated the application of the method to high-pressure steam turbines with nozzle control governing in the first stage to mixed pressure turbines and to heat-extraction turbines. The ratio of blade speed to steam speed was affected in certain stages to an appreciable extent with a reduction in efficiency as a consequence. Relative steam velocities were altered and shock losses introduced. In certain types of plant considerable free expansion losses were involved.

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OUTDOOR SWITCHGEAR FOR LONDON.

Details of the Equipment for the Brimsdown Generating Station of the North Metropolitan Electric Power Supply Co.

WHEREAS it is now fairly common practice in this country to place 33 kV sub-station equipments out of doors the Brimsdown central station is the first instance of main generating station switchgear being thus situated, consequently a considerable amount of interest attaches to a description of this installation.

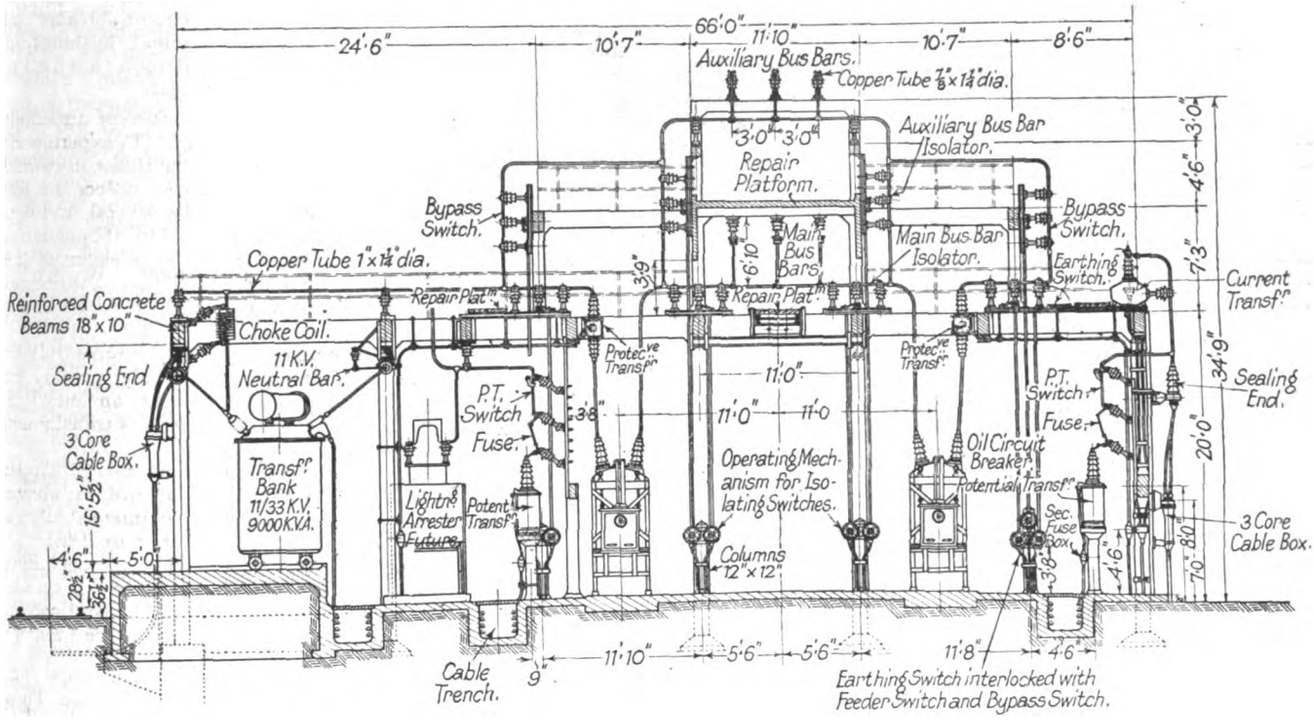

Fig. 1.—Section of the outdoor switchgear structure at the Brimsdown generating station of the North Metropolitan Electric Power Co.

The whole of this switchgear has been designed and installed by Ferguson Pailin to the specification of Mr. J. M. Donaldson, the chief engineer of the North Metropolitan Electric Power Supply Co. An end view of the structure is shown in Fig. 4, and a line drawing of the section of the structure corresponding to this view is given in Fig. 1.

The present installation comprises one 9 000 kVA transformer bank stepping up from the generating pressure up to 33 kV, together with outgoing feeders and bus coupling equipment. The installation is at present being extended by the addition of further feeders, another 9 000 kVA transformer bank and a 31 250 kVA generator. This is connected solid to the step-up transformer, all switching being carried out on the 33 kV side. Other similar generator sets and feeders will be added in the future. This station is interconnected with the Barking station. A single line diagram of the main connections of the existing installation and the extensions at present in hand is shown in Fig. 2.

As this gear is for central station control it is impossible for it to be completely shut down at any time for cleaning or repairs, consequently the arrangement of the busbar has to be such that work can be carried out in safety on one set of bars, whilst the other set and the various circuit equipments are alive. This has been accomplished by arranging the two sets of busbars one above the other as is clearly shown in Figs. 1 and 2. A repair platform is provided for each set of bars, whilst guard rails and ferro-concrete screens prevent independent contact with the live contacts of isolating switches, live connections, etc.

With a station of this description where the busbars are

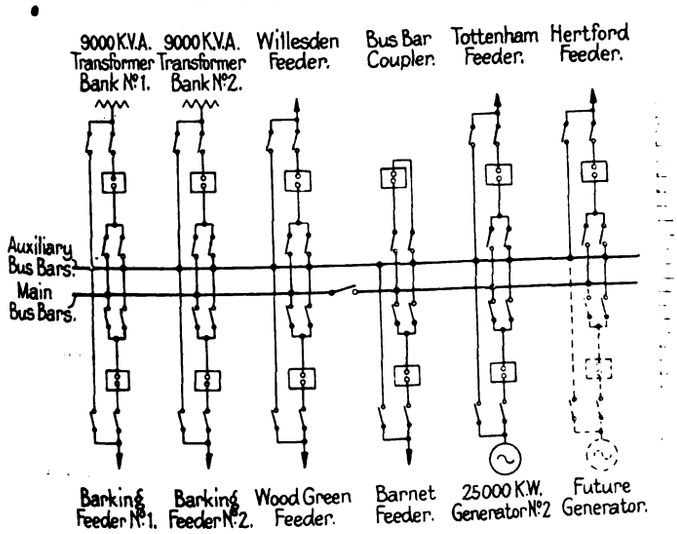

Fig. 2.—Single line diagram of main connections at Brimsdown.

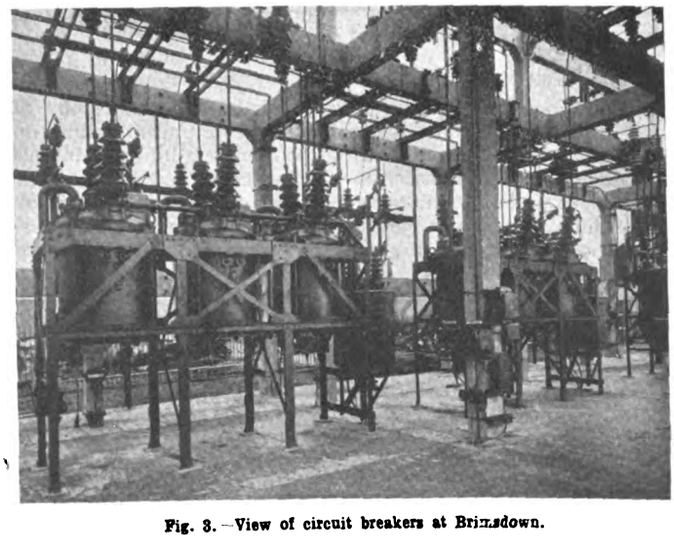

Fig. 3.—View of circuit breakers at Brimsdown.

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always alive, it is important that the painting and cleaning of the supporting structure should be reduced to an absolute minimum, consequently the structure has been built up of reinforced concrete which is impervious to the atmosphere in preference to galvanised steel. Although more expensive initially this will prove economical in the long run. The power transformer plinths, isolating switch operating pedestals and potential transformer pedestals are built of the same material.

High rupturing capacity oil circuit breakers are incorporated in the scheme and are of Ferguson Pailin's type "TA." These circuit breakers, which are suitable for use on systems up to 88 kV, were recently described in THE ELECTRICIAN, and are shown in situ in Fig. 3. Each breaker comprises three single pole units with a common set of operating mechanism. The construction is extremely robust throughout and the terminal bushings are of the condenser pattern with the upper portion protected by glazed porcelain weather sheds.

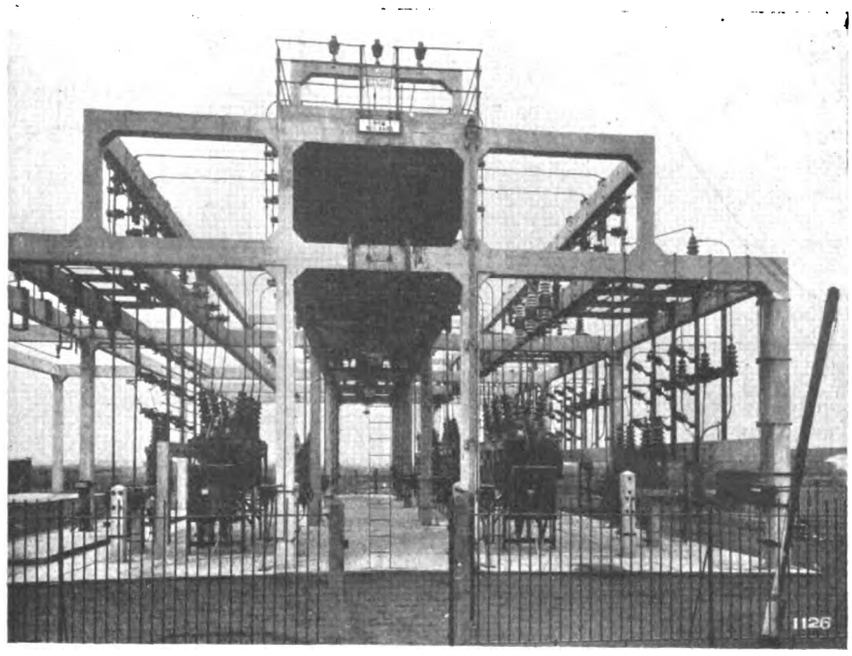

Fig. 4.—End view of structure at Brimsdown.

All the isolating switches with the exception of those for the potential transformers are of the triple pole rotary pattern, arranged for hand wheel operation from the ground level. On the feeder isolators separate earthing blades complete with hand-wheel operating mechanism are provided. This earthing gear is so arranged that the phases are earthed successively and not simultaneously. Auxiliary contacts are fitted on the mechanism for operating the semaphore diagrams on the control board. Each circuit is also provided with a by-pass isolating switch connecting the circuit direct to the auxiliary busbars. This enables the oil breaker on any circuit to be made "dead" for inspection, cleaning or repairs, whilst the supply to the circuit is maintained through the by-pass switch, auxiliary busbars and automatic bus coupling oil circuit breaker.

Balanced protection has been employed through except on the bus coupler switch, outdoor pattern current transformers being used. Transformers of the outdoor compound filled wound primary type are also used for metering purposes. All the other current transformers are of the bushing type mounted on the circuit breaker terminal bushings underneath the top plate.

Special attention has been paid to the lighting equipment on the outdoor gear to enable switching operations, etc., to be carried out at night. Wembley lanterns mounted on suitable standards are situated all round the structure, and in addition further lighting points are fitted in the main gangway below the two sets of busbars. Power plugs are also fitted at suitable points on the main uprights.

The circuit breakers are remote electrically operated by d.c. solenoids, the control panels being situated indoors in the power station. These panels are of the vertical slate fronted pattern, the back and sides being enclosed by dust-proof sheet steel doors and partitions. An indicating diagram runs the whole length of the board at the top. Semaphores operated by auxiliary contacts on the various circuit breakers and isolating switches, etc., indicate the positions of these pieces of apparatus, and thus showing the operator the state of the system. The synchronising gear is mounted on a separate cast iron floor mounting pedestal.

THE DIRECTIONAL RECORDING OF ATMOSPHERICS.*

By R. A. WATSON WATT

DATA on atmospherics have consisted hitherto chiefly of brief and isolated observations, based on aural estimates. The present paper describes an instrument enabling continuous records at widely distributed stations to be readily obtained The development of this recorder arose out of an investigation into the possibility of locating thunderstorms, which afterwards developed into a general inquiry into the origin and nature of atmospherics. Observations were first made with a standard Bellini-Tosi radiogoniometer. Later a simple and easily operated directional recorder suitable for obtaining data throughout the 24 hours was developed.

The apparatus, which is described in the original paper in detail, comprises a teak framing supporting a frame antenna, belt-driven by a turret clock and carrying a recording drum on which is inscribed the trace of an oscillographic pen, actuated by the output of the multi-stage amplifier connected to the frame antenna. The oscillograph is a tetrapolar moving-iron instrument, designed by Abraham and Bloch, and the pen gives a deflection of 3 mm. per milliampere for small deflections. A calibration curve of the instrument is given in the original paper. The instrument has certain drawbacks. It is non-discriminating and deals with the average direction of arrival of atmospherics, and it is only quantitative within somewhat narrow limits. But in spite of these and other limitations common to all normal direction finders, it gives fair sampling throughout the 24 hours, and the time devoted to maintenance and the records is less than that required for aural observations. In particular, it is always ready to record special phenomena, whereas the aural observer is limited to observations at certain fixed hours if any protracted period is to be covered. The total number of lost hours during the first 2½ years working averaged 8 per cent., but fell to 3 per cent. over the last 1½ years.

Data on the monthly mean values of intensity of disturbance at each hour of the day, for the hourly azimuths of greatest and least disturbance, are available for the period January, 1922, to August, 1924. Typical curves for May and November are presented in the original paper. The diurnal variation in atmospheric disturbance in a long wave receiver may now be described as reaching a maximum six hours after sunset, the fall from the maximum being temporarily interrupted by a slight increase 2½ hours before sunrise. The maximum disturbance for the day is reached some four hours after sunrise. An increase, most marked in summer, then begins and reaches a maximum five hours before sunset.

* Abstract of a Paper read before the Institution of Electrical Engineers.

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CORRESPONDENCE.

AMERICA THROUGH ENGLISH EYES.

[To the Editor.]

Sir,—For several years I have been an interested weekly reader of The Electrician, and have enjoyed its varied subject-matter very much. The issue of June 18th, 1926, was particularly interesting to an American, in that it gives us a rare opportunity to see ourselves as others see us. We hear so many comments from our friends and those close by, but it is seldom that we get an opportunity to hear the viewpoint of those from across the water. The articles by Mr. Mitchell and Col. Crompton and your editorial are all very valuable comments.

There are one or two points, however, on which I might differ with the impression. Two of these which are more or less interlinked are the questions of generator size and operating margin. Both Col. Crompton and yourself have the opinion that we Americans "identify progress with mere size." A glance back over the history of the industry of twenty years ago shows that the generating units, which are now considered so monstrous, are not so large in proportion to the size of the total system as were the generators built at that time. A man who goes into a generating station and sees perhaps a half dozen very large generating units gets the impression that each unit is a large portion of the whole. In fact, this is not quite true, because interconnection of generating stations is such that capacity which is not needed at one time for the local load may be used at some other centre. With the large number of stations, which are under the control of one system operator, more smaller units would complicate his problems very greatly.

I should also like to refer to the statement in the editorial concerning large generating units that "in the very nature of things such sets can only be fully loaded for a relatively small portion of the operating time." These large sets, as they are added, are used largely to handle the base load of the system, and the smaller and less efficient units are transferred to take care of peak loads only, so while a unit of 100 000 kW capacity may seem large, several of them may be kept loaded practically constantly through transmission lines on a system with a maximum capacity in the neighbourhood of 1 000 000 kW. With the rapid rate of growth in the electrical industry, the capacity of one of these units may be easily absorbed in a single year. When talking to some of our operators at the time of our maximum load in December, we get the impression that every year we have not only no excess capacity, but sometimes less than we really need to safely take care of the load. I will venture to say that few metropolitan systems in this country have a reserve capacity in excess of 15 per cent., which is none too much to take care of the failure of a unit at the time of the maximum load.

As a proof of this increased efficiency, obtained largely by high capacity units, I am sending you a curve showing the ratio of the cost of living to the cost of electricity for the past twelve years, which you may compare with the same items on cost in England as shown on p. 641 of the issue of The Electrician above referred to. You will note that while the cost of electricity in England is considerably higher than it was in 1913, the cost of electricity in the United States is not above the figure, nor has it ever risen to that figure, while the relative cost of living is 70 per cent. higher.—I am, etc.,

Titus G. Le Clair.

Chicago, Ill.
August 3rd, 1926.

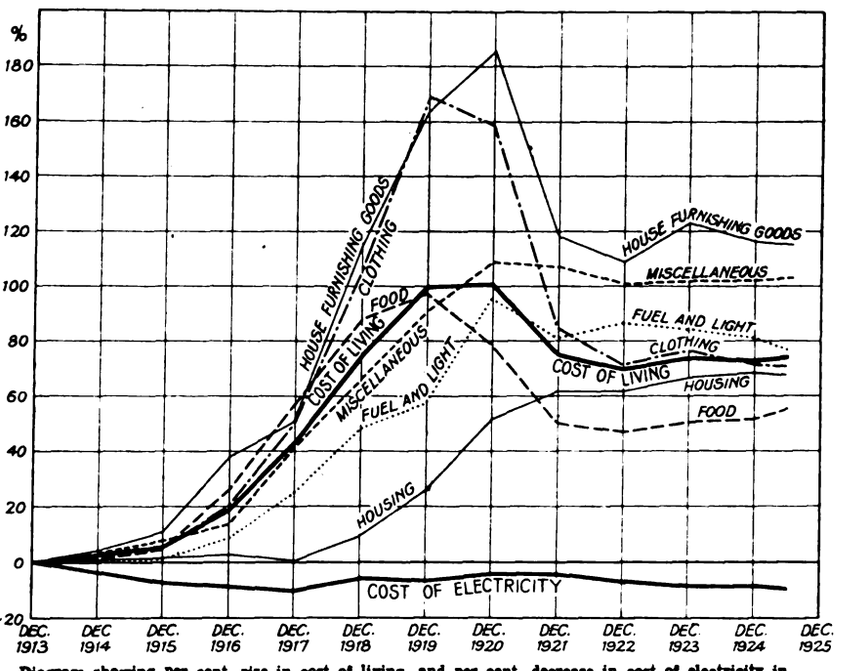

Diagram showing per cent. rise in cost of living, and per cent. decrease in cost of electricity in the United States. December 1913=0.

LANGUAGE AND THE METRIC SYSTEM.

[To the Editor.]

Sir,—I have read your editorial on Esperanto in The Electrician of July 9th, 1926. I wish to call your attention to the fact that Esperanto is by no means the only International Auxiliary Language suggested. Another one is "Interlingua," which was mentioned by you in an editorial published in The Electrician of January 9th, 1925, in connection with a translation in this language of a pamphlet on radio communication.

It seems strange for an engineer to object to a language because it is not a natural, but an artificial one, as all that engineering does is artificial.—I am, etc.,

A. Fanti.

Washington, D.C.
August 4th.

[To the Editor.]

Sir,—With reference to your correspondent's letter on Esperanto and technical literature, I fear he is sadly misinformed.

The sentence he quotes was written nearly 20 years ago by a non-Esperantist, who, failing to find anything in genuine Esperanto to criticise, invented a supposed Esperanto sentence in order to ridicule it. This sentence is copied year after year by opponents, though its use was exposed and ridiculed by Kotzin in 1912. Such tactics are amusing, but cannot be taken seriously.

I feel tempted to correct various errors on point of fact in your correspondent's letter (he really should be more careful to check his statements before sending them to the Press) but do not desire to trespass unduly on your space. Facts are more important than theories in any case, and no reasoning can explain away the continued progress of Esperanto and the failure of all so-called improvements on that language.—I am, etc.,

M. C. Butler,
Secretary,
British Esperanto Association.

London, W.C.
August 14th.

"ELECTRICAL CONTRACTIONS."

[To the Editor.]

Sir,—In reply to Mr. H. E. Walker's letter published in your issue of August 13th, I would suggest that the finest remedy for incidents such as he mentions is to leave such jobs severely alone. It may require courage to do so, but it will pay in the long run.

The case mentioned only tends to show how many contractors are apparently waiting for inquiries to be created. The object of "Electrical Contractions" was to suggest a channel through which contractors might direct their energy

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and enterprise in the creation of new and profitable business not hampered by "electrical satellites."

No suggestion was made of giving away electric irons to secure jobs put out for tender, but to promote the use of electricity with a resultant increase in the contractor's business. Such a method of promoting sales and interest is in no way debasing, and is used with success in many industries.

The time and money involved by the contractors who solicited the job Mr. Walker mentions might have been much more profitably utilised in creating new business, and the jobs so made would quite easily stand the additional cost of an electric iron.

If Mr. Walker will divide the contracting business into two classes—that which is created by contractors and that which comes into being without their help, or is the outcome of somebody else's suggestion or recommendation—he will realise that there is a big gap between the two. The former nearly always goes to the lowest tenderer, or to those in favour (which costs money), while the latter more frequently goes to those who exercise the most enterprise and salesmanship.

The industry is decidedly the grandest in the world, but electrical contractors, in common with those in other industries, never gain success by waiting only for opportunities to tender in competition, frequently against heavy odds and —other things—for jobs created by others and directed by intermediaries.

The published names of successful tenderers are often seen at a later date under the columns headed "Commercial Information."—I am, etc.,

"FEEDER-BOX."

August 14th.

REVIEWS.

Lehrbuch der Drahtlosen Telegraphie. By Dr. J. ZENNECK and Dr. H. RUKOP. (Stuttgart: Ferdinand Enke.) Pp. 902. 34.50 gold marks.

The present edition of Dr. Zenneck's famous work is marked by the inclusion of Dr. Rukop as joint author and by a large increase in the subject-matter, thus bringing the book into conformity with modern practice and theory.

The earlier edition of Dr. Zenneck's work was one of the few books which were of such outstanding importance as to justify their translation into the English language, and from the time of its first publication in 1908 down to the commencement of the war it was regarded as the leading work in the world on radio telegraphy.

Owing to the rapid growth of knowledge on the subject, chiefly due to the extraordinary development which took place during and subsequent to the war, the earlier work became incomplete, and to some extent, out of date, so that the generation of post-war radio engineers in many cases will not have realised the outstanding place which the work at one time occupied in radio literature.

The fifth edition now under review, consists of a reprint of the fourth edition together with the addition of a chapter consisting of 330 pages on thermionic valve work.

The first 508 pages is identical with Seelig's translation, and need not be referred to.

The new matter is a book in itself; it covers the subject of the use of thermionic valves in a thoroughly comprehensive manner, and is largely due to Dr. Rukop. Commencing with a historical survey of the early use of vacuum tubes, the authors proceed to the theory of thermionic valves and their principal uses. The effect of the various valve parameters on the operation of thermionic valves and methods of determination and measurement of these parameters is fully described. A few pages in this section are devoted to double and multiple grid valves.

The subject of reaction is next dealt with, including the generation, power and efficiency of oscillations of both sinusoidal and non-sinusoidal currents and voltages. The question of frequency wobble and its correction is discussed.

A short section follows on the use of the thermionic valve as a detector. The subject of valve transmitters for telegraphy and telephony is dealt with more or less fully, and includes information on the high tension current supply to such transmitters, together with descriptions of the various methods of its regulation at constant pressure.

Two interesting circuits are given for the voltage control of a rectified h.t. supply due respectively to N. Hahn and W. Schaffer. The d.c. voltage is maintained constant in the first case by passing the d.c. current through a winding designed to saturate a choke in the a.c. low tension supply. Thus a load in the d.c. side reduces the inductance of the choke and compensates for the reactance drop in the alternator and transformer.

The second example is more complicated and operates from the l.t. a.c. circuit, where a transformer in series with the main transformer has its secondary connected through valves to produce a d.c. rectified supply. This supply is utilised to bias the grid of a three-electrode valve, the anode filament circuit of which is in series with the alternator field.

The second arrangement does not appear to have particular advantages for radio work, since it would be much simpler and just as effective to pass the main rectified current through a compound winding on the alternator. It could, however, be employed as an a.c. voltage regulator at power stations, thus doing away with vibrating relays, while it would have the advantage that a valve failure would result in a drop of machine voltage rather than in a rise.

The behaviour of intermediate circuit transmitters is well described, and the phenomena of "Ziehen" and "unspringen" (generally referred to as "flopping") receives more extended treatment than is usually given in other works.

Other matters dealt with include duplex telephony, high and low frequency multistage amplifiers, super heterodyne receivers and miscellaneous applications of thermionic valves.

A very complete bibliography and index completes the volume.

The work as a whole is exceptionally good, and it seems a pity it has not been published in two separate volumes so that those who already possess earlier editions are not compelled to repurchase most of the subject matter.

Moreover, the paper bound issue should be avoided as the binding is insufficiently strong to stand ordinary handling.

The value of the work is greatly increased by the large number of references included in the text, and will possess particular interest to all radio engineers, so that we hope that the English translation will, in due course, be brought up to date.

E. H. SHAUGHNESSY.

The Principles of Applied Electrochemistry. By A. J. ALLMAND, M.C., D.Sc., and H. J. T. ELLINGHAM. Second Edition. (London: Edward Arnold and Co.) Pp. x+727. 35s. net.

Prof. Allmand was the sole author of the first (1912) edition, and the general plan of what has now become a great standard work is in no way changed. The preface to the present edition is written by the Professor, which has enabled him to state that Mr. Ellingham not only searched through practically the whole of the literature from 1911 to 1923, but also took upon himself the rewriting of the great bulk of Part I (general and theoretical), and several important chapters of Part II, special and technical, and further, that without that help, a fully revised edition could not have appeared. The former is retained practically at its original length by suppressing two chapters rendered unnecessary by the increased familiarity of technical men with the elements of physical chemistry. The space vacated is mainly devoted to an extended treatment of irreversible electrode phenomena, with some other matters of importance. One of the latter is the discussion of the theory of the chemistry of the lead accumulator proposed by Féry, in 1916, in opposition to the generally accepted "double sulphate" theory of Gladstone and Tribe. The authors are "forced to conclude" that the latter is essentially correct, and that of Féry untenable.

Part II has received an accession of about 180 pages, which was absolutely necessary, seeing that the dozen years which have elapsed since the publication of the first edition included the war years, during which electro-chemical and electro-metallurgical development more than maintained their ground. Excluding minor processes, this expansion finds expression in the appearance of new and important electrolytic methods of copper and zinc extraction, in much new detail in the chapter dealing with alkali-chloride cells, and in the rewriting of the electro-metallurgical section. This includes two new chapters entitled—Electric Refining, Melting and Heat Treatment of Steel, and Electrothermics of the Non-Ferrous Metals.

The book will be even more valuable than in its first form, both to technical men and to students.

G. W. de TUNZELMAN.

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NEWS IN BRIEF.

Free Electricity for Buyers of Kettles—New Zealand Market for Cookers—Irish Electrical Imports Increasing—Telephone Education.

THERE were three fatal accidents at electricity generating stations in June.

Four cases of lead poisoning at electric accumulator works were notified during June.

Electrical workers employed in the building trades in New York are now paid $12 daily. Bricklayers, however, receive $14.

An electrical exhibition at which electric cookery demonstrations will be given is being organised at Newton Abbot next month.

The incandescent oil lamp at the Pendeen Lighthouse has been replaced by an electric light of greatly increased illuminating power.

According to a local Press announcement, occupiers of Guiseley municipal houses are to be provided by the municipality with electric lamps at cost price.

At a meeting of Leigh Council on August 12th, Alderman Dobb, chairman of the Electricity Committee, said that almost all the bread was mixed by electrical machinery.

Australia's new import duties on iron and steel goods which came into operation last week give British manufacturers a large and increased preference for at least several months.

Official statistics show that of 76 720 insured electrical engineering employees, 11·3 per cent. were unemployed on June 21st. This figure is 5·7 per cent. higher than that for a year ago.

In newspaper advertisements the Newcastle-upon-Tyne Electric Supply Co., Ltd., is offering "ten free units of electricity . . . to every consumer paying monthly or quarterly accounts, who buys a kettle from us on or before August 31st."

The B.E.A: reports that repeat orders have been received for electrically driven rotary drum concrete mixers for the Indian Sutlej Valley irrigation project, making a total of fourteen supplied by the same British firm for this scheme.

It is stated that by a recent arrangement with the London Joint Electricity Authority, Chiswick District Council is to receive Chiswick House and its grounds in return for the 45 acres of the Duke's Meadows on which the new power station is to be built.

Mr. J. W. McEwan, mayor of Petone, a large industrial centre near Wellington (N.Z.), who is visiting this country states that while there is a big demand for electric cookers there is not a single British electric cooker on the market in New Zealand. The Americans are, in consequence, doing a good business with their cookers.

Mr. F. W. Furkert, engineer-in-chief and under-secretary of the Public Works Department, New Zealand, is said to be visiting several of the leading British electrical firms here to discover whether they can supply suitable machinery and equipment for the Lake Waikaremoana hydro-electric project which is to cost over £2 000 000.

Electric cookers and electrical machinery for use in the food industry are considered to offer possibilities from the British trade exhibitors' point of view at the Finnish Food Fair to be held at Helsingfors from October 1st to 6th. Details are obtainable from the Finnish Consulate-General, 57, Gordon Square, London, W.C.1.

Following the acceptance, despite opposition, of a Dutch tender for cable at £2 295, compared with the lowest British offer of £2 762, Salford Electricity Committee is to obtain and submit to the City Council particulars as to (*a*) wages, (*b*) hours of labour, and (*c*) conditions of service of craftsmen and general workers in the electric cable-making industry in Holland and Italy, and also in particular as to the percentage increase over the figures for the year 1914 of the cost of living in such countries.

In a communication to the "Daily Mail" Mr. F. A. Mitchell-Hedges alleges that though the Guatemalan Government offered a contract for an electric railway amounting to over £1 000 000 to Great Britain, "none of the large contracting firms in England even took the trouble to make inquiries." "The result," he adds, "is that the contract went to the A.E.G. in Germany, who have constructed a great dam across the River Samala, built the power house, and are already well advanced with the railway."

Dornoch telephone exchange was formally opened last week.

Three thousand Hackney street lamps are being converted from gas to electricity.

Hutt Valley (New Zealand) Electric Power Board has decided to give preference to British firms.

Over 11 000 people have visited the Ashton-under-Lyne Co-operative Society's all-electric bungalow.

Bournemouth Corporation has refused a Post Office proposal to instal a beach telephone in a tent.

Manchester's telephones increased last year by 9·4 per cent. London's increase in that period was 8·71 per cent.

A paper on "Electric Ploughing" will be read by Mr. R. Borlase Matthews at the World Power Conference at Basle on September 5th.

Burnley Corporation's old magneto telephone system is being replaced by a "Relay" centralised automatic installation which links up 83 stations.

Stockholm and Gothenburg are both changing over to automatic telephony, and contracts have been signed for the delivery of automatic equipment for 45 000 lines.

Mr. W. J. Liberty, public lighting superintendent of the City of London, is to read a paper on "The History of Artificial Lighting" before the Society of Engineers at Burlington House, London, on October 4th.

An electrically-controlled swing bridge, carrying two lines of railway over the River Waveney, on which constructional work has been proceeding for about three years, has now been completed by the London and North Eastern Railway.

A five-storey steel structure in which there will not be a single rivet or bolt is to be built by the Westinghouse Electric and Manufacturing Co., as an addition to its transformer factory at Sharon, Pennsylvania, U.S.A. All the joints will be arc welded.

During June the Irish Free State imported electrical goods of the value of £45 816, compared with £24 308 in the corresponding month last year. The total value of electrical imports for the first six months of this year is £221 474, against £159 144.

Blackpool Corporation states that unless the Government prohibits the use of unnecessary lights the ambitious scheme of promenade illuminations will be carried through as contemplated from September 25th to October 23rd, even if the coal dispute continues and the Department has to rely on a foreign supply. Mr. Chas. Furness, electrical engineer, has been instructed to purchase all the necessary material.

Discussing progress made by the British electrical industry, a writer in the "Manchester Guardian Commercial" points out that eleven of the leading electrical manufacturing companies have published reports during the last few months each showing profits of over £100 000, and that, of these, nine show better profits—in some cases a great deal better—than those for the preceding year, while only two have done worse.

The Belgian Government will shortly lease the State telephones and telegraphs to a national company for a limited term of years. According to "The Times" the value of the system will be estimated at 1 800 000 000 fr. and the capital of the company will consist of preference shares which will be offered to the public to the amount of 1 500 000 000 fr., and of ordinary shares of the value of 300 000 000 fr., which will remain the property of the State.

Viscount Wolmer, Assistant Postmaster-General, in a letter to Commdr. Kenworthy, M.P., states that steps are being taken to educate children in the use of the telephone, and he mentions that at Leeds arrangements have been made to instal in the Central School of Commerce telephones with automatic dials for practical demonstrations. Applications from other local authorities for similar facilities will be considered. As evidence of the Department's activity in advertising the telephone service, Lord Wolmer points out that wages and commission paid to the canvassing staff last financial year amounted to over £135 000, and about £1 000 000 a month is being spent on telephone extensions and development. "We most certainly do go out after business," he adds, "and the rapid growth of the service shows we are getting it."

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ELECTRICAL "CONTRACTIONS"—II.

Contractors and the Coming Lighting Campaign—Show Window Inconsistencies—The Folly of Waiting for Business.

By "FEEDER BOX."

JUDGING by the Electricity Bill proposals, the coming E.D.A.-E.L.M.A. campaign, and the continual appeals of the Press in the interests of increased electricity consumption, one would imagine that electrical contractors situated in both inner and outer suburban districts would be making preparations to meet an increase of public interest in the use of electricity.

A recent wandering visit among the suburban contractors, however, indicated that only very few are making any real effort to assist themselves and the industry in general to make further progress either in the domestic or the industrial applications of electricity.

Random inquiries regarding the state of business, interest in recent electrical publicity, and the movements of the various electrical associations, elicit similar answers, answers, which in condensed form indicate an entire lack of interest in anything but the everyday requirements of a small circle of existing customers and random callers. In the majority of cases the progressive and prosperous contractor is so because he has taken an active interest in the progress of electricity by making use of the E.D.A., the E.L.M.A. and the Press. He has attended to his shop window display and his showroom, if any. He has made full inquiries regarding the new devices and ideas which are from time to time made known through the usual channels.

The Progressive Contractor.

New methods of business organisation, of costing and other small but important details are met with in every day routine, and from time to time explained in the Press and discussed at meetings. The progressive contractor makes a point of watching and considering these developments, eventually adopting them himself with a successful result which is only slightly moderated in some cases by lack of capital. Nevertheless, he reaps certain benefits, making additions to his knowledge and experience which ultimately guide him out of the rut on to a higher road.

Many local contractors' premises might be aptly described as being reminiscent of a derelict railway waiting room, while the window space might be much more profitably added to the interior, for all the good it does as a display space. The subject of contractors' shop windows has already been discussed times out of number, but will yet bear much more attention.

It is no exaggeration to assert that five out of every six contractors' shop windows are completely useless, since they usually contain only a very poor and extremely ancient selection of ceiling roses, blocks, lampholders, switches, etc., all material which is not of the slightest interest to passers-by. In addition, the whole assortment and the window glass carry the dust which has accumulated over a considerable period. In the face of the untiring efforts of the E.L.M.A. and the recent improvements in shop window and display lighting, the average contractor's window remains conspicuous only by reason of its out of date and inadequate lighting.

Many instances of inconsistencies of this sort can be seen within a few minutes' walk of each other, such as a showcard seen at night in a contractor's un-illuminated window, proclaiming the advantage of after-hours lighting, or a vacuum cleaner displayed in a dusty window back-dressed with dusty cloth material.

Errors in Ticketing Goods.

Even those contractors who possess and maintain attractive shop windows are apt to make small but important errors in ticketing their goods merely with the price, the wattage and the voltage. The price is an important item, but the wattage and the voltage most certainly do not convey anything to the spectator except in some cases a rather vague and misleading notion of the consumption. Domestic appliances in particular should be ticketed with price, consumption cost per hour in money, and a clear explanation of the functions of the appliance in question.

An electric toaster or iron, for instance, should be marked with the price of the appliance, ½d. per hour, toasts two pieces of bread at once, etc. This information enables the housewife to sum up in a very short time the value of the appliance and to compare it with her existing method of making toast.

Another error is that of stating exactly how much flexible cord is included in the price, for it is rarely long enough, and a discussion over the cord, its length and its cost per extra length, is annoying, discouraging to the buyer, and quite unnecessary. The price of the appliance without cord, and an additional price per yard of cord is a much safer method. It is also advisable to avoid the display of any adaptor or plug top, until the buyer has provided some particulars of her installation.

The personal reception of a prospective customer is an important matter which many local contractors would do well to study, for it is possible to walk into many contractors' shops and be received by an assistant who knows nothing, or by the contractor who is so disinterested in anything, even a customer, that he almost says "Good morning," and shows one to the door before he knows what one's mission is. It is not always possible to see every traveller who calls, but it is not wise to make a definite rule of seeing no callers but customers and regular travellers, as it is quite easy to miss a really interesting and profitable proposition.

Success can only be attained by the exertion of a certain amount of effort, and enterprise is one of the ruling factors. No business man ever attained success by sitting in his office waiting for inquiries, for while he is waiting, others may be adopting new ideas and making business come to them. *No contractor will do any good by sitting waiting for fuses to blow, and trying to make them pay overhead expenses.*

Advertising, the distribution of attractive literature, the display of a well-dressed window, and the expenditure of more time and trouble in connection with service to customers all go to help the increase of business. The E.D.A. and the E.L.M.A. have done some very good work for the electrical industry, but only a very small number of contractors have availed themselves of the services of these concerns, and there has been and is now a serious lack of co-operation between contractors which, until removed, will hamper progress.

The contractor is the link between manufacturer and consumer, and as such holds the trade in his hands. A wholehearted and combined movement by suburban electrical contractors assisted by the manufacturers and associations would make a greater improvement in trade than that hitherto made by the unassisted and hampered efforts of those who have already made admirable individual efforts to promote business.

Boiling Rings.

Novel Constructional Features in New Domestic Electrical Appliance.

A NEW boiling ring possessing several novel features and constructed on an entirely new principle has been placed on the market by Wm. Geipel and Co., Vulcan Works, St. Thomas's Street, London, S.E.1. The appliance is circular in shape, a cast iron top plate of 9½ in. diameter being mounted on a planished steel supporting ring above a cast iron base. A new type of plug-in element is used, consisting of a hollow fireclay former, round the outside of which is a spiral groove in which the resistance coil is laid. This coil is in two parts, one of heavy gauge special nickel-chrome wire taking 1 100 W for boiling purposes, the other part being of finer wire taking 300 W for simmering purposes. The refractory former is fitted with knife contacts of heavy gauge pure nickel, and these plug into sockets mounted on a moulded plate fixed to the cast iron base. The plug contacts are so positioned that it is impossible to connect up incorrectly. The two heats are controlled by a rotary snap switch.

Surrounding the element is a reflector of polished spun aluminium which takes the form of an inverted cone. This reflector effectively reflects the heat upwards on to the bottom of the utensil in use, so that very little of the heat generated reaches the casing of the appliance. The reflector is self-aligning and is easily lifted out without disturbing any other part of the boiling ring.

Just above the element a cast iron spider is fitted, which not only forms a support for the kettle or other utensil but also affords protection for the elements and prevents spilled liquids from running down on to the latter.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

MR. H. Sutcliffe, Hebden Bridge U.D.C.'s electrical engineer has had his salary increased to £412 per annum.

Belfast Corporation has now approved Mr. Johnstone Wright's visit to the U.S.A. and has granted him £150 towards his expenses.

Mr. R. Judson has left the Radio Communication Co. to take up the position of assistant publications manager with the British Broadcasting Co.

Mr. Ernest Griffith Morris, assistant engineer at the Carmarthen power station, was married last week to Miss Margaret Jones, eldest daughter of Mrs. Jones, of St. Peter's Street, Carmarthen.

Mr. James M. Roebuck, a member of the staff of the Heckmondwike electricity works, was married on August 7th to Miss Mildred Sykes, only daughter of Mr. Ernest Sykes, of Heckmondwike.

Mr. H. Stewart, electrical engineer, Ilfracombe, was involved in a motor accident at the cross roads at the Barnstaple entrance to Braunton last Saturday night. A collision with another car took place at a particularly bad corner. Both vehicles were damaged, and a passenger in one of them received slight injuries, but Mr. Stewart fortunately escaped.

Sympathy will be extended to Mr. Charles Furness, chief electrical engineer and tramways manager, Blackpool, in the bereavement he sustained last week by the death of his wife, Mrs. Charlotte Furness. Mr. Furness finds it impossible at present to individually acknowledge the many tributes of sympathy and remembrance, but desires to express the heartfelt thanks of himself and his family.

The staff and workmen in Wolverhampton Corporation Electricity Department have presented Mr. S. T. Allen, the borough electrical engineer, who is now taking up the appointment of chief engineer, and manager of the West Midlands Joint Authority, with a handsome grandfather clock and a gold wrist watch. The presentation was made by Mr. E. Morgan, who is Mr. Allen's successor at Wolverhampton.

To mark the occasion of his leaving the London United Tramways to become general manager of the Athens Transportation Co., Mr. H. J. Troughton was entertained by his colleagues at a farewell dinner and presented with a gold chronometer watch. Mr. Troughton, who is an A.M.I.C.E., A.M.I.E.E., and an A.M.I.M.E., has held various appointments in the tramways service during the past twenty-five years, and had also been technical assistant to the chief engineer of the North Metropolitan Electric Power Supply Co., and later technical assistant to the chief engineer of the Metropolitan Electric Tramways, Ltd. During the past seven years he has carried out a great deal of renewal and experimental work on the company's tramways.

OBITUARY.

The following deaths have been announced :—

MR. THOMAS MARSHALL CALLENDER, on August 14th, at Sidcup, Kent, aged 52 years. He was the third son of the late Thomas Callender.

DR. JOHN HALL-EDWARDS, on August 15th, aged 67 years. He was senior medical officer in charge of the X-rays department of the Birmingham General Hospital and one of the pioneers in this field. As the result of his work he developed chronic dermatitis and lost one arm and four fingers of the hand of the other.

MR. FREDERICK J. W. LUCK, for many years prominently identified with the Westinghouse Electric International Co. in various countries, in London recently, following a protracted illness contracted in Brazil, to the electrical development of which country he contributed largely. Educated in London, Mr. Luck was a brilliant technician and engineer. While working as an engineer in Spain, in 1902, he was engaged by the Société Anonyme Westinghouse as technical advisor to the sales manager for Spain and Portugal, representing the Société Anonyme Westinghouse in both countries. In 1905 he was sent by the Westinghouse Electric and Manufacturing Co. to Rio de Janeiro, Brazil. During his long stay in that country Mr. Luck designed and was responsible for the installation of many of the important power plants there. He was transferred from Brazil to the London office of the Westinghouse Electric International Co. in September, 1923, and retired in July, 1924.

ELECTRICAL ELEMENTS.

Some Notes on their Efficiency—Charges of Unreliability Disproved.

A GOOD deal of misapprehension apparently still exists about the efficiency and durability of the elements used in electrical heating and cooking appliances. To some extent the manufacturers and distributors of these appliances are to blame for this state of affairs, for it is the exception rather than the rule for any reference to be made in advertisements or sales literature, to the characteristics of this vital part of every electric fire and cooking unit. Yet it is obviously important that facts concerning these elements should be widely disseminated.

Only the other day a letter was brought to our notice in which the statement was made that a baker was only deterred from installing a bread baking oven because he had been informed that the elements were constantly "burning out." The absurdity of this statement is, of course, obvious to the majority of those engaged in the electrical trade but it only goes to emphasise the need for dispelling a widespread ignorance.

It is not too much to say that the elements employed in present day electric heaters and cookers are as efficient as scientific investigations and long experience can make them. They are in fact, highly efficient in the emission of radiant heat, and under average conditions and the exercise of normal care their length of life is fully commensurate with the rigour of the service they are called upon to perform.

Unless the oven above referred to is egregiously overloaded the possibility of the elements "burning out" is remote in the extreme. In the G.E.C. standard type of oven, for instance, these elements are contained in steam tight tubes running the whole length of the oven, thus not only guarding against the pernicious influence of humidity, but ensuring so far as is humanly possible that the elements will give maximum service for a maximum period.

The same remark applies with equal accuracy to other types of ovens, as well as to all the electric heaters and various cooking appliances to-day made in Great Britain.

In the case of the ovens the actual elements which consist of an alloy of metals drawn into tough and coherent wire of large sectional area, are run, even at "full," at black heat, a fact which precludes the possibility of "burning out" and is at the same time conducive to longevity.

From independent inquiries we have made it is learned that a number of ovens have been operating under these conditions regularly each day over a period of eighteen months and more, and there is no record of the failure of a single element! This is surely convincing testimony to the durability of these elements, and their efficiency is so obvious that in many instances where large equipment has been installed for bread baking, etc., extensions and additions are actually being made or are in contemplation.

Books Received.

List of Members of the Institution of Civil Engineers. (Corrected to July 1st, 1926.) (London : The Institution.)

"The World Race for Trade : Britain's Chance." (London : United Newspapers (1918), Ltd.) Pp. 86. 6d. net.

"Electro-Craft in Theory and Practice." By L. H. Baxter. (London : B. T. Batsford, Ltd.) Pp. 168. 7s. 6d. net.

"Electrical Insulating Materials." By A. Monkhouse. (London: Sir Isaac Pitman and Sons.) Pp. xvi. + 392. 21s. net.

"The Lead Storage Battery." By H. G. Brown. 2nd Edition. (London : The Locomotive Publishing Co.) Pp. 186. 5s.

"Elementary Heat and Heat Engines." By F. G. R. Wilkins. (London : Humphrey Milford.) Pp. vii. + 312. 7s. 6d. net.

"Journal of the Institution of Electrical Engineers." Vol. 64, No. 350 (August). (London : E. and F. N. Spon.) 10s. 6d. net.

"Journal of the Institution of Electrical Engineers." (July.) Vol. 64, No. 355. (London : E. and F. N. Spon.) 10s. 6d. net.

Simplified Practice Recommendation, No. 45 : "Grinding Wheels." Issued by the Bureau of Standards. (Washington: Government Printing Office.) Pp. 23. 10 cents.

"The Electrical Industry in Germany." (B.E.A.M.A. Special Publication No. 3.) (London : British Electrical and Allied Manufacturers' Association, Inc.) Pp. 152. 10s. 6d. net.

"Physical and Chemical Constants, and Some Mathematical Functions." By G. W. C. Kaye and T. H. Laby. 5th Edition. (London : Longmans, Green and Co.) Pp. 161. 14s. net.

"A Unicontrol High-Frequency Radio Direction Finder." By F. W. Dunmore. Scientific Papers of the Bureau of Standards, No. 525. (Washington, D.C. : Superintendent of Documents, Government Printing Office.) 5 cents.

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IN LIGHTER VEIN.

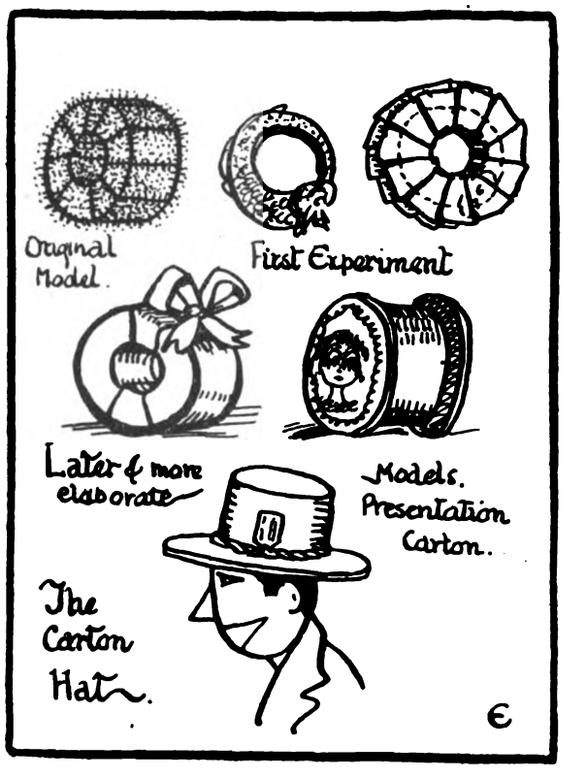
Random Comments and Reflections on Electrical Topics.

THERE seems to be such a difference of opinion on this Cable Carton question. First we read in the advertisements that this firm was the first to put cable in a carton, and then we read that another firm was the first to use a split carton, another the originator of the shape, and—well, where *are* we ?

We did want to know how it all began ; how it first came about that we got these pretty little boxes, instead of going about in sackcloth and "dashes." So the whole question has been investigated regardless of expense, and (whether you like it or not) here it is.

THE TRUE HISTORY OF THE CABLE CARTON.—(1 *Reel.*)

The scene is the annual dinner of the Cable Fakirs' Association. The chief guests are Sir William Whackintosh and Sir Thomas Tryem, the famous publicist.



Sir William drew the attention of the members to their lack of attention to the Better Presentation Method and its relation to sales. He was pleased to see that in other branches of the electrical trade the use of this method was growing. For example, the famous firm of Os ram their bulbs into neat cardboard boxes. In general, electrical companies were of the opinion that this had given a decided Philip to the trade. Again, the Ed is one, which, packed in a neat carton, is bound to find increased sales.

Why, Sir William asked, should cable be distributed in coarse wrapping which affected both the clothes and the temper of the fastidious modern workman ? Although it was excellent as a poultice for pipes, hessian had its limitations. If the cable was packed in a tasteful carton, neatly tied with blue ribbon, he was sure that sales would increase.

After several attempts, Sir William Tryem rose. Heartily agreeing with the last speaker, he advocated going still farther. His great sales stimulating motto was "Save the wrapper." He had found from long experience that the collecting of wrappers was the greatest sales dodge ever discovered. But who, he asked, would save a canvas wrapper ? Change to a neat carton, he continued, and in exchange for 12 empty cartons give a useful present, such as a bar of soap, a dozen gas mantles or moth balls. Sales would soar, and factories would soon be working full swing. Also the same wrappers or cartons could be used over and over again.

Several members of the Cable Fakirs' Association rose) and fell) simultaneously in support of the proposal, and always practical, a member seized the nearest approach to a coil of cable (the remains of a whiting), which Capt. Dun sheathed in a perforated menu, so producing the first model of the now familiar Cable Carton.

OVERSEAS TRADE.

Encouraging Increase in British Electrical Exports in July.

BRITISH electrical exports during July, at £1 620 444, were by far the largest in recent months, and were better by £446 657 than the June figure and £320 693 in advance of the exports of July, 1925. This brings the total for the first six months to £9 572 716, which still shows a deficiency of £900 403 in comparison with the corresponding figure for last year.

The month's electrical imports totalled £393 127, an increase of £8 639 on the July, 1925, figure, but the aggregate total for the seven months, at £2 618 965, is £339 065 below that of the corresponding period of 1925. An interesting item is that showing imports of £5 500 worth of submarine cables, this being the first import for some years.

Comparative tables of electrical imports and exports are given below.

Imports Lower.

IMPORTS.	Month of July. 1925. £	Month of July. 1926. £	Seven Months. 1925. £	Seven Months. 1926. £
Electrical Machinery	93 401	104 622	634 838	677 140
Electric Wires and Cables, Insulated—				
Rubber insulated (not being Telegraph or Telephone Wires or Cables)	16 653	13 363	116 275	118 993
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	16 413	45 499	209 801	211 474
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	11 697	10 903	106 922	93 103
Submarine Telegraph and Telephone Cables	—	5 500	—	5 500
Telegraph and Telephone Instruments and Apparatus (except wireless valves)	35 460	32 031	518 908	251 601
Carbons, Electric	6 520	5 497	51 255	45 477
Electric Lamps and parts thereof—				
Electric Glow Lamps	39 445	18 581	251 813	154 803
Arc Lamps and Electric Searchlights	122	328	2 942	2 169
Parts thereof (except Carbon Rods)	157	337	3 310	2 665
Batteries and Accumulators (including parts)	46 056	53 480	263 509	252 436
Electrical Instruments (other than telegraphic and telephonic): Commercial (including ammeters, voltmeters, etc.), House Service Meters, and Scientific	28 935	17 990	154 137	129 993
Switchboards, other than Telegraph and Telephone	160	15	800	479
Electrical Goods and Apparatus, all other Sorts	89 469	84 981	643 520	673 132
Total of Electrical Goods and Apparatus	384 488	393 127	2 958 030	2 618 965

Improving Export Position.

EXPORTS.	Month of July. 1925. £	Month of July. 1926. £	Seven Months. 1925. £	Seven Months. 1926. £
Electrical Machinery—				
Railway and Traction Motors	53 864	25 056	339 341	263 422
Other Motors and Generators	183 254	198 543	1 294 642	1 178 495
All other Sorts	198 681	304 723	1 842 875	1 826 660
Electric Wires and Cables, Insulated—				
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	105 511	127 438	799 081	875 431
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	95 253	133 219	756 820	882 388
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	41 249	71 055	444 343	443 115
Submarine Telegraph and Telephone Cables	49 647	34 921	1 064 986	118 703
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	258 291	297 433	1 736 318	1 726 084
Carbons, Electric	900	1 098	15 435	9 686
Electric Lamps and Parts—				
Electric Glow Lamps	38 171	50 099	273 373	279 208
Arc Lamps and Electric Searchlights	108	618	8 553	3 292
Parts thereof (except Carbon Rods)	190	242	2 631	3 119
Batteries and Accumulators (including Parts)	87 775	127 077	596 992	557 171
Electrical Instruments (other than Telegraphic and Telephonic): Commercial (including Ammeters, Voltmeters, etc.), House Service Meters and Scientific	20 268	35 999	195 572	219 415
Switchboards, other than Telegraph and Telephone	8 115	7 897	53 246	43 715
Electrical Goods and Apparatus, all other Sorts	158 474	205 035	1 058 911	1 142 812
Total of Electrical Goods and Apparatus	1 299 751	1 620 444	10 473 119	9 572 716

According to the annual report of the Italian Association of Electric Power Companies, the capacity of Italian power plants installed has increased from about 1 000 000 kW in 1914 to 2 107 500 kW at the end of 1924, and 2 369 000 kW at the end of 1925.

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TRADE PUBLICATIONS.

Details of Catalogues and Dealer-Helps Issued by Manufacturers.

AN interesting booklet on "Moulding in Formite Bakelite," is issued by the Damard Lacquer Co., Ltd., Warwick Road, Greet, Birmingham.

A small folder (No. 200) entitled "Contact," issued by J. H. Tucker and Co., Ltd., King's Road, Tyseley, Birmingham, gives particulars of Tucker "Telac" 15 A sockets and plugs.

A list of prices of flexibles, cable, switches, lampholders, ceiling roses, shades, wireless valves, headphones, etc., is issued by Belbin and Bowden, Ltd., 3, Finsbury Square, London, E.C.2.

Electrolux, Ltd., 153-155, Regent Street, London, W.1, is sending out a price list, illustrated leaflets, and copies of a report by the N.P.L. (reference F.C. 197) on Electrolux refrigerators, which can be seen in operation at the company's showrooms.

A circular giving particulars of the new "Super One" battery for providing h.t. current for super heterodyne and neutrodyne wireless sets can be obtained from the Ever Ready Co. (Great Britain), Ltd., Hercules Place, Holloway, London, N.7.

"Efficient Heat Control" (book 42), is issued by the Foster Instrument Co., Letchworth, Herts. This deals with the Foster thermo-couple (stem) type practical pyrometers, and the patterns include dial recording, strip recording and power plant pyrometers, and automatic signalling pyrometers, with "broken couple" alarm. The book is well printed and illustrated, and contains interesting details of materials and construction.

Amongst literature recently issued by the British Thomson-Houston Co., Ltd., Mazda House, Newman Street, London, W. 1, is a folder (L. 359) on the "Tungar" battery charger, which charges accumulators from alternating current, a leaflet (L. 357) giving prices and other particulars of "Mazda" colour-sprayed lamps; and a postcard (L. 366) bearing a coloured miniature of the well-known "Brilliant Performer" radio valve showcard.

Young, Osmond and Young, Ltd., Stafford House, Norfolk Street, London, W.C.2, send us an elaborate illustrated book on "Heat," which contains articles on economical electric heating for large buildings and industrial purposes, the Lightfoot electric tubular heating system for assembly rooms, theatres and other large buildings, for suburban residences, and special uses of the system such as the heating of oil tanks, printing presses, calender rolls, spinning and weaving sheds, shop windows, the radiators and cylinder jackets of motor car and other engines, towel rails, linen-drying rooms and hospitals. Full directions for the use of the installations are given. A smaller booklet specifying the types and prices of installations suitable for houses of certain sizes, and a leaflet price list are also available.

The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2, has recently issued a new catalogue (B.C. 3 502) of Gecophone wireless receiving sets, components and accessories. The receiving sets described and illustrated cover the whole range of receivers, from crystal sets to supersonic heterodyne sets. The Gecophone low-loss slow motion variable condenser is also illustrated, and its construction is explained. The book also contains circuit diagrams, tables giving recommended Osram valve combinations, a glossary of wireless terms and definitions, a page of wireless symbols, etc. The company is also distributing a booklet entitled "How to get to Magnet House" (R. 11 916) and a couple of large mailing cards on (1) Junior type Home Office fuse boards, and (2) a few selected G.E.C. manufactures, including lamps, lampholders, wall plugs, Osram valves, and Gecophone broadcasting sets.

The D.P. Battery Co., Ltd., Bakewell, Derbyshire, is sending out an illustrated booket on "Electric Locomotives for Military Purposes." It is stated that the majority of standard gauge battery locomotives are fitted with D.P. Kathanode type batteries, and it is obvious that in addition to military service, such locomotives are suitable for use in docks, large power stations, gasworks and breweries and for shunting, for which purpose they have been used by British railway companies for many years. At the end of 1924 the War Office placed an order with the English Electric Co. for three battery shunting locomotives, after a two-year's trial of two similar locomotives. Each of these weighs 21 tons, and is equipped with a Kathanode lead acid battery of 108 cells with a capacity of 504 Ah at the five-hour rate of discharge. The booklet also contains views of the locomotives and the interiors of the driving cab and battery.

From Oerlikon, Ltd., 28 and 31, Essex Street, London, W.C.2, we have received bulletins 55 and 56/57. The former contains a brief survey of some of the methods adopted for the supervisory control of plant in large electric power stations and a description of the mimic busbar system evolved by the Oerlikon Co. in that connection, while the latter contains articles on "The Induction Regulator as used for Power Factor Regulation in Interconnected systems," "Improvements in the Process of Purifying Insulating Oils" (giving the results obtained during comparative tests with a filter press and a De Laval centrifugal purifier, respectively); and notes on the new drying-out installation for transformers at the Oerlikon works, and on winding gear for sinking pumps, and a short account of electric trials on the P.L.M. Railway.

"The Development of Staybrite Steel" is the title of a new book issued by Thos. Firth and Sons, Ltd., Norfolk Works, Sheffield, price 12s. 6d. It is explained in the preface that Firth Staybrite steel is not intended to replace Firth stainless steel, which has a 12/14 per cent. chromium content. Staybrite steel has a much higher chromium content with a substantial percentage of nickel, which fit it for application to many purposes for which plain chromium stainless steels are unsuitable—or less suitable. Staybrite steel is claimed to be an ideal material for resistance units, as it has a specific electrical resistance of 69 microhms per cubic centimetre, compared with a resistivity of 10-12 in mild steel and 1·8 in copper. Cold working makes Staybrite steel feebly magnetic; after 26 per cent. elongation in a tensile testing machine, its maximum permeability is about 7, and the maximum induction for a field of about 400 c.g.s. units only 1 820, compared with about 2 000 and 20 000, respectively, for mild steel. Results of tests are given which indicate that Staybrite steel shows no tendency to develop corrosion due to electrolytic action when in contact with other metals or alloys and immersed in either sea or tap water.

LIGHTING POULTRY FARMS.

Some Suggestions for Securing the Most Efficient Installations.

AT the tenth annual Poultry Conference, held at the Harper Adams College, Newport, last Thursday, Mr. R. Borlase Matthews said that for the poultry farmer the main uses of electricity are in connection with the lighting of the laying houses (to further the increased winter egg production) of the brooder houses and the incubator room. Further, there was the utilisation of electricity for the automatic heating of incubators and hovers, the operation of electric fans in incubators for the better circulation of the warmed air, the application of ultra violet rays, the operation of an ozone generating apparatus, the maintenance of a h.t. discharge, and the purely mechanical tasks of the poultry farmer in connection with the pumping of water and kibbling and crushing of grain, etc.

It was not generally known that capital for an electrical installation, whether the farmer was a tenant or a landlord, could now be raised through an organisation which operated in conjunction with the Ministry of Agriculture.

Experience had indicated that the intensity of the light required for lighting poultry houses should be about a foot-candle on the floor level. The lamps should be hung at least 6 ft. from the floor, all rays should be reflected on to the feeding space, and the lights should be fitted with extensive type reflectors.

The author gave tables which enable the number of lamps required to be deduced from the dimensions of the poultry house, bearing in mind the type of lamp, the type of reflector, and the voltage of supply. A 40 W vacuum type lamp with pip end frosted, mounted in an extensive encircled reflector, would suit most poultry house conditions. This unit should be placed 6 ft. above the ground and 10 ft. from the adjoining lamp.

For distribution purposes on the poultry farms overhead wires were recommended, the poles being such that the wire was kept 12 ft. above the ground or 6 ft. above the buildings. A voltage of at least 100 was best for farm work of any kind, as it would allow for expansion when the poultry farmer wished to do more than merely light his own residence.

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TESTED LINES.

Reports on Electrical Apparatus Submitted for Test.

THE "M-L" anode converter, marketed by S. Smith and Sons, Ltd. (M.A.), Cricklewood, London, is designed to supply the H.T. current for the anode circuit, thus taking the place of the normal H.T. battery. It consists of a small motor-generator which is driven by an accumulator, which may also be used at the same time as the filament battery, and is made in various types as standard for 6V and 12V supply. The input is controlled by a rheostat located between the terminals, to which the accumulator is connected, and is capable of varying the output within certain limits, the particular instrument tested, Type " B," ranging from 105V to 130V at 15 mA in the former case. An efficient smoothing circuit for the H.T. current, consisting of two large condensers and a choke coil, is interposed between the generator and the output terminals. The whole apparatus is enclosed in a cast metal case, painted black outside, fitted with rubber feet, and occupies comparatively little space. The workmanship and general appearance are good.

The single-voltage types, namely Type " B " (6/120V or 4/80V), Type " C " (12/300V) and Type " D " (12/500V) are capable, as the description implies, of delivering only one value of H.T. current at a time, and to meet the necessity of supplying simultaneously two values, Types " BX " and " CX " are made, one pair of terminals supplying the full pressure, while another pair give a lower value which is capable of being regulated in four steps by means of a switch arm. A two-voltage box is also supplied for attachment to the single voltage type to produce the same result.

A single voltage, Type " B," converter has been in use on a multi-valve receiving set for some two months and, within certain limits, has proved satisfactory. It is obvious that there are limits to the usefulness of this instrument, as it is not desirable to have only one H.T. voltage available. This difficulty was overcome, for testing purposes, by dealing with the detector valve separately. For the ordinary user, however, it seems that the two-voltage type is a *sine qua non*, and a three-voltage type would be still more useful. The maximum output at 120V is 20mA, and the consumption at this load is round about 2A, so that a large accumulator should be used.

In use there is no appreciable ripple, and only a slight humming is noticeable from the rotor of the machine; this, however, is so slight as to be practically negligible. The output appears to be constant over considerable periods of continuous running.

Wootophone Variable Condenser.

F. E. Wootten, Ltd., 56, High Street, Oxford, submitted one of their latest type low-loss condensers of 0·0005 mF. capacity. This condenser, which is adapted for one-hole fixing, is fitted with brass vanes and aluminium skeleton end-plates. The fixed vanes are insulated from the frame and are soldered and slotted into square brass rods at two points, these latter being screwed to ebonite strips which form the insulating material. The rotor is mounted on flat springs, one at each end of the shaft, controlled by a screw passing through the end-plate. It is thus possible very readily to adjust the whole rotor endwise, and to vary the rotational friction. A pigtail connection is fitted, and the rotor shaft is of ¼ in. diameter. The standard knob is of generous dimensions, and a 4in. dial is fitted, graduated from 0 to 100 over half a revolution.

The general design of the condenser is good; it was noticed, however, that a certain amount of hand finishing had been done in fitting the fixed blades, and this detracted from the appearance. It is suggested that the end-plates should be made rather stiffer, the better to withstand the reaction of the springs on which the rotor turns. In actual use the condenser was found to turn smoothly, and the maximum capacity was approximately as rated.

Points of View.

Specialised mathematicians and efficient physicists are relatively happy only because they are blind to the beauties of the world around them.—*Sir Thomas Holland.*

* * *

I suggest that each group of pits could well feed a 20 000 kW electricity generating set and produce 6 000 000 cu. ft. of gas per 24 hours.—*Sir Arthur Duckham.*

WORK IN PROSPECT.

Trade Possibilities for Electrical Installation Contractors.

BEACONSFIELD.—Roman Catholic Church. Particulars, the Priest-in-Charge.

BLACKPOOL.—Church and schools, Whitegate Drive, for Committee of the First Church of Christian Scientists. Particulars, the Secretary.

COVENTRY.—Public abbatoir, for Town Council. Particulars, the architect, Mr. R. Stephen Aveling.

DARLINGTON.—Offices, for Town Council. Particulars, the Borough Surveyor.

EASTBOURNE.—Parish hall, for St. John's Parish. Particulars, the Vicar.

EPSOM.—Block of shops and flats, South Street, for Mr. R. F. Trower.

HALESOWEN.—Housing scheme (60), Banners Place, Cradley. for Urban Council. Particulars, the architect, Mr. W. F. Edwards, 8, Avenue Road, Blackheath, near Birmingham.

HAMILTON.—Town Hall, Municipal offices and public library, for Corporation. Particulars, the architect, Mr. James Lochhead.

HECKMONDWIKE.—Bank premises, Market Place, for National Provincial Bank, Ltd.

HEREFORD.—Public baths (£12 000), for Town Council. Particulars, the borough engineer.

HORNBY.—Church and schools, for Wesleyan Trustees Particulars, the architect, Mr. F. B. Richardson, 50, Skinnergate, Darlington.

IVER.—Cottage hospital extensions. Particulars, the architect, Mr. E. E. Slater, Winton Cottage, Taplow, Bucks.

KIRKBURTON.—Housing scheme (17), Twinshaw Road, for Urban Council. Particulars, the architect, Mr. E. A. Rundell, Council Offices, Lepton.

LIVERPOOL.—Schools, Duncombe Road, to cost £13 275, for City Education Committee. Particulars, the contractors, Tysons, Ltd.

LONDON.—Re-building stores, Piccadilly, and nurses' home, and pathological block, Greenwich Seamen's Hospital. Particulars, the contractors, Foster and Dicksee, Rugby.

LYE.—Houses (52), Hodge Hill, for Urban Council. Particulars, the contractor, Mr. Tate.

MALMESBURY.—Alterations to Town Hall, to cost £3 000, for Town Council. Particulars, the contractors, Downing and Rudman.

MOLESEY.—Housing scheme (40), for Urban Council. Particulars, the Surveyor.

PONTEFRACT.—Maternity and Child Welfare centre, for Town Council. Particulars, the borough engineer, Mr. W. H. Newton.

RAWMARSH.—Housing scheme (61), Haugh Vale Road, for Urban Council. Particulars, the architect, Mr. J. A. Tonge, Parkgate.

ROWLEY REGIS.—Housing scheme (52), Cradley Heath, for Urban Council. Particulars, the Surveyor.

RUNCORN.—Extensions to Church schools (£4 000). Particulars, the Vicar.

SHREWSBURY.—Workshops and power house, Harlescott, for Chatswood Safe Co.

SOYLAND (YORKS).—Power house, Oldham Road, for Jerry Wadsworth and Son, Ltd.

ST. HELENS.—Alterations and additions to Town Hall, to cost £60 000, for Town Council. Particulars, the Borough Surveyor.

STALYBRIDGE.—Mortuary, for Town Council. Particulars, the borough surveyor, Mr. J. N. White.

TAUNTON.—Public bath to cost £8 000, for Town Council. Particulars, the Borough Engineer.

TETBURY.—Extensions to Grammar school, for Gloucestershire Education Committee. Particulars, the education architect, Mr. R. S. Phillips, Shire Hall, Gloucester.

TWICKENHAM.—Housing scheme (52), and four blocks of flats, Colne Lodge site, for Urban Council. Particulars, the Surveyor.

WALTON-LE-DALE.—Houses (20), for Urban Council. Particulars, the contractor, Mr. B. Cank.

WESTON-SUPER-MARE.—Memorial hospital, to cost £39 387. Particulars, the contractors, Hayward and Wooster, Bath.

WIMBLEDON.—Houses (60), for Town Council. Particulars, the contractors, the Triangular Construction Co., Ltd.

WINDSOR.—School, for the Borough Education Committee. Particulars, the Director of Education.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given.

DUNDEE CORPORATION, August 20th.—Supply and erection of six 200 kVA outdoor type transformers. Specification, etc., from Mr. D. H. Bishop, general manager and engineer, Electricity Supply Department, Dudhope Crescent Road, Dundee.

DUNDEE CORPORATION, August 20th.—Supply of e.h.t. three core and l.t. four core and two core paper insulated lead covered and double steel tape armoured cable. Specifications, etc., from Mr. D. H. Bishop, general manager and engineer, Electricity Supply Department, Dudhope Crescent Road, Dundee.

FARNWORTH URBAN DISTRICT COUNCIL, August 20th.—Low-tension cables, distribution pillars and underground disconnecting boxes. Specifications from Mr. A. J. Hutchison, Albert Road, Farnworth.

MANCHESTER CORPORATION, August 21st.—Two electrically-driven centrifugal pumps, with switch and starting gears, etc., for the Waterworks Committee. Specification, etc., from the Chief Clerk, Waterworks Offices, Town Hall, Manchester; deposit £1 1s.

BARNES URBAN DISTRICT COUNCIL, August 23rd.—One 3 000 kW turbo-alternator, with condensing plant and auxiliaries. Specification, etc., from Mr. C. S. Davidson, Electricity Works, High Street, Mortlake, London, S.W.14; deposit £1 1s.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD., August 23rd.—Supply and erection of a central evaporating equipment at the company's Barking power station. Specifications, etc., from F. C. McQuown, joint manager and secretary, Moorgate Court, Moorgate Place, London, E.C.2; deposit £5 5s.

LICHFIELD CITY COUNCIL, August 23rd.—Electric lighting installations at Guildhall and municipal offices, free library and museum, and art school. Particulars from the Electrical Engineer, Municipal Offices, Lichfield.

SALFORD CORPORATION, August 23rd.—Supply and delivery of e.h.t. paper insulated lead-covered cable. Particulars from City Electrical Engineer, Electricity Works, Frederick Road, Pendleton.

BELFAST GUARDIANS, August 24th.—Electrical installation in Corry's Buildings. Specifications from the Clerk, 51, Lisburn Road, Belfast.

DUBLIN BOROUGH COMMISSIONERS, August 24th.—Change-over time switches. Specification from the City Electrical Engineer, Fleet Street, Dublin.

ST. PETER'S CHURCH, WALSDEN, August 24th.—Electric lighting installation. Particulars from the Churchwardens.

Electric Goods Lift.

MANCHESTER CORPORATION, August 25th.—Supplying and fixing electric goods lift at Victoria Square Dwellings, Oldham Road, Manchester. Specifications from the City Architect, Housing Department, Civic Buildings, 1, Mount Street, Manchester.

METROPOLITAN ASYLUMS BOARD, August 25th.—Re-wiring electric lighting circuits and installing main supply cable at Princess Mary's Hospital, Cliftonville, Margate. Specification, etc., from the Board's Office, Victoria Embankment, E.C.; deposit £1.

BRISTOL BOARD OF GUARDIANS, August 26th.—Electrical fittings for six months. Particulars from Mr. T. S. Lamb, St. Peter's Hospital, Bristol.

STIRLING TOWN COUNCIL, August 26th.—Electrical work in connection with erection of eleven houses and four shops, being the first development of St. Mary's Wynd rehousing scheme. Specifications from Mr. A. H. Goudie, burgh engineer; deposit £1.

NORTHWICH BOARD OF GUARDIANS, August 27th.—Re-wiring London Road hospital. Particulars from Mr. J. C. Smith, the master of the Institution.

DUNDEE TOWN COUNCIL, August 28th.—Electric lighting and heating work at Public Health Institute. Particulars from the Town Clerk, City Chambers, Dundee.

MILLOM URBAN DISTRICT COUNCIL, August 28th.—High-tension and low-tension mains, h.t. switch cubicle, l.t. switchboard, transformers. Specifications from Mr. A. Lawrence, Council Offices, Millom, Cumberland; deposit £1 1s.

DUBLIN CORPORATION, August 30th.—Supply of single-phase and three-phase meters and slot meters for one year. Specification from the City Electrical Engineer, Fleet Street, Dublin; deposit £1 1s.

EDINBURGH ASSOCIATION FOR THE PROVISION OF HOSTELS FOR WOMEN STUDENTS, August 30th.—Electric light and power installations at two hostels at Craigmillar Park, Edinburgh. Specifications from Mr. Frank Wood, architect, 6a, George Street, Edinburgh.

These limestone caves at Wellington, N.S.W., are the subject of an interesting installation made by the British General Electric Co., Ltd., of Sydney. The plant consisted of a 5 h.p. set, including 110 V, 40 A generator, belt-driven by a crude oil engine, and marble switchboard complete with instruments. Pirelli-General wires and cable were used with G.E.C. accessories and Osram lamps. The main cave is 500 ft. long by 100 ft. wide, and in places is 50 ft. high; this, and a second main cave are at present being equipped.

LONDON COUNTY COUNCIL, August 30th.—Electric goods lift and electric service lift at Hackney Institute, Dalston Lane, Hackney. Specifications from the Chief Engineer, L.C.C., Old County Hall, Spring Gardens, London, S.W.1; deposit £1.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, August 31st.—One 125 kVA transformer (Contract No. 25). Extra high pressure switchgear (Contract No. 29). Specifications from Mr. R. W. Willis, electrical engineer and manager, 37, High Street, Cheadle, Cheshire; deposit £1 1s. for each specification.

INDIA STORE DEPARTMENT, LONDON, August 31st.—Supply of 12 000 electric lamps. Specifications from Director-General India Store Dept., Branch No. 10, Belvedere Road, Lambeth, London, S.E.1.

LIVERPOOL CORPORATION, August 31st.—Supply and installation of closed circuit code-signalling street fire alarm and telephone system. Specification from the Town Clerk.

VENTNOR URBAN DISTRICT COUNCIL, August 31st.—Schemes for electric lighting installation in main Assembly Hall, stage illumination, and lighting of adjacent rooms at Ventnor Town Hall. Particulars from the Surveyor; suggestions and estimates to Mr. James Wearing, Town Clerk, Town Hall, Ventnor.

SEVENOAKS URBAN DISTRICT COUNCIL, September 1st.—Supply and fixing of electrically-driven syren at the Fire Station, Eardley Road, Sevenoaks. Specification from the Surveyor, Council Offices, Argyle Road, Sevenoaks.

WESTMINSTER (LONDON) GUARDIANS, September 1st.—Electric lamps, fittings and sundries. Tender forms from Mr. W. J. Lickley, Guardians' Offices, Princes Row, Westminster, London, S.W.1.

COVENTRY CORPORATION, September 3rd.—Buildings, foundations and subways; eight 15 000 kW turbo-alternators condensing plant and economisers; eight water-tube boilers,

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complete with induced draught plant, and chimneys; coal and ash handling plant; switchgear; steam and water pipework; crane; and cooling towers. Specifications, etc., from Mr. Geo. Tough, engineer and manager, Electricity Department, Council House, Coventry; deposit £5 5s.

SOUTHEND-ON-SEA, September 3rd.—Twelve months' supply (from 5 000 to 8 000 tons) of fuel oil. Particulars from Mr. A. C. Johnson, deputy borough electrical engineer, Electricity Works, London Road, Southend-on-Sea.

GRIMSBY CORPORATION, September 4th.—Supply of 10 000 yd. single way (or equivalent) cable ducts, alternatively of fibre or stoneware. (Specification No. 218.) Supply of about 1 800 yd. paper insulated, lead-covered low tension concentric feeder cable. Specifications from Lt.-Col. W. A. Vignoles, borough electrical engineer, Corporation Electricity Works, Grimsby. (Note.—Tenders only from firms on the King's National Roll.)

OLDHAM GUARDIANS, September 6th.—Electric lamps and fittings. Particulars from the Clerk, Mr. F. W. Fletcher.

CROYDON CORPORATION, September 6th.—Supply of two 50 000 lb. per hour water tube boilers, etc. Specifications from the Engineer and Manager, Electric House, 38, High Street, Croydon.

INDIA STORE DEPARTMENT, September 7th.—Two 40 kW d.c. oil engine generating sets, complete with cooling plant switchgear, cables, etc., for Bhatinda power station. Specifications from the Director-General, India Store Department, Branch No. 14, Belvedere Road, Lambeth, London, S.E.1.

SEDGEFIELD PARISH COUNCIL, September 7th.—Electric lighting of the Parish Hall. Particulars from Mr. F. J. Davison, Clerk to the Sedgefield Parish Council.

STOKE-ON-TRENT CORPORATION, September 7th.—Supply and erection of one 10 000 kW turbo-alternator and condensing plant (contract 2 614); one natural draught cooling tower (contract 2 615); and ironclad l.t. three-phase switchgear (contract 2 616). Specification, etc., from the City Electrical Engineer, St. George's Chambers, Wolfe Street, Stoke-on-Trent; deposit £2 in respect of each contract.

HOLBORN (LONDON) GUARDIANS, September 8th.—Electrical fittings during six months from October 1st, 1926, to March 31st, 1927. Tender forms from Mr. C. J. Cross, 53, Clerkenwell Road, London, E.C.1, after August 23rd.

INDIA STORE DEPARTMENT, September 10th.—Supply of power station and switchgear and auxiliary plant, in connection with Great Indian Peninsular Railway electrification. Specification (£1) from the Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1.

TUNBRIDGE WELLS TOWN COUNCIL, September 11th.—Two water tube boilers, superheaters, economisers, mechanical stokers, forced and induced draught plant, steel stack, overhead coal bunkers, coal elevator and conveyors, and truck tippler. Specifications from Mr. R. N. Torpy, borough electrical engineer.

LONDON COUNTY COUNCIL, September 13th.—Three water tube boilers, with auxiliaries. Specifications from General Manager, L.C.C. Tramways, Victoria Embankment, London, W.C.2; deposit £3.

ST. MARYLEBONE (LONDON) BOROUGH COUNCIL, September 13th.—Supply and fixing of electric overhead runway for removing house refuse from storage pit to screening plant. Particulars from Borough Engineer, Town Hall, Marylebone Road, London, N.W.1.

BIRMINGHAM CORPORATION, September 21st.—Supply, delivery and erection of plant for refuse disposal and salvage works. Specifications from the Superintendent, Salvage Department, 161, Corporation Street, Birmingham; deposit £1 1s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

JOHANNESBURG MUNICIPALITY, August 21st.—Street lighting material. (Reference B.X. 2 728.)

JOHANNESBURG MUNICIPALITY, August 21st.—Reverse power relays (contract 668). (Reference B.X. 2 725.)

VICTORIAN ELECTRICITY COMMISSIONERS, August 23rd.—Supply of 10 in. diameter disc suspension insulators, with cotton split pin or similar coupling device. (Reference B.X. 2 614.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, August 24th.—Synchronous condensers (section 18, Waikaremoana). (Reference B.X. 2 608.)

PRETORIA MUNICIPALITY, August 26th.—Equipment for five transformer stations. (Reference B.X. 2 721.)

SOUTH AFRICAN RAILWAYS AND HARBOURS ADMINISTRATION, August 26th.—Material for distribution system in connection with the Cape Town suburban electrification. (Reference B.X. 2 680.)

CITY ELECTRIC LIGHT CO., LTD., BRISBANE, August 27th.—Supply, delivery and erection of one 12 500 kW turbo-alternator. (Reference A.X. 3 085.)

NEW ZEALAND RAILWAYS DEPARTMENT, August 30th.—Supply of slip ring induction 400 V 50 cycle three-phase motors and starters. (Reference B.X. 2 561.)

DEPUTY-DIRECTOR OF POSTS AND TELEGRAPHS, MELBOURNE, August 31st.—Telegraph equipment (schedule C. 109.) (Reference B.X. 2 653.)

PERNIK STATE COAL MINES, BULGARIA, September 1st.—Electricity generating plant, consisting of two 4 000 kW steam turbo-generator sets, buildings, etc.

VICTORIAN RAILWAY COMMISSIONERS, September 1st.—Equipment for automatic control of two rotary converters at Seaford sub-station.

VICTORIAN RAILWAY COMMISSIONERS, September 1st.—Automatic sub-station equipment (contract No. 39 287), for Elwood sub-station. (Reference B.X. 2 598.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 2nd.—Electro-pneumatic working of points and day colour light signalling, with alternative current track circuits, in connection with the electrification of the Cape Town suburban railways. Specifications, etc., from the Office of the High Commissioner for the Union of South Africa, Trafalgar Square, London, W.C.2, or from the Chief Railway Storekeeper, Park Station Chambers, Johannesburg; deposit £5 5s.

INDIAN STORES DEPARTMENT, SIMLA, September 6th.—Two 40 kW 240/480 V d.c. three-wire oil engine generating sets. (Reference B.X. 2 782.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, September 6th.—Supply of 66 000 V oil circuit breakers for Barren Jack hydro-electric scheme. (Reference B.X. 2 749.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 7th.—Synchronous condenser for Arapuni power scheme, section 165. (Reference B.X. 2 665.)

DUNEDIN (N.Z.) CORPORATION, September 8th.—(i) Reaction water wheel for direct connection to a.c. generator; (ii) one 3 000 kW, 6 600 V, 50 cycle generator; (iii) four 1 000 kW 6 600/20 000 V, 50 cycle transformers; (iv) switchboards, oil-break switches, disconnecting switches, voltmeters, ammeters and wattmeters, current and potential transformers, etc. (Reference B.X. 2 654.)

INDIAN STORES DEPARTMENT, SIMLA, September 14th.—Steam raising plant, feed pumps, oil separator, cooling tower, 300 kW, 440/520 V, steam engine driven d.c. generating set, complete with condensing plant; switchboard and connecting cables and accessories for Peshawar (Cantonment) Power Station. (Reference 20 816/1926.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, September 14th.—Telephonists' telephones and handsets. (Reference B.X. 2 696.)

CONSTANTZA (ROUMANIA) PORT ADMINISTRATION, September 15th.—Supply and erection of eight electric portal cranes. (Reference A.X. 3 399.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 15th.—Supply and installation of electricity distribution system for the town of Luxor, including 6 830 metres of h.t. and 1 210 metres of l.c. armoured cable, 6 transformer cabins, 12 transformers (from 10 to 50 kVA), copper cable, poles, cable boxes, cut-outs, insulators, lamps, etc. (Reference B. 2 737.*)

JOHANNESBURG COUNCIL, September 18th.—Underwriters' wire. (Reference B.X. 2 766.) Supply of 6 600 V truck-type ironclad switchgear panels. (Reference B.X. 2 767.)

SYDNEY CITY COUNCIL, September 20th.—One h.t., d.c. Kenetron valve testing set for underground cables. (Reference B.X. 2 748.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, September 21st.—Switchboard keys, and parts (schedule 26/720). (Reference B.X. 2 699.)

AUCKLAND ELECTRIC POWER BOARD, September 27th.—One 14-ton electrically-operated crane. (Reference A.X. 3 415.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 28th.—Three motor-driven low lift pumps with control

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apparatus, for Taieri drainage scheme. (Reference A.X. 3 274.)

NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMWAYS (CHIEF ELECTRICAL ENGINEER'S BRANCH), September 29th.—One drag link ash conveyor. Reference No. A.X. 3 432.)

VICTORIAN GOVERNMENT RAILWAYS, September 29th.—Two motor-driven disc grinding machines and necessary equipment. (Reference No. A.X. 3 433.)

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, October 4th.—Pole oil switches. (Reference B.X. 2 795.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, October 5th.—Switchboard cords (schedule No. 115). (Reference B.X. 2 747.)

NEW PLYMOUTH (N.Z.) HARBOUR BOARD, October 16th.—Supply delivery and erection of 30-cwt. portal electric horizontal luffing jib crane, fittings and accessories. (Reference A.X. 3 458.)

SYDNEY COUNCIL, October 18th.—Two 100 ton electrically-operated overhead travelling cranes. (Contract 1 033. Reference A.X. 3 467.)

CHRISTCHURCH (N.Z.) DRAINAGE BOARD, October 19th.—Supply and erection of three sets of electric centrifugal pumping plants (contract 26 329). (Reference A.X. 3 215.*)

VICTORIAN GOVERNMENT RAILWAYS, October 20th.—Supply and delivery of rail motor equipment. (Contract No. 39 614. Reference No. A.X. 3 449.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Telephone plugs and sleeves. (Schedule C.120: Reference B.X. 2 799.)

SYDNEY ELECTRICITY DEPARTMENT, November 1st.—Supply, delivery, erection, setting to work, testing and maintenance at Bunnerong power station of boiler feed pumps. (Reference A.X. 3 470.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Supply of 110 000 V transformers for Waikaremoana power scheme, section 17. (Reference B.X. 2 744.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Indoor control gear and switchgear for Waikaremoana electric power development (section 14). (Reference B.X. 2 675.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone transformers. (Reference B.X. 2 797.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 23rd.—Lightning arresters and transformers. (Reference B.X. 2 792.)

Tenders Accepted.

BELFAST CITY COUNCIL.—J. Graham, reconstructing tramways, £165 557 15s.

MONTAGUE BURTON'S PREMISES, BLACKPOOL.—Jones Bros., electrical installation.

COUNTY SCHOOLS, WREXHAM.—E. O. Walker, for installing electric light installation, £137.

CARDIFF RURAL DISTRICT COUNCIL.—Pirelli-General Cable Works, Ltd., cables, £3 778 15s.

GLASGOW CORPORATION.—Whitecross Co., Ltd., supply of tramway trolley wire, £1 023 10s.

ADMIRALTY.—Metro-Vick Supplies, Ltd., Cosmos vacuum and gasfilled lamps, part contract.

GUILDFORD CORPORATION.—Standard Telephones and Cables, Ltd., cable, etc., £926 6s.

HYTHE TOWN COUNCIL.—J. Cain and Co., sub-main wiring at Council houses, at 12s. per house.

HECKMONDWIKE URBAN DISTRICT COUNCIL.—H. Thornton, for electrical work at Council houses.

CHESTER CORPORATION.—Herbert Morris, Ltd., five-ton travelling crane, for a sub-station, £74.

MERSEY DOCKS AND HARBOUR BOARD.—W. T. Henley's Telegraph Works Co., Ltd., electric cable.

NORTHERN CO-OPERATIVE SOCIETY, LTD.—J. Worling, electrical work at new garage at Berryden.

EVESHAM BOARD OF GUARDIANS.—Abell and Smith, electric lighting installation at Cottage homes, £33.

HULL CORPORATION.—Scholl and Son, Ltd., supply of X-ray apparatus to tuberculosis sanatorium, £346.

LONDON COUNTY COUNCIL.—Metro-Vick Supplies, Ltd., electrical accessories for 12 months (part contract).

WARWICK BOARD OF GUARDIANS.—Midland Electric Light and Power Co., Ltd., electrical installation, £700.

CORK BOROUGH COMMISSIONER.—R. Merrick and Sons, electric welding repairs to Parnell Bridge, £949 15s.

ST. AUSTELL URBAN DISTRICT COUNCIL.—W. G. Heath and Co., electric wiring of premises in Fore Street, £32 5s.

H.M. OFFICE OF WORKS.—Metro-Vick Supplies, Ltd., "Cosmos" vacuum lamps for 12 months (part contract).

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—Chamberlain and Hookham, Ltd., meters, £3 7s. 6d. each (recommended).

LONDON COUNTY COUNCIL.—British Thomson-Houston Co., Ltd., auto-transformers for tramways sub-stations, etc., £740.

STAFFORD CORPORATION.—Pulsometer Engineering Co., supplying electrically-driven sewage pump and connections, £398.

CLACKMANNAN E.C. (ALLOA).—J. Simpson, electrical installation at proposed new offices, Glebe Terrace, Alloa, £128 19s. 2d.

NORMANTON URBAN DISTRICT COUNCIL.—Union Cable Co., Ltd., supply and laying of approximately 1 400 yards feeder cable, £2 790 8s. 8d.

CARDIFF RURAL DISTRICT COUNCIL.—Pirelli-General Cable Works, Ltd., cable work in connection with Dinas Powis lighting scheme, £3 778 10s.

EPSOM URBAN DISTRICT COUNCIL.—W. H. Allen, Sons and Co., Ltd., two Diesel engines, for the electricity works, £12 539 15s. (recommended).

WEST BROMWICH GUARDIANS.—Whittaker Bros., Ltd., electric light wiring, etc., at new nurses' home, mortuary and post mortem room £795.

METROPOLITAN ASYLUMS BOARD.—Oxford Wireless Telephony Co., Ltd., wireless receiving apparatus for St. Luke's Hospital, £195 (recommended).

GUILDFORD CORPORATION.—Standard Telephones and Cables, Ltd., cable in connection with the new Woodbridge Road power station, £925 15s. 6d.

GRIMSBY TOWN COUNCIL.—C. Dickinson, electric wiring of 34 houses at Nunsthorpe, £139 3s.; Metropolitan-Vickers Electrical Co., Ltd., supply of switchgear for pumping station, £275 15s.

ROCHDALE TOWN COUNCIL.—R. W. Aerstall, electric lighting and power installation for 70 houses on Turf Hill estate. Electroflo Meters Co., Ltd., recording apparatus for measurement of the flow of crude sewage.

PETERBOROUGH CORPORATION. — Pirelli-General Cable Works, Ltd., Peterborough, Spalding cable, £20 806. Foster Engineering Co., Ltd., kiosks, £47 10s. each. Fourteen tenders were received, the highest being £122 each.

ADWICK-LE-STREET URBAN DISTRICT COUNCIL.—Callender's Cable and Construction Co., Ltd., cables and apparatus for extending the electricity supply to Adwick Old Village, Council houses, and Woodlands, £10 913.

HASTINGS CORPORATION.—Ferranti, Ltd., 50 transformers at £139 each, and 100 at £194 each, plus 10 per cent. for contingencies. Yorkshire Switchgear and Engineering Co., six transformer kiosks at £285 each. W. T. Glover and Co., Ltd., cables for extended area.

WESTMINSTER CITY COUNCIL.—Rashleigh, Phipps and Co., Ltd., electric lighting, etc., of staircases and balconies at St. James's Dwellings, £94 10s. (recommended). Other tenders: Coleby, £76 18s.; Brown and Hall, £94 15s. 5d.; Belshaw and Co., £98 6s. 6d.; Withers and Chadwick, £127 10s.

GREAT INDIAN PENINSULAR RAILWAY.—Metropolitan-Vickers Electrical Co., Ltd., one 2 260 H.P. electric passenger locomotive capable of attaining a safe travelling speed of 85 m.p.h. This is in addition to a recent order for 41 electric freight locomotives. English Electric Co., 15 motor coach and 42 trailer coach equipments (repeat order), and twelve 1 250 kW rotary converters, 22 000 V transformers and automatic d.c. switchgear for three complete units.

SAFFRON WALDEN TOWN COUNCIL.—Read and Partners, Ltd., supply of engine and dynamo, switchgear, booster balancer and battery, accumulator battery and mains, £4 754 15s. (accepted). Other tenderers were:—Pinching and Walton, £4 935 12s.; G. E. Taylor and Co., £4 980 16s. 10d.; Baily, Grundy and Barrett, Ltd., £5 455 15s. 5d.; A. V. Gifkins and Co., Ltd., £5 666 10s.; Buxton and Co., £7 708 15s.; and Waring, Withers and Chadwick, £11 122 5s.

From the Igranic Electric Co., Ltd., Elstow Road, Bedford, we have received a leaflet on "XLLOS" (extra low loss) inductance coils (publication No. 6 215), a leaflet describing the Indigraph Vernier knob and dial (No. 6 218) and a folder on the Igranic supersonic heterodyne receiver outfit (No. 6 220). Copies will be supplied to the trade on application.

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ELECTRICITY SUPPLY.

Radcliffe to Spend £1 500 on Cookers for Hire—Mid-Cheshire Developments—Contractors and Chester Electricity Showroom Policy.

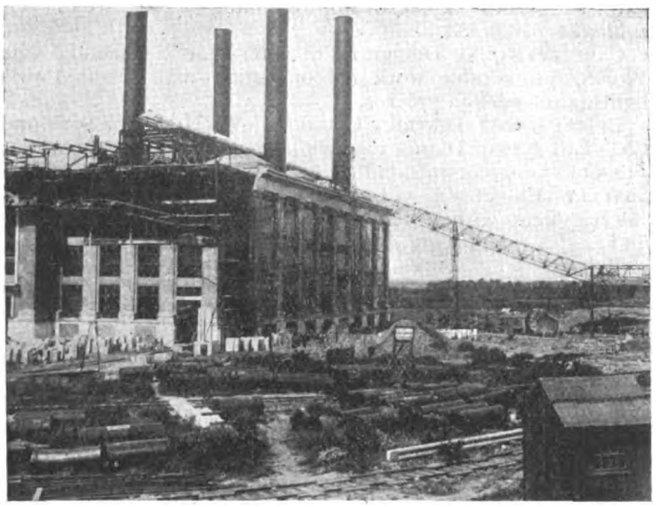
ALTHOUGH charges for Perth gas will be increased, electricity rates are not to be raised.

Whitby U.D.C. has applied for a loan of £100 for the purchase of electric cookers for hire.

It is stated that Burnley electricity works may be considerably extended in the near future.

Sunderland Corporation has applied for sanction to the borrowing of £20 000 in respect of service mains.

Clitheroe R.D.C. has sanctioned the laying of cables by the Lancashire Electric Power Co. in Mytton and Whalley.



The new power station at Ferrybridge, Yorks, which is now rapidly nearing completion.

An electricity supply scheme for the burgh is to be considered at an early date by Turriff (Aberdeenshire) T.C.

Dumfries T.C. has received sanction to a loan of £5 500 for the installation of new hydro-electric plant at Maxwelltown.

Bedwas and Machen U.D.C. has received sanction to a loan of £6 136 for the Bedwas and Trethomas electricity scheme.

Middlesbrough T.C. has applied to the Electricity Commissioners for a loan of £55 390 for mains, services and meters for the ensuing two years.

It is hoped to have the latest additional section at Dalmarnock power station sufficiently advanced to permit of the official opening early in the autumn.

Radcliffe U.D.C. has applied for loans of £1 500 for the purchase of electric cookers for hiring out, and for £13 000 for mains and services for three years.

Witney U.D.C. is applying for sanction to a loan of £6 100 for extension of generating plant and the installation of an electrically operated pump at the water pumping station.

In our previous issue we inadvertently gave the net profit of the Oldham Corporation electricity undertaking for the year ended March 25th, 1926, as £4 951. This should read £30 417.

Maidstone T.C. has reduced the minimum charges for electricity for lighting from 12s. 6d. each winter quarter to 5s., and from 6s. 6d. for each summer quarter to 2s. 6d., as from July 1st.

Maidstone Charges Reduced.

Speaking at the inauguration of the Thornton electricity supply last Friday, Mr. J. Marshall said the number of consumers exceeded by 30 or 40 per cent. the number anticipated in the first place.

Peterborough T.C. has decided to give a supply of electricity to the sugar beet factory being erected at Woodston at an outlay of £1 730, on a guaranteed minimum income of £325 yearly for five years.

Edinburgh Corporation is now hiring out electric cookers at an annual rental of 30s. The Corporation fixes the stoves and keeps them in proper working order, but the expense of wiring is borne by the consumer.

Watford T.C. has made the following reductions in the charges for electricity:—Lighting, first 80 kWh, from 7d. to 6½d.; beyond, from 4½d. to 4d.; Norwich system, 0.125d. off; power, 5 per cent. off accounts; heating, 5 per cent. off.

Crook U.D.C. has decided to allow prepayment consumers of electricity a rebate of 1d. for each shilling placed in the meters. The lighting rate for picture halls is to be the same as that allowed to other large consumers, namely, 6d. per kWh for the first 500, 5½d. for the next 250, and 5d. beyond.

Tamworth R.D.C. has received from the Leicestershire and Warwickshire Electric Power Co. an intimation of its intention to construct electricity mains in the parishes of Bolehall and Glascote. The Pooley Hall Colliery Co., Ltd., has applied to the Council for consent to an application for a Special Order to supply electricity in the district.

Hackney Rates Raised.

The increased charges for the supply of electrical energy at Hackney in consequence of the continuance of the coal dispute have now been fixed. As from the September 30th meter readings an increase of 10 per cent. will be made on all accounts, which includes meter rents, during the next two winter quarters ending December, 1926, and March, 1927.

The new Mid-Cheshire electricity supply scheme, which was inaugurated by the Mid-Cheshire Electricity Supply Co., Ltd., on Tuesday, covers an area including Knutsford, Northwich, Winsford and Middlewich. Special efforts are to be made to develop the supply of electricity to outlying farms, and it is stated in this connection that a new type of village outdoor transformer sub-station will be employed.

Sleaford U.D.C. has applied for a loan of £754 for electricity purposes. The Council has made a reduction in the charges for electricity for lighting and power as under:—Power, discount of 5 per cent. if the total yearly consumption is 5 000 kWh and under 10 000, 10 per cent. for 10 000 and under 15 000, 15 per cent. for 15 000 and under 20 000, and 20 per cent. for 20 000. Lighting, 5 per cent. for a yearly consumption of 1 000 kWh and less than 2 500, 10 per cent. for 2 500, and 20 per cent. for 5 000.

At a recent meeting of Reigate R.D.C., Mr. Sanders said he was anxious to get a supply of power, which he was told could be got from Reigate at 2d. per kWh. At present, he said, they had power in Buckland to take power from Reigate by agreement with the Corporation, but if they gave a monopoly to the Leatherhead and District Co. they would force everyone to pay what he considered an exorbitant rate. The Chairman said the R.D.C. had given its consent to the company's proposal to supply in Betchworth and Buckland, and a letter from the company stated that Reigate Corporation could not supply in Buckland unless it obtained an Order to supply in bulk.

Chester's municipal electricity showroom has now been open nine months during which time the expenditure was £2 685 and the income £2 678. Including the proportion of interest and sinking fund, rates, taxes, current used in the showroom, the total loss amounted to about £160. On a full year's working there should be no loss. The chairman of the Electricity Committee states: "We have kept strictly to our policy as agreed by the Council and not interfered with electrical contractors, but, I venture to suggest, have helped such firms by connecting such a large number of new consumers. In my opinion private traders should make more use of the showroom."

With reference to the application by the Gwynedd Trust, Ltd., for the Nantwich Electricity Special Order to enable the promoters to supply electricity within an area comprising the urban districts of Nantwich and Tarporley, and the rural districts of Nantwich and Tarvin, the Electricity Commissioners have decided that the application be divided into two parts: (*a*) That part relating to Tarporley and Tarvin rural district which will be dealt with concurrently with the application by the Chester City Council in respect of the same districts; (*b*) the remaining part (Nantwich Urban District and part of Nantwich Rural District), and that this part of the Order be made and submitted to the Ministry of Transport for confirmation.

The annual report on the municipal electricity undertaking presented at last week's meeting of Taunton T.C. showed not only a decrease of £1 290 on working expenses, but the trading income increased by £2 467. The net profit on the

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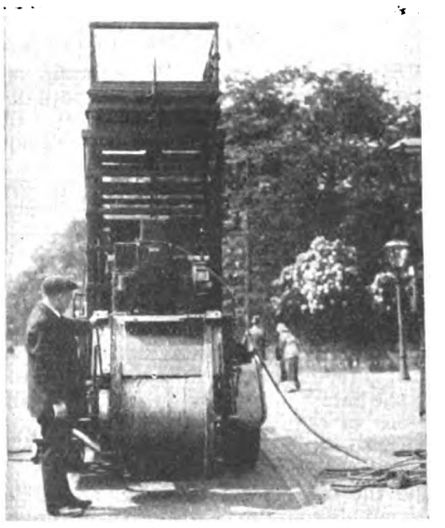
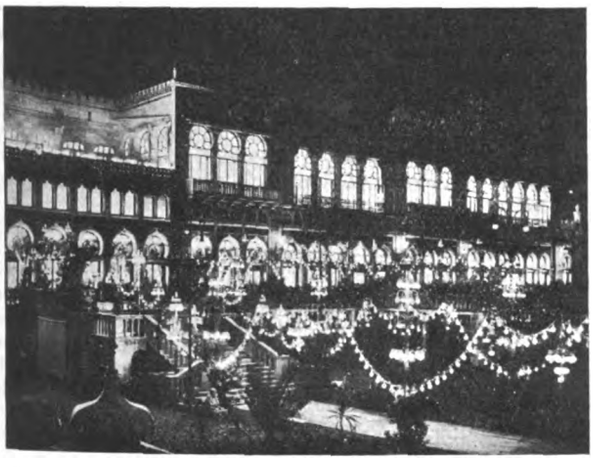
ELECTRICAL NEWS IN PICTURES

These electrically-driven children's vehicles have just been introduced on the American market. Some models attain a maximum speed of 15 miles per hour.



This Salford Corporation tramways tower wagon incorporates several novel features, including an electric compressor, an electric welding plant, and an electric rail grinder.



Electrical illuminations are lavishly used during the season on the Lido, as this striking night view of the Excelsior Palace Hotel there clearly shows.

Another of the many outdoor applications of wireless is illustrated in this picture showing the use of a portable wireless receiver for dancing on the beach.

year amounted to £4 461, which has been placed to reserve, bringing this fund up to £8 038. In view of the satisfactory result the following reductions have been made in charges to consumers :—Lighting, 6d. per kWh up to 500 kWh per quarter instead of 6½d., 5d. from 500 to 1 000, and 4d. per kWh over 1 000 kWh ; heating, 1½d. per kWh for all used, instead of 3d. for first 50 per quarter and 1½d. for all in excess ; power, 2½d. per kWh up to 2 000 per quarter, 2d. for 2 000 to 4 000, and 1½d. per kWh over 4 000, a reduction of ½d. in each case ; sewage disposal works, 1d. per kWh for power purposes, instead of 1½d. ; public lighting, £2 000 per annum, instead of £2 400.

In his annual report on the Southport electricity undertaking, Mr. E. Moxon, the borough electrical engineer, says there was an increase of 145 281 kWh, equivalent to 14 per cent., on the past year for heating, cooking, etc., and of the 369 607 kWh used by consumers who have adopted the new inclusive domestic tariff the greater proportion was for heating, cooking, etc. Receipts from the sale and hire-purchase of domestic appliances are greater by about £1 800, this being the amount of business done through the new showrooms for a period of five months. After the showrooms have been debited with their proportional expenses for rent, rates, establishment and electricity charges, salaries and wages, there is a satisfactory profit. In Mr. Moxon's opinion, the department and its consumers, and also the electrical contractors, will benefit by the showrooms. A few consumers have adopted the all-electric method.

The question of applying to the Electricity Commissioners for power to extend their area of supply to include the parishes of Bollen and Hillmorton was considered at a recent special meeting of Rugby Council. Mr. H. Yates said the question had been brought to a head by the decision of the Leicestershire and Warwickshire Power Co. to apply for power to supply these villages, among others. The Council's engineer had estimated that the cost of the necessary work would be about £25 000, which would mean a loan charge of £1 819 a year. For a time there would be a slight loss on the extension, but it was estimated that in a few years the scheme would be self-supporting and eventually a paying proposition. It would pay the Council to go in for this scheme now rather than to take over the supply when the boundaries of the town were enlarged. The opposition case was that the cost would be at least £35 000, and that as the Power Company were prepared to supply the villages the ratepayers should not be saddled with this additional burden. Moreover, dissatisfaction would be caused by the fact that the price to the townspeople would be 4½d. per kWh, as against 7d. per kWh to the new area. On a vote being taken the motion was defeated by nine to four.

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WIRELESS NEWS.

Manufacturers' New Reduced Prices for Wireless Valves.

SEVERAL of the leading British radio valve manufacturers have introduced, as from August 16th, new reduced prices affecting the majority of their products. Generally speaking, valves formerly sold at 26s. are now 22s. 6d., and the 22s. 6d. valves are reduced to 18s. 6d. The 16s. 6d. and 15s. 6d. valves will now sell at 14s. There is no general reduction in the prices of the 14s. and 8s. valves.

In connection with these price reductions, an official of the Wireless Retailers' Association of Great Britain states, in a letter to THE ELECTRICIAN, that all dealers already holding stocks of the valves should be allowed rebates on their stocks. It is pointed out that to accord such rebate to dealers who, to the advantage of the manufacturers, make a point of carrying a stock of their valves, would seem to be an act of the barest justice; yet the trade recalls that on previous occasions of reductions in price the greatest difficulty was experienced in obtaining redress.

It is also considered that not only would the decision to confine the rebates to retailers who in consideration of an additional discount have signed an agreement to sell only V.M.A. valves, be unjust, but in view of the many excellent non-V.M.A. valves on the market any such action would not be in the interests of the manufacturers themselves.

Finally, the Association expresses the hope that the trade will receive an early assurance that on this occasion fair treatment will be accorded to all dealers, whether under agreement with the V.M.A. or not.

New Productions for the National Show.

Many new wireless sets and accessories will be shown for the first time at the National Radio Exhibition at Olympia, London next month. Already there are 166 exhibitors, and 91 per cent. of the space has been taken. Among new apparatus is a neat cylinder, about 3 in. in height and diameter, by means of which an extra valve can be added to any set by attaching it direct to the last valve-holder and fixing two valves in the holders provided on top of the cylinder.

Other novel exhibits will be valves which, it is claimed, can be dropped, bounced and knocked about without harming their efficiency; a loud speaker in the form of an ordinary picture to hang on the wall; an instrument, measuring 6 by 8 by 9 in., which transmits and receives photographs by radio, telegraph or telephone; and an entirely new loud speaker which is claimed to eliminate the difficulty of producing low notes as clearly as high notes.

Berlin Wireless Exhibition.

The Berlin Wireless Exhibition, to be held from September 3rd to 12th, with nearly 300 exhibitors of radio apparatus, its displays by different German radio societies and its elaborate model plant shown by the postal authorities, will furnish a good opportunity for a personal survey of the German position, and the exhibition authorities are this year making special efforts to attract English trade visitors. The journey from London may be accomplished in about 22 hours in comfort, the return fare being under £10 second class. The Foreign Department of the exhibition undertakes to engage rooms on behalf of any radio manufacturer or trader, and generally to see that the question of language offers no bar to an exhaustive survey of the German radio trade. Details are obtainable from Thomas Cook and Son, from any German consulate, or direct from the Berliner Messe-Amt, Breite Strasse 35, Berlin.

Wireless News in Brief.

Twenty-seven Canadian radio manufacturers last year produced wireless apparatus worth £1 109 000.

The Lead Market.

IN their lead market report dated August 14th, James Forster and Co. state that the week opened with a firmer tone and by August 10th lead had reached £33, and November £32 13s. 9d. Since then there has been a sagging tendency, the close being steady at £32 8s. 9d. for August, £32 0s. 3d. for September, £32 3s. 9d. for October and £32 2s. 6d. for November.

The market was mainly professional, with consumers taking little interest. Arrivals are still on the light side, but, on the other hand, consumption is not so good. The future is obscure and largely depends on whether the recent improvement in demand from Germany is maintained.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

"FOR economy travel by tram" is a slogan just introduced by Glasgow Tramways Department.

The electrified railway between Lisbon and Cascaes, the first in Portugal to be converted, was opened this week.

The gross loss on the East Ham tramway undertaking for the past year was £12 670, against £14 769 for the previous year.

Although an offer of German trolley wire was £43 cheaper than the lowest British offer, Glasgow Corporation has rejected the foreign bid.

No action is to be taken at present regarding a proposal that Glasgow Corporation should seek powers providing for the electrification of railways in the city area.

Orders have so far been placed for 16 electric locomotives for the Czechoslovak railways electrification scheme, the first section of which is to be completed this autumn.

Organised tramway workers at Bolton have notified the Tramways Committee that they cannot go on working without an agreement, and they asked for a consideration of the position. In view of the probability of negotiations for the resuscitation of the national agreement, the Committee has taken no action.

At the inquiry into the collision at Newcastle-on-Tyne between a driverless electric train and a goods train it was revealed that a handkerchief had been tied over the "dead man's handle." A member of the L.N.E.R. electrical staff said that in 23 years' experience of electric trains he had never before heard of a similar case.

Buenos Aires City Council is still considering the position of the concession granted to the Anglo-Argentine Tramways Co. in 1909 for the construction of an underground tramway line from Retiro to Constitucion station. The local "Financial Times" correspondent states that an early clearance of the obstacles to these extensions is expected. There is, however, before the Council a competitive proposal of underground construction.

London County Council Highways Committee proposes to spend £23 300 upon improving 100 of the Council's tramcars. It is intended to have transverse seats in the centre part of the lower deck, to cover the floor with cork carpet, to increase the number of lamps by four, to provide bell pushes, to fit handrails for outside passengers, and to rearrange the handrails on the lower deck to correspond with the new seating arrangements. The cost per car is estimated at £242 3s. 2d.

Salford Corporation has in service a Leyland tower wagon which incorporates some particularly novel features. Not only is it equipped for (1) the maintenance of overhead tramway equipment, but also has (2) a reel wagon for the running of overhead trolley wire, (3) an electric compressor and receiver for spray painting purposes, (4) an electric welding plant complete, for metal electrodes and carbon arc, and (5) an electric rail grinder for grinding rails after welding. This vehicle (illustrated on page 221) is believed to be the only one of its kind in service.

Two 2 000 kW rotary converters are to be installed in the Mansion House sub-station of the London Underground Railways, and to provide room for one of these an existing 1 500 kW rotary converter is to be removed. The intention is to supply the eastern end of the Central London Railway from this sub-station, and thus avoid addition to the size or number of sub-stations on that railway, which may be necessary to deal with future increases in the train services. The new equipment at Mansion House will also provide a margin to cope with further increases in the District Railway train services.

To the number of railways which are changing over from steam to electric power, may now be added the name of the Cape Town suburban railways. The work which is now in progress embraces the electrification of the section of line extending from Sea Point on the west of Cape Town, and through Cape Town to Simonstown, a distance of about 26 route miles, nearly half of which is along the coast. In all over 77 miles of underground power, telephone and pilot cable will be used. The cable is being supplied by W. T. Henley's Telegraph Works Co., Ltd., who are also jointing and laying or supervising the laying of all but a small fraction of the cable. The scheme calls for two power stations at Dock Road and at Salt River, and eight sub-stations.

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COMPANY NEWS.

A Renewal of Activity on the Electrical Share Market—Several Manufacturing Rises—Underground Railway Improvement.

THERE has been rather more doing in the electrical share markets during the past week, though business is still restricted by August holidays. English Electrics have risen nearly 2s., to 15s. 7½d.; General Electrics and Metro-Vickers, at 30s. 3d. and 25s. 7½d. respectively, are each 1s. 3d. higher; and Brush Electrical ordinary shares are 7½d. better. On the other hand, Electric Construction ordinary shares, at 31s. 3d., have shed 7½d.; and Telegraph Construction £12 shares are 5s. lower at 28¾. Marconi's International Marine shares have recovered 1s. 3d. to parity, and Eastern Telegraph stock is a couple of points up. Underground Railways £10 shares are 2s. 6d. higher, but Metropolitan District and British Electric Traction ordinary stocks are each ½ down.

Last Annl. Divd.	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
%	**Electricity Supply.**				
10	Brompton & Kensington Ord.	32/6	32/6	45/-	24/-
4	Central Elec. Supp. 4% Deb...	90	90	100	67
15	Charing Cross Elec. Ord. (£1)..	44/4½	45/7½	60/-	10/-
4½	" " 4½% C.P. (£1) ..	17/6*	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	48/1½	48/1½	52/6	20/3
6	" " 6% C.P. ..	22/6	22/6	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	59/4½	59/4½	61/3	14/6
6	" " 6% C.P. ..	22/6	22/6	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	13¼*	13¼	13¼	3¼
10	Lon. Elec. Sup. Ord. (£1) ..	32/6	32/6	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	35/7½*	36/10½	41/6	8/-
4½	" " 4½% C.P...	17/6	17/6	18/6	9/6
7	N'castle & Dist. Supp. Ord. ..	20/-	20/-	21/10½	7/9
7	" Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	22/6	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord (£5) ..	16¼	16¼	15¾	5¼
15	W'minster Elec. Sup. Ord. (£1)	42/6*	43/1½	48/9	18/-
4½	" " 4½% C.P. (£1)	17/6	17/6	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-*	27/-	32/6	12/6
	" " 6% C.P...	22/6*	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	134½	134½	123	24
6	" 6% Pf. Stk.	109½	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	70	70	89½	40½
4	" " 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	78¼	78½	102¾	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	50½	50½	73½	10
4	" " 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	" " 4% Deb. ..	78½	78½	98¾	52
5	Lon. & Sub. Trac. A. Deb. ..	78½	78½	89	65
4	Lon. Un. Trams. 1st Deb. ..	47	47	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	64½	64½	101½	49
5	" 5% Deb. ..	68½	68½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	63*	63½	84½	19
3½	" 3½ Pf. Stk.	63½*	64½	88¼	40½
3½	" 3½% Deb.	60½	60½	92¾	51
3½	Met. Dis. Rly. Ord. Stk. ..	51¼	51	58	12¾
4½	" " 4½% 1st Pref. ..	77½	77½	91	45
6	" " 6% Perp. Deb. ..	112¼	112½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb.	65	65	73½	48½
—	Underground Elec. Rlys. Ord.(£10)	3¾	3¼	5¾	21/3
3	Yorks. (W.R.)Trams. Ord. ..	11/6	11/6	27/-	1/-
4½	" " " 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
†3½	Brit. Elec. Transformer 7% C.P.	18/9	18/9	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	67/6	67/6	62/-	26/6
6	" " 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	23/-	23/-	23/4	19/7½
7	" " 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	25/7½	25/-	29/-	10/-
‡15	Callender's Cable Ord.	65/-	65/-	85/-	22/-
6½	" " 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	" " 7½% B. Pref...	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)..	11/-	11/-	28/9½	1/11
7½	" " 1st Pref...	21/3	21/3	26/-	5/-
10	Elec. Construction Ord. ..	31/3	31/10½	30/4	6/7½
7	" 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	15/2½	13/9	29/3	7/3
6	" 6% C.P... ..	18/-	18/-	21/3	10/6
6	Ericsson Telephones 6% C.P...	21/3	21/3	21/-	12/7½
6	Ferranti 6% Pref.	19/4½	19/4½	18/6	16/9
7	" 7% 2nd Pref... ..	18/-	18/-	19/-	13/9
5	" 1st Mort. Deb. Stock..	91½	91½	96½	80½
7½	General Elec. Ord.	30/3	29/-	59/-	13/6
20	W. T. Henley's Ord.	77/6	77/6	86/6	23/3
17	Johnson & Phillips Ord. ..	63/1½	63/1½	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	25/7½	24/4½	37/-	13/1
8	" " 8% C.P. (£2) ..	47/6	47/6	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	30/-	30/-	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	28¾	29	56/2/6	19¾
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb ..	74½	74½	87½	60
10	Eastern Ord. Stk.	180½	180½	213½	113/2/6
3½	" 3½% Pref. Stk.	65½	63½	84/17/6	49
4	" 4% Deb. ..	79½	79½	103½	60
10	Eastern Extension Ord. (£10)..	10½	10½	21½	10/12/6
4	" 4% Deb. ..	79½	79½	97½	60
22	Gt. Northern Telegraph (£10)..	27½	27½	42/12/6	19
‖10	Indo-European (£25)	40½	46½	59½	25
—	Marconi's Wireless T. Ord. ..	15/-	15/-	9/16/3	20/9
7½	" Int. Mar.	30/-	18/9	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	18½	18½	23	11/6/3
4	" " 4% Deb. Stk. ..	78½	78½	10	60/2/6

* Ex-dividend.
† For half-year to June, 1925.
¶ Plus 3 p.c. in respect of 1921.
‡ Plus share bonus.
‖ Including bonus.

TORQUAY TRAMWAYS CO., LTD.—Int. div., 4 p.c., tax free, on ord. shs. Last yr. same.

JOSEPH LUCAS, LTD.—Fin. div. on "A" and "B" pref. shs. for six mos. to August 31st.

WALKERS, PARKER AND CO.—Int. div., 6d. per sh., less tax at 4s., payable September 30th. Last yr. same.

LONDON UNDERGROUND RAILWAYS.—Scheme for reorganisation of share capital was adopted without discussion at a meeting of shareholders.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Rumours of a possible capital re-organisation are officially denied, the board stating that no capital reorganisation of any kind has been or is under consideration.

MIDLAND ELECTRIC MANUFACTURING CO., LTD.—This company, which is taking over the Midland Electric Manufacturing Co., and Birmingham Foundries, Ltd., has invited applications this week for 25 000 preference shares of £1 each at par. The shares will carry a cumulative dividend of 7½ per cent.

ENGLISH ELECTRIC CO. OF CANADA.—Rept. for 1925 shows current assets $619 159 (agst. $691 989). Current liabilities are $94 383 ($158 658). After depreciation of $40 000 net pft. was $24 004 ($55 092). Div. of 2½ p.c. was pd. on cum. pref. stk., leavg. accumulated surplus of $293 848. Company now has reserve for depreciation of $419 304, and contingent reserve of $20 000.

HAVANA ELECTRIC RAILWAY CO.—Advices from New York state that $5 500 000 25 yr. 5½ p.c. gold debentures at the price of 92, to yield over 6¼ p.c., are being offered there. Each deb. will be accompanied by a 25 yr. warrant entitling the holder to subscribe for 23 shares of common stock at the price of $45 per sh. This issue was to be followed by an offering of $5 000 000 6 p.c. cum. pref. stk. with common stk.

NORTH OF SCOTLAND ELECTRIC LIGHT AND POWER CO.—Rept. states that during yr., owing to Inverness T.C.'s decision to exercise option of purchase of Inverness undertaking, the £27 160 5 p.c. first mtge. deb. stock was redeemed. Pending payment by Inverness T.C., temporary cash loan of £25 000 was arranged. After making provision for income-tax, meeting premium on deb. stk, redeemed, deb. and loan int. and pref. sh. div., also adding amt. brot. fwd., there remains blce. of £15 453. Int. div. of 3 p.c. on ord. shs. was pd., free of tax, last Oct., and dirs. recommend further div. of 4 p.c., free of tax, with blce. of £11 053 fwd.

MONTREAL LIGHT, HEAT AND POWER CONSOLIDATED CO.—At a recent meeting the shareholders approved the conversion of the $100 par value shs. into one 6 p.c. cum. redeemable pfd. sh. at par value of $50, and three common shs., with nominal or par value. The change took effect on August 2nd, and interim certificates for the new shs. are now ready for delivery upon surrender of present $100 par value stk. certifs. and sh. warrants with serial coupon No. 41 and subsequent coupons attached to the Montreal Trust Co., 11, Place d'Armes, Montreal. Definitive certifs. will be ready for delivery at later date, due notice of which will be given.

New Companies.

PEARSON'S STORES, LTD.—Cap., £3 000. Electrical engineers, etc. Reg. office: 138, Buchanan Street, Glasgow.

E. COWLES, LTD.—Cap., £15 000. Electrical engineers, etc. A director: W. H. Day, 112, St. Stephen's Road, Hounslow.

BILLETOP AND GILPIN, LTD.—Cap., £2 000. Electrical engineers, etc. A director: C. T. Billetop, 8, Barkby Road, Syston, Leics.

LANG ELECTRICAL CO., LTD.—Cap., £100. Electrical and mechanical engineers, etc. Reg. office: 24, Brent Street, Hendon, London, N.W.4.

STAFFORD O'BRIEN AND PARTNERS, LTD.—Cap., £1 000. Electrical and general engineers, etc. Reg. office: 66, Victoria Street, London, S.W.1.

W. H. RICKETTS AND SON, LTD.—Cap., £1 200. Electrical engineers and contractors, etc. Reg. office: 115, Bedford Road, Clapham, London, S.W.4.

DAVID SHANKS AND CO., LTD.—Cap., £2 000. Manufacturers of and dealers in electrical fittings. A director: W. Scorer, 153, Bristol Road, Birmingham.

WILSON AND CROWE, LTD.—Cap., £700. Manufacturers of electrical apparatus, etc. Solicitors: Docker, Hosgood and Co., 10, Newhall Street, Birmingham.

RELIABLE TRADING CO., LTD.—Cap., £100. Manufacturers of, agents for and dealers in electrical appliances, etc. Reg. office: 317, High Holborn, London, W.C.

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PERREM IGNITION AND ELECTRIC CO., LTD.—Cap., £10 500. To develop and turn to account the Perrem ignition system. Reg. office: 37, Westmoreland Street, Dublin.

M. PARTRIDGE AND CO., LTD.—Cap., £5 000. Electricians, etc., and to adopt agreement with Miss Margaret M. Partridge. Reg. office: 4, Copthall Buildings, London, E.6.

NUWAY MANUFACTURING CO., LTD.—Cap., £3 000. Manufacturers of wireless accessories, etc. Reg. office: Old Grange Works, Old Grange Road, Sparkbrook, Birmingham.

KAMM AND CO., LTD.—Cap., £10 000. To acquire business of electrical engineer carried on by L. A. Kamm. Reg. office: 27, Powell Street, Goswell Road, London, E.C.

J. J. R., LTD.—Cap., £1 000. Manufacturers of and dealers in wireless sets and other apparatus, etc. Solicitors: Kenneth E. Bartlett, 83, Cannon Street, London, E.C.4.

LLANSILIN ELECTRICITY CO., LTD.—Cap., £1 500. To carry on business of an electric light and power company. Reg. office: The Post Office, Llansilin. (Public company.)

SHARRATT ELECTRICAL CO., LTD.—Cap., £2 000. Electricians, workers and dealers in electricity, motive power and light, etc. Solicitors: J. Stanton, 14, High Street, Chorley.

SMITH AND ANCILL, LTD.—Cap., £3 000. Manufacturers of and dealers in electrical, electro-technical and similar articles and appliances, etc. Reg. office: 32, Furnival Street, London, E.C.4.

ALEXANDER AND MANN (HARROW), LTD.—Cap., £250. Manufacturers of telephones, telegraphs, dynamos, accumulators, lamps and electrical apparatus. Reg. office: 150, Pinner Road, Harrow.

MCGOWAN WILD AND CO., LTD.—Cap., £4 500. To acquire the business carried on by McGowan Wild and Co., at 206, Hurst Street, Birmingham, and to carry on the business of electric welders, etc.

ROOKE BROS., LTD.—Cap., £5 000. To acquire the business of a wireless and radio apparatus manufacturer and dealer carried on by E. E. Rooke. Reg. office: 55, Cardington Street, London, N.W.1.

BRITISH IDEAL PATENTS, LTD.—Cap., £5 000. Manufacturers of and dealers in recording and reproducing instruments, wireless apparatus, etc. Reg. office: 4A, Parton Street, Southampton Row, London, W.C.1.

PASCO (LIVERPOOL), LTD.—Cap., £400. Manufacturers, importers and exporters of and dealers in wireless telephones, telephonic and telegraphic apparatus, parts and accessories, etc. Reg. office: 16, Newington, Liverpool.

ELECTRIC TRANSMISSION, LTD.—Cap., £10 000. To acquire a sub-lease of "Culford Works," Kingsbury Road, Dalston, lately occupied by Twiss Electric Transmission, Ltd., and goodwill of business of said company, etc.

ECONOMIC HOUSEHOLD APPLIANCE CO., LTD.—Cap., £700. Electric stove manufacturers, manufacturers of electric refrigerators, etc. Reg. office: Economic Works, Queen Anne Road, Well Street, Hackney, London, E.9.

MIDLAND ELECTRIC DETONATOR FUSE CO., LTD.—Cap., £2 500. Manufacturers, importers and exporters of electric detonator fuses, electric powder fuses, electric shot firing cables, etc. Reg. office: Portland Square, Sutton-in-Ashfield, Notts.

N. K. (BRADFORD), LTD.—Cap., £2 000. Manufacturers of and dealers in electrical lamps and globes, etc., and to adopt an agreement with N. K., Ltd. Solicitors: Kenneth Brown, Baker, Baker, Lennox House, Norfolk Street, London, W.C.2.

L. NICHOLSON AND CO., LTD.—Cap., £6 000. To adopt agreement with L. Nicholson and to carry on businesses as electrical engineers and dealers in electrical accessories as formerly carried on by him at 9, High Street, Milford-on-Sea, etc.

MIDLAND ELECTRIC MANUFACTURING CO., LTD.—(Public co.). Cap., £150 000. To acquire the Midland Electric Manufacturing Co., Ltd., etc. First directors: W. L. Barker and B. D. F. Docker. Reg. office: M.E.M. Works, Barford Street, Birmingham.

TEL-A-LITE AND ACCESSORIES, LTD.—Cap., £500. To acquire from H. C. Proctor the benefit of certain existing inventions relating to electric lighting systems and apparatus, etc. A director: A. Norris, 5, Egerton Road South, Heaton Chapel, Stockport.

THOMAS J. DIGBY ILLUMINATING ENGINEERING CO., LTD.—Cap., £20 000. To acquire business of an illuminating electrical engineer and contractor and general electrical engineer carried on by T. J. Digby. Reg. office: 12, Gerrard Street, London, W.1.

WAVIO, LTD.—Cap., £500. To manufacture, erect, and maintain, repair and deal in wireless, telegraphic and telephonic apparatus valves, instruments, equipment, accessories, electrical, magnetic, and radio active instruments, etc. Reg. office: 40B, Queen Street, Hitchin.

M. C. L. AND REPETITION, LTD.—Cap., £120 000. Electrical engineers and contractors, manufacturers of and dealers in electrical apparatus for lighting, starting and ignition equipments for motor cars, etc. Solicitors: Slaughter and May, 18, Austin Friars, London, E.C.2.

MALEY AND TAUNTON, LTD.—Cap., £5 000. Manufacturers of and dealers in brakes, tramway carriages, trucks, motors, accumulators, dynamos and other materials for tramways, electrical and mechanical engineers, etc. A director: A. W. Maley, 4, Grosvenor Road, Handsworth, Birmingham.

MAGNETO CONCESSIONS CO. (ENGLAND), LTD.—Cap., £100. To acquire business of manufacturers of, agents and concessionaires for and dealers in motor accessories, dynamos, starter motors, etc., carried on by W. D. Meagher, as the Magneto Concessions Co. (England). Reg. office: 232, Deansgate, Manchester.

ASSOCIATED SIGNS, LTD.—Cap., £100. To acquire the business of sign merchants carried on by J. Akers, E. C. Leachman and G. H. Pettitt at Coventry House, Coventry Street, W., as "Associated Signs," and to carry on business of advertisement agents and contractors, manufacturers of and dealers in advertising apparatus for displaying electric artificial light, etc.

TROUGHTON AND YOUNG, LTD.—Cap., £15 000. To acquire the business of an electrical contractor carried on by H. T. Young as "Troughton and Young," at 143, Knightsbridge and Park Mansions Arcade, Knightsbridge, and to carry on the business of mechanical, electrical, wireless and general engineers and contractors, etc. Reg. office: 143, Knightsbridge, London, S.W.1.

RICHARDS WALTON, LTD.—Cap., £5 000. To acquire business of dealers in wireless apparatus carried on at Abbey Wood by A. Richards and J. B. Walton as "Lincoln Radio of London" and "Arnold Richards" and the business of manufacturers of and dealers in wireless and electrical apparatus carried on by Abbey Industries, Ltd., at Abbey Wood Works, Abbey Wood.

Business Items.

MESSRS. Pearn and Carson, electrical engineers, Sherwell Lane, Plymouth, are about to open a shop and commodious premises at 26, Tavistock Road, Plymouth.

The Leicester depot of T. Beadle and Co., Ltd., of Hull, has been moved from Newport Place, Northampton Street, to larger and more convenient premises at 26, Charles Street, Leicester.

Mr. W. L. Barber will be managing director of the new Midland Electric Manufacturing Co., Ltd.—details of which are given under "Company News"—and will have the assistance as general manager of Mr. T. Birkett, who has been for six years in the service of the old company.

The Department of Overseas Trade has received from Canada a list of department stores which have expressed a wish to receive catalogues from United Kingdom manufacturers of electric lighting fittings, lamps and shades, and wireless receiving sets and accessories. A copy of the list can be obtained from the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. Reference No. 19 915/1926 should be quoted.

A firm of manufacturers' agents in Wellington, New Zealand, desires to secure agencies on an indent and stock basis for electric lamps, flex, and allied lines. They intend covering the whole Dominion, calling upon the wholesale trade only. A representative of the firm intends to visit the United Kingdom shortly. Particulars can be had from the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1. The reference number 188 should be quoted.

Metal and Chemical Prices.

TUESDAY, August 17th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£65 10 0	10s.	—
Electro Wirebars	,,	£67 5 0	—	—
H.C. Wire, basis	per lb.	9 11/16d.	—	—
Sheet	,,	9 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 1 11/16d.	—	—
Brass 60/40—				
Rod, basis	per lb.	7½d.	—	—
Sheet, basis	,,	9⅝d.	—	—
Wire, basis	,,	10⅛d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£4 12 6	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£13 10 0	—	—
Lead Pig—				
English	,,	£34 0 0	—	—
Foreign or Colonial	,,	£32 12 6	—	2s. 6d.
Tin—				
Ingot	,,	£291 0 0	—	£7 12 6
Wire, basis	per lb.	3s. 9½d.	½d.	—
Aluminium Ingots	per ton	£120 0 0	—	—
Spelter	,,	£34 0 0	—	—
Mercury	per bottle	£15 10 0	—	—

Sulphur (Flowers)—Ton £11 10 0 *Sodium Chlorate*—Per lb. 3d.
,, (Roll-Brimstone)—,, £10 5 0 *Sulphuric Acid* (Pyrites, 168°) *Copper Sulphate*— ,, £25 to £25 10 0 per ton, £6 15 0
Boric Acid (Crystals) ,, £37 *Sodium Bichromate*—Per lb. 3½d.
Rubber—Para fine, 1s. 7d.; plantation 1st latex, 1s. 7⅜d.

The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BOWDEN, M. L., AND SON, 33, High Street, Harrow, electrical engineers. £19 8s. 3d. July 12th.

CRONIN, B. A., and HOWELLS, Faraday House, Wyndham Street, Bridgend, electrical engineers. £12 19s. 2d. July 8th.

FUCHSIAPHONE INSTALLATIONS, 11, Mill Street, Middleton, electrical and wireless engineers. £39 19s. 2d. July 14th.

HARRISON, Mr. R., 293, Hawthorne Avenue, Hull, electrical contractor. £23 15s. 1d. July 10th.

PUTTOCK, Joseph, 77, Ashburnham Road, Bedford, electrical engineer. £21 12s. 10d. July 9th.

WHITE, Mr. W., The Shielding, Broad Lane, Whoberley, Coventry, wireless goods factor. £11 8s. 10d. July 2nd.

Deed of Arrangement.

GRIFFITH, Benjamin (trading as EXCEL ELECTRICAL CO.), 30, South Castle Street, Liverpool, electrical engineer. Filed August 11th. Trustee, F. T. P. Deyes, 51, North John Street, Liverpool, C.A. Secured creditors, £9; liabilities unsecured, £1 092; assets, less secured claims, £818.

Receivership.

CLEVELAND METAL CO., LTD. C. U. Peat, of Royal Exchange, Middlesbrough, was appointed receiver and manager on July 31st, 1926, under powers contained in debentures dated April 19th, 1921.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*

ADAIR (P.) LTD., wholesale electrical and wireless distributors, 32/34, Holborn Viaduct, London, E.C.1, and at Glasgow, Manchester and Newcastle-on-Tyne. The statutory meeting of the creditors in this voluntary winding up was held on August 11th, at the Institute of Chartered Accountants, Moorgate Place, E.C. The liquidator, Mr. W. H. Bevan, C.A., of 182, Temple Chambers, London, E.C., presented a statement of affairs showing liabilities of £12 387, all due to unsecured creditors, and net assets estimated to realise £4 574, a deficiency of £7 813. Mr. Bevan reported that the company was formed in October, 1922, to acquire from Mr. P. Adair the business he had previously carried on as a dealer in electrical lamps and accessories. The consideration paid to the vendor was the allotment of 488 £1 shares. The nominal capital of the company was £500, and the remaining 12 shares were allotted for cash. The company was able to trade successfully up to about February, 1925. The turnover during the four months to February, 1923, was £8 200, or approximately £25 000 per annum. During the twelve months to February, 1924, the turnover increased to £30 000, and in the following year it went up to £39 000. For the year to February, 1925, the net profit, after charging Mr. Adair's salary of £1 000, was £1 510. Up to that time the company had been dealing principally in bulbs for motors, which were purchased from abroad. The balance sheet dated February, 1925, showed that the company was then in a fairly healthy position. The assets included cash £3 300; book-debts, £7 300; and stock, £1 040, whilst there was a credit balance on the profit and loss account of £1 844, after bringing in the share capital of £500. About that time the suppliers gave notice to terminate their contract with the company. Mr. Adair had then to decide whether he would seek another source of supply or join the Electric Lamp Manufacturers' Association. Eventually he decided on the latter course. Up to 1925 the business had been carried on in London, but it was then decided to start branches in various parts of the country. In December, 1925, he (Mr. Bevan) was asked to report on the position of the company. He prepared figures, and ascertained that between March and December, 1925, there had been a net loss of £734. Efforts were made to obtain further capital, but it was not forthcoming, and for the twelve months to February last on a turnover of £25 000, there was an actual net loss of £3 056. On further investigation, it became apparent that the opening of the branches was not justified by the results, and they were mainly responsible for the state of affairs which existed.

Mr. P. Houston, of the British Traders' Association, said it appeared that some months ago the company consulted its principal creditors, who became aware of the position. The other creditors had not the same knowledge, and they had supplied goods on credit since. The creditors eventually decided to confirm the voluntary liquidation of the company with Mr. Bevan as liquidator. An advisory committee of creditors was appointed, consisted of representatives of Messrs. C. J. Vogel, Copenick and Aldershof, Philips Lamps, Ltd., "Z" Electric Lamp and Supplies Co., Ltd., Volt, Ltd., of Tilburg, and Siemens and English Electric Lamp Co., Ltd.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Companies Winding-up Voluntarily.

HANBURY (C. K.) LTD.—F. Clarkson, Bank Chambers, Hargreaves Street, Burnley, certified accountant, appointed liquidator, August 9th. Meeting of creditors at the office of Jobling and Jobling, Yorkshire Penny Bank Buildings, 3, Hargreaves Street, Burnley, on Thursday, August 26th, at 2.30 p.m.

PREMIER ELECTRIC WELDING CO. (EAST OF SCOTLAND) LTD.—By Special Resolution passed July 8th, confirmed July 26th. R. W. Liddell, of Nobel House, Buckingham Gate, London, S.W.1, appointed liquidator.

Bankruptcy Information.

ECONOMIA, 258, High Holborn, W.C. Receiving order, August 9th. Creditor's petition. First meeting, August 23rd, 12 noon, and public examination, October 27th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

Notice of Dividend.

GREGORY, Foster Frank, 2A, Westbourne Road, Luton, electrical engineer. First and final dividend, 6¼d. per £, payable August 24th, Official Receiver's Office, The Parade, Northampton.

Bankruptcy Proceedings.

RADIO PHONOPORE AND ELECTRICALS, LTD., 58, Coleman Street, E.C. The report of the Official Receiver has been issued to the creditors and shareholders. The accounts filed under the liquidation show liabilities of £13 486, assets valued at £3 468, and a deficiency of £14 117, with regard to contributories the issued capital being £4 100 ordinary shares. The company was registered on January 12th, 1923, with a nominal capital of £5 000 for the purpose of carrying on business as manufacturers of telegraphic, telephonic, phonoporic and wireless instruments. It was promoted by Mr. Francis R. W. Robinson, who was receiver for debenture holders of Phonopore Construction Co., Ltd. (now wound up) which carried on business at the Phonopore Works, Southall, and he arranged for the sale to the company through, Mr. E. W. White, of the assets of Phonopore Construction Co., Ltd., for £5 400. That amount was paid to Mr. White by cheque, and he handed the company his cheque for £4 900 in payment for 2 750 shares for 2 150 debentures. The business was carried on at the Phonopore Works, apparently without success, the trading accounts showing a loss of £3 358 from January 1st, 1924, to March 31st, 1925. The failure of the company is attributed to lack of capital and to the purchase of certain materials which proved unsuitable, and which prevented output, thereby causing heavy loss in addition to the loss on the materials themselves. Mr. M. C. Spencer, C.A., 3, Frederick's Place, Old Jewry, E.C., has been appointed liquidator with a committee of inspection.

REFLEX RADIO CO., LTD., 198, Lower Clapton Road, E. The report of the Official Receiver has been issued. The winding-up order was made in May, and accounts have been submitted showing total liabilities £3 151 (unsecured £1 832) and assets £878, absorbed in the preferential and debenture claims. The deficiency as regards contributories is estimated at £1 984, the issued capital being £152 in ordinary shares. The company was registered as a private company on September 23rd, 1925, with a nominal capital of £1 000 and was formed to acquire as a going concern the business of wholesale factors of radio and wireless components, carried on under the style of Reflex Radio Co. The business had been carried on by Arthur Thomas and Robert Ernest Izzard, since October, 1923, and was sold to the company for £1 150, satisfied by the issue of debentures for £1 000 and shares £150. The business was carried on successfully until January, 1926, when the demand for the reflex coil, of which the company had obtained the sole selling rights, and which had been the mainstay of the business, decreased, owing to the competition of a similar coil, and this resulted in the company trading at a loss. A debenture receiver was appointed in March, 1925, and carried on the business until May 27th last. He has discharged the claims of the bond holders, and handed to the Official Receiver a surplus of £69, leaving assets to the value of about £300 to be realised by the latter official.

ZENITH MANUFACTURING CO., Willesden Green, London, N.W.2, state that they are in no way connected with the Zenith Radio Manufacturing Co., of Guildford, against the proprietor of which a receiving order was recently made.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

241 454 B. G. C. Stephens. Electric iron plugs. (23/3/25.)
241 456 Singer Manufacturing Co. Electric motor controllers. (19/11/24.)
241 458 Calor Elektrizitats-Ges., and O. Dreyer. Safety devices for electrical circuits. (1/4/25.)
241 461 C. W. Becker. Furnace electrodes. (15/4/25.)
232 619 Siemens-Schuckwerwerke Ges. Method of and means for switching out portions of circuits with wattless current commutators. (17/4/24.)
241 473 E. Shrubsole. Electric heaters for boiling water and generating steam. (4/5/25.)
234 087 British Thomson-Houston Co., Ltd. Electric steam generators. (16/5/24.)
234 510 British Thomson-Houston Co., Ltd. Automatic reclosing circuit-breaker systems. (24/5/24.)
241 383 British Thomson-Houston Co., Ltd. (General Electric Co.) Electric protective arrangements. (22/5/25.)
237 290 Automatic Telephone Manufacturing Co., Ltd. Impulse transmitters for use in telephone or like systems. (15/5/24.)
239 221 British Thomson-Houston Co., Ltd. Electric incandescent devices. (30/8/24.)
241 614 London and Provincial Radio Co., Ltd., and E. Duckworth. Variable electric couples or inductance devices for wireless apparatus. (21/7/24.)
241 617 H. R. C. Van de Velde, J. Stewart, and E. H. Trump. Wireless telephone transmitting systems. (21/7/24.)
241 618 P. W. Willans. Radio receiving sets. (21/7/24.)
241 623 R. Hadden (J. B. Regan). Circuit controlling means for electrical train-control apparatus. (22/7/24.)
241 633 F. E. Popplewell. Means or apparatus for transmitting motion to motor vehicles propelled by electric or other power. (26/7/24.)
241 642 British Thomson-Houston Co., Ltd., and F. P. Whitaker. Direct current supply systems. (31/7/24.)
241 653 G. W. Hale and Radio Engineering Co., Ltd. Electrical transformers. (13/8/24.)
241 655 Siemens Bros. and Co., Ltd., and W. G. Patterson. Circuit arrangements for automatic telephone systems and the like. (15/8/24.) (Cognate Application, 23 242/24.)
241 656 J. Gaunt. Wireless receiving apparatus and the like. (18/8/24.)
241 660 Metropolitan-Vickers Electrical Co., Ltd. (Westinghouse Electric and Manufacturing Co.). Control of electric traction motors. (22/8/24.)
241 661 H. H. Andrewes and Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.). Electrical devices such as variable electrostatic condensers, variable inductances, and the like. (23/8/24.)
241 662 English Electric Co., Ltd., and F. D. H. Bremner. Electric motor control systems. (26/8/24.)
241 674 L. H. Reid. Wireless or electrical terminals, couplings, and the like. (11/9/24.)
222 140 British Thomson-Houston Co., Ltd. Systems of electric distribution. (20/9/23.)
241 684 G. F. Shotter. Electrical apparatus for the measurement of the level and flow of liquids. (23/9/24.)
222 884 A. C. Ireland. Electric cooking utensils and other like apparatus and an element therefor. (3/10/23.)
241 694 Igranic Electric Co., Ltd., and W. K. Alford. Rheostats. (3/10/24).
237 854 Maschinenwerke Ges. F. Schneider. Head telephone receivers. (30/7/24.)
241 716 Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (W. Dubilier). Electric condensers. (27/10/24.)
237 547 H. J. J. M. De R. Belleszize. Electrical apparatus for the elimination of aperiodic disturbances. (22/7/24.) (Addition to 226 784.)
225 836 Siemens und Halske Akt.-Ges. High-tension thermionic valves. (4/12/23.)
241 749 J. G. Kjellgren. Method for the production of connectors for bonding electric rails. (11/12/24.)
226 560 International General Electric Co., Inc. Telephonic repeating systems. (22/12/23.)
241 785 Deltavis Co. Electrical contact plug. (21/1/25.)
241 794 Deltavis Co. Electrical contact plug. (24/3/25.) (Addition to 241 785.)
241 796 H. L. Grant. Protecting devices for electric detonators. (6/11/24.)
241 805 L. E. Fillmore and L. W. Fillmore. Variable electric condensers. (16/4/25.)
241 812 Brompton and Kensington Accessories Co., Ltd., and A. Logan. Safety device for electrically heated vessels. (29/4/25.)
234 812 British Thomson-Houston Co., Ltd. Control of dynamo electric machines. (27/5/24.)
235 185 C. Lorenz Akt.-Ges. Method of and means for frequency transformation in electrical phenomena. (7/6/24.)
235 188 British Thomson-Houston Co., Ltd. Electric switches. (3/6/24.)
236 237 Vox Maschinen Akt.-Ges. Electromagnetic talking machines. (28/6/24.)
236 572 Telegraphie Ges. System Stille. Magnet carriers for electromagnetic talking machines. (3/7/24.)
241 843 British Thomson-Houston Co., Ltd. Electric transformers. (31/12/24.)
241 806 J. S. Williams. Condensers for wireless telegraphy and telephony. (25/10/24.)
241 964 J. McCreath. Electrically-operated indicating-apparatus for vehicles. (29/4/24.) (Cognate applications 22 620/24 and 27 070/24.)
241 971 J. H. Watkins, E. B. Watkins and Dubilier Condenser Co., Ltd. Variable electric condensers. (1/7/24.)
241 972 A. Rosen. Telephone transmission lines. (2/7/24.)
222 448 E. W. Muller. Electric traction systems employing storage batteries. (26/9/23.)
219 984 V. F. Spigai. Electric distribution systems. (29/7/24.) (Convention date not granted.)
241 992 R. Woods. Variable electric condensers. (30/7/24.)
241 993 C. Pickstone. Composition or mixture for use as an insulating-material in electrical work and for other purposes. (31/7/24.) (Cognate applications 1 688/25 and 1 689/25.)
241 994 W. C. Fairweather (Underwood Typewriter Co.). Electric motors. (1/8/24.)
241 996 S. R. Mullard and Mullard Radio Valve Co., Ltd. Filaments for thermionic valves and for electron-emitting devices. (1/8/24.)
242 002 A. H. Railing and A. E. Angold. Electric relays for automatic voltage regulation. (5/8/24.)
242 006 H. V. Higgitt and Eastern Telegraph Co., Ltd. Electric telegraphy. (7/8/24.)
242 008 English Electric Co., Ltd. and T. Zweigbergk. Electromechanically-operated switch devices. (8/8/24.)
242 010 W. F. Dunn and E. A. Tansley. Variable electric condensers. (12/8/24.)
242 013 G. W. Hale and R. Lyle. Electrical signalling, particularly wireless receiving systems. (16/8/24.) (Cognate application 29 603/24.) (Addition to 223 630.)
220 652 Neufeldt und Kuhnke. Asynchronous dynamo-electric machines. (17/8/23.)
242 023 F. B. Dehn (Mohawk Electric Corporation). Radio condenser. (8/9/24.)
221 825 Telefunken Ges. Fur Drahtlose Telegraphie. Antenna systems for receiving wireless signals. (11/9/23.)
242 035 C. A. M. Buckley and H. S. Buckley. Telephone receivers. (18/9/24.)
242 041 C. E. Brigham. Electromagnetic sound-reproducers. (24/9/24.)
242 048 Siemens Bros. and Co., Ltd., and W. G. Patterson. Automatic telephone systems and the like. (1/10/24.)
242 057 W. S. Sholl. Holders or supports for thermionic valves or electron discharge tubes. (14/10/24.)
226 243 E. Brauer. Method of and device for signalling by means of electric waves. (14/12/23.)
242 108 K. Nobuhara. Dynamo-electric machinery. (24/12/24.)
242 115 R. W. Barker (Anti-Stall, Inc.). Electric starting device for engines. (6/1/25.)
229 704 Westinghouse Lamp Co. Electric discharge devices. (23/2/24.)
242 140 W. Fairweather (Singer Manufacturing Co.). Electric switch. (3/3/25.)
242 143 Western Electric Co., Ltd. (Western Electric Co., Inc.). Construction of inductance coils. (9/3/25.)
242 145 Dr. B. Zavada. Electrical power transmission systems. (14/3/25.)
242 156 F. V. Breemdem. Electric terminals. (1/4/25.) (Cognate application 13 824/25.)
231 883 Dubilier Condenser Co., Ltd. Electric condensers. (4/4/24.)
242 161 Zimmermann and Jansen Ges. and H. Rappold. Electrical arrangement for working blast heaters for blast furnaces. (6/4/25.) (Addition to 30 571/24.)
242 166 Chloride Electrical Storage Co., Ltd. (Electric Storage Battery Co.). Supports for secondary electric batteries. (8/4/25.)
233 736 Felten und Guilleame Carls-werk Akt.-Ges. Sheathing for single-core alternating current cables. (12/5/24.)
234 523 Akt.-Ges. Brown, Boveri, et Cie. Arrangements for driving auxiliary machines for electrical generators. (24/5/24.)
235 603 International General Electric Co., Inc. Electric magnets. (16/6/24.)
235 892 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. X-ray tubes. (18/6/24.)
236 571 Telegraphie-Ges. System Stille. Controlling-devices for electromagnetic talking-machines. (3/7/24.)
241 628 British Insulated Cables, Ltd. and G. H. Nisbett. Electric cables. (15/12/24.)
242 318 W. B. Whitney, E. B. Wedmore and British Electrical and Allied Industries Research Association. Means for breaking electric circuits. (9/5/24.)
231 815 Kleinschmidt Electric Co., Inc. Telegraph typewriters. (3/4/24.)
242 338 V. Hope. Electric fuses. (5/8/24.) (Cognate application 3 338/25.)
242 340 J. H. M. Christensen. Magnifying apparatus for telegraph signals and circuits associated therewith. (5/8/24.)
242 342 C. S. Franklin. Wireless telegraph and telephone aerials. (5/8/24.)
242 350 S. E. Witt. Receivers, particularly of the loud-speaking type. (6/8/24.)
242 351 S. E. Witt. Receivers, particularly of the loud-speaking type. (6/8/24.)
242 353 P. M. Edinborough and Metropolitan-Vickers Electrical Co., Ltd. Electric resistance elements particularly for use with electric radiators. (7/8/24.)
242 354 A. Reyrolle and Co., Ltd., H. W. Clothier and R. W. Biles. Electric protective systems. (7/824.)
242 355 A. Reyrolle and Co., Ltd. and R. W. Biles. Electric protective systems. (7/8/24.)
242 356 British Thomson-Houston Co., Ltd. (General Electric Co.) Insulated electric cable joints. (7/8/24.)
220 323 Siemens und Halske Akt.-Ges. Apparatus for the electric transmission of signals to a distance. (8/8/23.)
242 368 A. H. Railing and J. P. Huggard. Voltage regulation of dynamo-electric machines. (16/8/24.)
220 963 Western Electric Co., Ltd. Testing systems for telephone circuits. (25/8/23.)
242 381 M. J. Railing, C. C. Garrard and W. Wilson. Electrical reverse current cut-out apparatus. (2/9/24.)
242 384 Western Electric Co., Ltd. (Western Electric Co., Inc.). Magnetic structures and method of manufacture thereof. (4/9/24.) (Addition to 188 688).
242 391 Fuller's United Electric Works, Ltd. and A. P. Welch. Terminals or couplings for electric wires. (17/9/24.)
242 396 A. E. O'Dell (Telegraphon Akt.-Ges.). Apparatus for recording telephone conversations. (24/9/24.)
242 398 Switchgear and Cowans, Ltd. and G. N. Neep. Electric switchboards. (27/9/24.)
242 408 J. W. Wyatt and J. Kipling. Electric lamp holders. (17/4/24.)
242 417 J. A. Crabtree. Electric switches. (18/10/24.)
242 423 Dubilier Condenser Co., Ltd., (formerly Dubilier Condenser Co. (1921), Ltd.), (H. R. van Deventer). Electrical condensers. (27/10/24.)
242 424 Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.), (H. R. van Deventer). Electrolytic condensers. (27/10/24.)
242 425 Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd., (H. R. van Deventer). Variable electric condensers. (27/10/24.)
242 438 General Electric Co., Ltd. and C. J. Smithells. Coated filaments for thermionic discharge tubes. (11/11/24.)
242 439 S. H. H. Barratt. Electric heating device for beds, cars and like locations. (11/11/24.)
242 443 M-L Magneto Syndicate, Ltd. and F. R. F. Ramsay. Shock-absorbing supports for thermionic valves. (15/11/24.)
242 457 Siemens Bros and Co., Ltd., and W. G. Patterson. Switches and circuit arrangements for telephone systems. (27/11/24.) (Addition to 219 740.)
242 465 W. Guy Peel. Electrical heating elements. (9/12/24.)
227 849 N. Japolsky and M. Kostenko. Electromagnetic percussive tool. (16/1/24.)
242 486 S. W. Cole. Holders for thermionic valves. (6/2/25.)
230 805 British Thomson-Houston Co., Ltd. Systems of electrical distribution. (14/3/24.)
242 495 Santon, Ltd. and H. C. Sanders. Combined plug-and-socket devices for electrical services. (21/2/25.)
242 500 E. Wainwright and H. A. I. Machen. Coil-holders for use in connection with wireless or other electrical apparatus. (6/3/25.)
242 509 Callender's Cable and Construction Co., Ltd. and W. J. Howard. Electric service boxes. (17/3/25.)
234 067 N. Japolsky. High-tension circuit breaker. (14/5/24.)

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Monday, August 23rd.

Electrical Contractors' Association (Ealing Sub-Branch).—Ordinary meeting.

Wednesday, August 25th.

Electrical Contractors' Association (Croydon Sub-Branch).—Ordinary meeting.

Electrical Contractors' Association (Cardiff Branch).—Ordinary meeting.

Electrical Contractors' Association (Belfast Branch).—5, Bedford Street. Ordinary meeting. 3.30 *p.m.*

Friday, August 27th-28th.

Iron and Steel Institute.—Autumn meeting at Stockholm.

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THE ELECTRICIAN

ESTABLISHED 1861.

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The Electrician.

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GERMAN INDUSTRY.

A SHORT time ago we announced that the British Electrical and Allied Manufacturers' Association had issued one of its special publications dealing with the electrical industry in Germany. As before the war Germany was one of our closest competitors, and is likely to be so again, her struggles to rejuvenate her finances and trade are of the greatest interest. It is, therefore, advisable to examine both the information given in this publication, and that obtainable from other sources, with some care.

The position, as seen by one observer, is stated in a series of articles by Mr. GEORGE RENWICK, which originally appeared in the "Daily Chronicle" and are now available in pamphlet form. His view is that the crisis of Germany to-day is infinitely more serious and severe than any recorded in the history of the modern industrial world, and that the situation is in fact heartrending. These are strong words and naturally tend to produce a charge of exaggeration. Mr. RENWICK, however, bases his statements on the unemployment figures, which reach more than five million, the low wages and the general financial depression, which is instanced by the fact that Krupps last year showed a loss of 15 300 000 marks, and has largely reduced its personnel. To make matters worse, no signs of returning prosperity are visible, and an eminent industrialist is quoted to the effect that with the heavy burdens of taxation and dear money it will be difficult, if not impossible, to shoulder the still more serious load which the Dawes scheme will impose.

Mr. RENWICK has some interesting things to say about the German electrical industry. Satisfactory to our hearing is the statement that they are two years behind us technically, and that the service of the great firms is not so efficient as it was. But the real cause of stagnation is the disproportion between markets and production, and the balancing of the two is equally its real remedy. To achieve this means higher production, and, in addition, a lower cost of production, which the German experts consider can only be obtained by a reduction in the already low wages. At the present time exports of every kind are much below the 1923 figures, while, on the other hand, imports have maintained a figure very near the level of that year. An important exception is, however, the electrical industry, whose exports in 1925 were 223 million marks as against 225 million marks in 1913. On the whole however, Mr. RENWICK feels that in a comparison with Germany Great Britain has very little about which to be downhearted, and with that conclusion we may fittingly call attention to what the B.E.A.M.A. publication has to say about the position.

It begins with a careful and most interesting review of the general economic position, which shows that if it is assumed that Germany's foreign indebtedness is £200 millions, more than £16 millions of goods must be exported each year in the service of interest, if interest at the rate of 8 per cent. is assumed. Germany, however, is much more important as a competitor than as a customer of Great Britain, and though the granting of credits will indirectly weaken her competitive ability, it cannot also fail to lead to increased production, and cause serious embarrassment to the heavy industries of this country. The Dawes scheme, it is considered, will have the same result, for, in order to obtain an export surplus, Germany will have to adopt a policy of deflation, which will bring about a catastrophic fall in prices. It will be remembered that we raised the same objections to the more localised scheme which Sir HENRY STRAKOSCH advanced some years ago, but the vastness of the Dawes conception seems to have observed the fact that it has equal disadvantages for our electrical industry.

Probably the most interesting part of the B.E.A.M.A. publication is that which deals with industrial finance, and especially the portion dealing with electrical manufacture. The figures given confirm Mr. RENWICK'S view that the German electrical manufacturing industry is less depressed than any other, and the falling off that is noticeable compared with 1913 is mainly in the export trade. At the last general meeting of the A.E.G., Herr DEUTSCH stated that of the output of that firm, 30 per cent. represented exports in 1924–25 as compared with 40 per cent. pre-war, but that the increase in orders over 1923–24 was 50 per cent. As is well known, the large German electrical undertakings such as the A.E.G. and Siemens-Schuckert established their position before the war by skilful financial control and by the adoption of the principle of amalgamation. Power developments at home and abroad were financed, especially by the former firm, and in this way a useful basic demand for plant was secured. Though the financial control of these firms over the supply undertakings has undoubtedly weakened, yet the more rapidly large scale distribution develops, the greater the advantage of the

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large manufacturer becomes, so that their technical control is actually stronger than ever. In considering their position, both as actual and potential competitors with British manufacturers for the world trade, this factor cannot be ignored.

The other side of the picture is disclosed by an examination of the financial position. Before the war the German manufacturer relied on three factors to obtain trade abroad; low prices, financial accommodation at low rates, and a combination of the two. Finance, in fact, was used, above all, as a means of advancing trade, and it is obvious from what we have already said, that German industry is therefore now deprived of one of the main instruments it had of advancing trade abroad. In fact the German manufacturer still labours under serious disadvantages, and is not in a position to adopt, with any real hope of success, pre-war methods of financial penetration. On the other hand, certain facts point to the conclusion that Germany has realised the need for sounder financial methods and has now sufficient resources to enter the market for contracts requiring long term financing. This is a position which requires close attention from our own industry.

The general conclusion, then, that must be reached is that, even allowing that conditions are as bad as Mr. RENWICK argues, yet the German electrical industry is almost once again on a pre-war footing, and that a formidable industrial machinery is being oiled up preparatory to the biggest onslaught of modern times on the markets of the world. It is the duty of our own industry, in face of these preparations, to be up and doing.

Current Topics.

The World Power Conference.

ON Monday next the Sectional Meeting of the World Power Conference opens at Basle. Five groups of subjects are to be dealt with: utilisation of water power, the exchange of electrical energy between countries, the economic relation between electrical energy produced hydraulically and thermally, electricity in agriculture and railway electrification. Our natural resources make the first of these of secondary interest to British engineers, though it must not entirely be forgotten, while the second is almost entirely without our purview. The remaining matters are, however, of extreme importance, and we are glad to see that British engineers are not only to receive, but to contribute information. Mr. R. BORLASE MATTHEWS is to read a Paper on Electric Ploughing, while Col. H. G. O'BRIEN is to contribute one on "The Economic Aspects of Railway Electrification with special consideration of those which cannot be expressed numerically." Here the sting is undoubtedly in the tail. At the same time visitors to Switzerland will, owing to the hospitality of the National Railway Department, have an excellent opportunity of seeing how the water power of the country is utilised and applied to railway purposes. The conference is being held in connection with an International Exhibition of Inland Navigation and Utilisation of Hydraulic Power. This in itself should be of the highest interest to visitors, as should the inspection of the various other engineering works which they will be able to see.

Selling Electrical Refrigerators.

ON several occasions recently we have emphasised the value to electrical retailers of the new legislation against food preservatives which will do more than years of pioneering propaganda to popularise the electrical method of refrigeration in British homes. Already quite a number of enterprising electrical contractors—notably the immediate past-president of the E.C.A.—are enthusiastically developing this new field, and it is therefore with a good deal of surprise that we find the President of the Incorporated Society of Advertisement Consultants, after a bitter inditement of the abominable inefficiency and want of enterprise "of retailers in general," somewhat surprisingly coming to the conclusion, in an article in "The Placard," that probably the most workable method of distribution for manufacturers of refrigerators for home use will be through the medium of house furnishers and ironmongers. While it is impossible for us to discover any logical reason for a suggestion of this kind, we think it can safely be left to the electrical retailers to prove its futility. Many of our electrical traders waited too long before showing interest in the wireless trade. It is inconceivable that they will permit a repetition of history in the electrical refrigeration field.

Electricity and the Swedish Iron Industry.

THE Paper on "The Development of the Swedish Iron Industry during the last Thirty Years," which was read before the meeting of the Iron and Steel Institute in Stockholm by Messrs. ARVID JOHANSSON and AXEL WAHLBERG contains some interesting information regarding the progress made in the use of electricity. The ore is mainly obtained from deposits in central Sweden, and in olden times the only source of power was water. As no means of transmitting this was available the works were established close to the falls, whether the site was otherwise suitable or not, and thus led to difficulties when modernisation was necessary. With the introduction of electricity it was, however, possible to remodel the whole iron industry of the country, and the position at the moment is that it would be an economy to substitute electric furnaces for blast furnaces if the electricity could be obtained at a reasonable price, say 0·8 öre per kWh. As it is, in 1923 52 148 tons of pig iron were produced electrically, with a consumption of 2 540 kWh per ton. Only about 9·1 per cent. of the water power available is developed. Progress on these lines is likely to develop, especially in the north of Sweden, where both cheap power and charcoal and ore are available. Electricity is also being widely used in the actual production of steel, as well as for operating the necessary machinery in the works. For this purpose three-phase motors were almost entirely used, pole changing and cascade connecting being employed to obtain the necessary speed variation. More recently direct-current motors in combination with the Krämer and Ward-Leonard systems of drive have been adopted.

Electricity in Mines.

Two useful pamphlets on the problems connected with the employment of electricity in mines have been issued by the Safety in Mines Research Board. The first (Paper 20) deals with the electric ignition of fire damp by direct and alternating current. Among other matters it refers to the work of Prof. THORNTON, who has observed that much stronger alternating currents than direct currents are required for ignition. In fact, that while a direct current of 0·5 A at 200 V was sufficient to explode a certain methane mixture, it required 20 A r.m.s. and 28 A (crest value) at 200 V and a frequency of 100 to do the same thing with alternating current. Dr. WHEELER repeated these experiments in two different types of apparatus which are described, one being similar to that used by Prof. THORNTON. Alternating current at 35 and 288 V was used in gas mixtures of different strengths, and practically the same minimum current for alternating currents (crest values) as for direct currents were obtained. When the frequency was raised to 150 the minimum ignition currents were much higher, but in the case of alternating current were actually lower than in the case of direct current. As these results differ from those obtained by a number of other investigators the Board are arranging for further investigation. The second publication (Paper No. 21) deals with the "perforated plate" protection of electrical

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mining apparatus. It describes additional experiments which have been made on this matter. These show that perforated plates complying with the specification allow a sufficiently rapid release of the pressure developed by a fire damp explosion, and will at the same time prevent the passage of flame. At least two types of sheet, which can be obtained commercially, must be used, each of which has an area of about 28 sq. in. per cub. ft. of enclosed explosive mixture. The sheets should be separated by about $\frac{3}{16}$ in. The ingress of dust can be prevented by superposing a sheet of lead foil 0·005 in. thick which can be protected by a grid of thick wire.

The Five Guinea Word.

THOSE of our readers who are interested in the problem of finding a suitable distinctive title for registered electrical installation contractors—and they must be many, judging from the large number of suggestions that we have received in connection with our "Five Guineas for a Word" competition—are finally reminded that the last date for the receipt of entries is Tuesday next, August 31st. Readers who have not so far sent in their suggestions should do so as quickly as possible, and those who have already done so may, if desired, submit any further ideas that may have occurred to them in the interim. The competition has been an interesting one from every point of view, and several competitors have stated how intriguing a problem it has been to produce a word containing a minimum number of easily-pronounced syllables, but yet indicating its true meaning. Many of the competitors affirm the need for and great value of a suitable title, and it is sincerely hoped that the National Register will find, among the hundreds of names submitted by readers of THE ELECTRICIAN, that elusive but desirable label for which they have been seeking.

Fuel Economy.

IN a letter to "The Times" Major-General C. J. BLOMFIELD argues that the expectation of the miners' leaders that when the coal industry resumes work there will be a greatly increased demand for coal is likely to be falsified so far as domestic consumption is concerned. The reason for this opinion is that during the last three months the public has learnt economy. Our experience is that the public has also learnt that it is better to depend on some central source of heat energy which can be reasonably expected to supply demands, even when the mines are shut down, than on the vagaries of Mr. COOK and the coal merchants in combination. The public has also found that by making a change it has rendered life both more pleasant and more convenient. We suggest that this attitude should be taken the fullest advantage of during the forthcoming national campaign.

The Coal Tonic.

WITH increasing numbers of miners returning to work the end of the coal deadlock cannot now be very long delayed, but a piecemeal cessation of hostilities can only be an armistice of short duration, and a definite settlement is essential to a lasting peace. That great damage has been caused by this disastrous stoppage no one will dispute, but the British industrial community can still find cause for congratulation on the still greater damage it has escaped. The two tremendous labour upheavals spread over the last three months might have been expected to have reduced our foreign trade to the zero mark. But they did not. On the contrary, as recorded in our issue last week, British electrical exports in July reached a peak which has not been exceeded for many months, and were higher than in any of the preceding six months of the present year. Showing such amazing resistance to the dreadful industrial diseases by which he has been attacked, the doubly "patient" British trader need have no fear for the future so long as he continues to use the same prescription, even when the turning-point is safely passed.

Beauty in Power Stations.

WHEN the usual "silly season" topics begin to lose their savour the popular daily papers occasionally concern themselves with questions of real interest to the community. The "Daily Express," for instance, has been asking the question: "Must power stations be ugly?", and has answered it with pictorial evidence supporting the contention that they need not be ugly. With this view we are in entire agreement so far as new stations are concerned, and it is gratifying to see that not a few of our power station designers are seeking to combine beauty with utility when circumstances allow. While it may be argued that there is a certain amount of dignity inherent in any well-designed industrial plant, its decorative possibilities do not always leap to the lay eye, and when slight modifications in the design of a works layout can put the matter beyond argument there are several obvious reasons why the little extra trouble should be taken. Perhaps the most potent of these is the Englishman's dawning realisation that the country already possesses far too many hideous structures, and his consequent disinclination to have dealings with people whose premises constitute an irritating blot on the landscape.

Design of Domestic Apparatus.

ANOTHER direction in which the electrical industry may profitably assist in the improvement of the general amenities lies in the design of electrical appliances for domestic use, and though it may at first sight appear that the growth of standardisation in design is not likely to promote the development of better-looking apparatus, there is no reason why the two aims should be antagonistic. Happily several of our manufacturers of household requisites are already reaping financial benefit from their endeavours to supply apparatus combining efficiency of operation with improved appearance and we hope that their example will lead others to a fuller appreciation of the desirability of allowing to the public slightly more æsthetic tastes than they have so far provided for.

Electrical Insulation Processes.

DURING the last few years, progressive design and increased voltages have necessitated the development of special methods and materials for effecting the satisfactory insulation of electrical equipment. The practice of the leading electrical manufacturers in the country in this field has advanced along two main lines, one aiming at improving the production and application of insulators, and the other aiming at the evolution and manufacturing of improved insulating materials and parts, formerly unobtainable from outside sources. Amongst the most important materials used for insulators of all kinds are treated papers, fibres and fabrics, though within the last few years several new materials have been introduced. The production of a flexible mica tape, which is manufactured on continuous process machines, has been improved, and an entirely new electric vitreous enamelling processs has been developed by the British Thomson-Houston Co. for the manufacture of vitreous enamel insulated resistances. One of the outstanding new classes of material now available is the synthetic resin group. The possibilities of this material and its usage in various parts of the world have been carefully studied, and as a result a species of resin, known as "fabrolite resin," has been developed, which can be made in liquid or solid form for the production of varnishes and compounds, and is principally used as a base material in the manufacture of fabrolite moulding powder, textolite gears, and synthetic bonded fabric and paper insulation for brush studs, controller shafts and slip rings. Fabrolite resin can be substituted for shellac in certain high voltage insulating cylinder construction, and has the characteristic property of becoming infusible and insoluble, thus retaining its mechanical strength at high temperatures after its final heat treatment has been effected.

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THE SQUIRREL-CAGE REPULSION MOTOR.

Some Notes on a Recent Development in Single phase Commutator Motor Construction and its Advantages over Existing Types.

By G. WINDRED.

A LARGE number of types of single phase commutator motor have been developed during recent years in a general effort by designers of this type of machine to produce a reliable motor which can compete with the polyphase type in the matters of starting torque and overload capacity without losing the important features of simplicity of construction and operation.

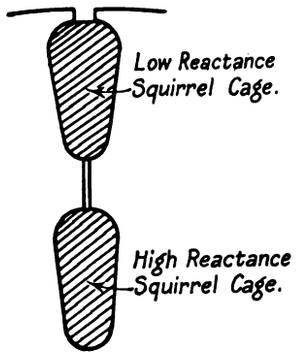

Fig. 1.—Rotor slot construction of double squirrel-cage induction motor.

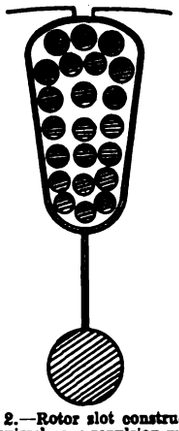

Fig. 2.—Rotor slot construction of squirrel-cage repulsion motor.

To a certain extent, robustness of construction together with operation comparable with that of the polyphase machine are incompatible features with the commutator motor, since the introduction of a commutator in itself increases the cost of manufacture, and results in a machine which requires additional attention while in service.

In the case of motors of the plain or compensated repulsion or the series type, in which the commutator has to deal with a large proportion or all of the motor current, it is obvious that difficulties are likely to be experienced with commutation in cases where the operating conditions are severe.

In traction work, for example, a large proportion of the motor maintenance expenditure is occasioned by brush and brushgear renewals, and turning and repairing of commutators, since the motors at present in use for this duty are of a type in which the commutator and brushgear carry heavy currents.

The object of the present paper is to describe a recent development of single phase repulsion motor practice which represents a marked improvement in many respects upon the various types already in existence, and to point out the advantages of the machine over the existing types.

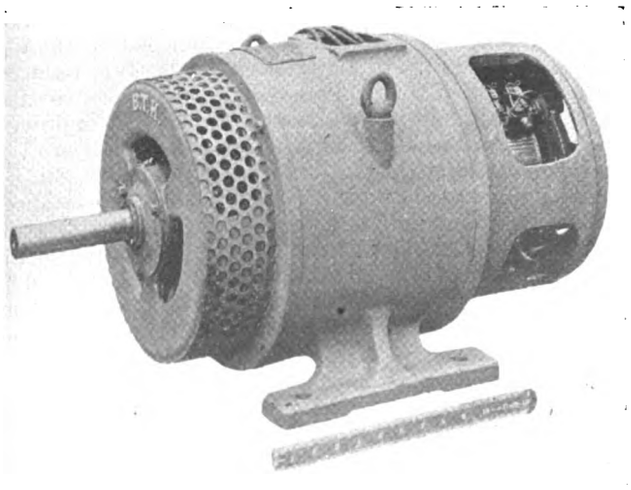

Fig. 3.—Example of new single phase motor.

It is natural that the question of priority of invention is introduced whenever an important development in any branch of engineering is made, but it is not part of the purpose of this paper to pursue the details of the various such claims which have been made in the present instance.

In connection with the development of this machine it is of interest to note the construction and characteristic features of the double squirrel-cage induction motor which is similar to the machine under consideration, but is employed chiefly on polyphase circuits.

In the case of the double squirrel-cage induction motor, the rotor construction of which is shown in Fig. 1, two distinct squirrel-cage systems are provided, one of which has a high resistance and low reactance, the other having, conversely, a low resistance together with a high reactance, and being contained in slots situated below those carrying the high resistance winding. At the moment of starting, when the secondary currents are of line frequency, it is obvious that the greater portion of the current will flow in the high resistance winding, this of course resulting in the development of a high starting torque. At the lower secondary frequencies which obtain when the speed of the rotor increases, reactance is no longer a determining factor, with the result that the rotor current flows mainly in the low resistance winding, thereby imparting to the motor a high operating efficiency and close speed regulation.

This type of motor has been used for ship propulsion, being rendered adaptable to this work chiefly on account of there being no necessity to supply large control apparatus.

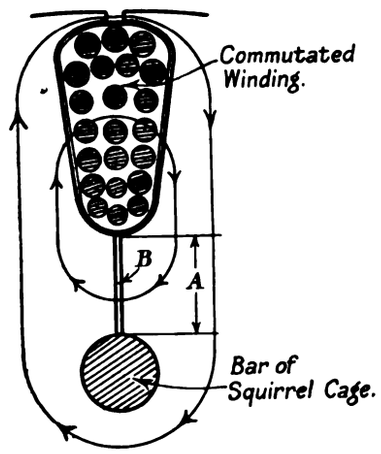

Fig. 4.—Distribution of flux in slot of squirrel-cage repulsion motor.

The torque-speed curve of the double squirrel-cage induction motor has a shape which, as would be expected, approximates to the resultant of the torque curves of each squirrel-cage. The torque curve, therefore has two maxima; one due to the outer or low reactance winding and occurring at some low speed, and the other due to the inner high reactance winding and occurring near synchronism. From the foregoing it will be seen that in the case of a machine designed for a high starting torque and having the inner squirrel-cage winding arranged to develop its maximum torque close to synchronism in order to maintain efficiency, there will be a considerable drop in the torque curve between standstill and synchronism, with the result that the machine may not accelerate the load which it starts. To overcome this defect motors have been designed having three squirrel-cage rotor windings, one of which is arranged to develop its maximum torque at some intermediate speed, thereby maintaining the resultant torque more constant over the speed range. This type of machine has been employed in cases where reversal under full speed and torque is required, but has not found any extensive sphere of application.

An example of the new single-phase machine, which is a development of the motor described above, is shown in Fig. 3, from which it will be seen that the general construction is robust and very similar to a direct-current motor. The constructional details are as follows:

The stator is arranged with a single phase chain winding the terminals of which are attached during operation to the supply mains, while the rotor carries a similar winding connected to a commutator in the same manner as the ordinary

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repulsion motor. In addition to the commutated winding the rotor carries a squirrel-cage construction, the bars forming this winding being located in slots situated some distance below those carrying the commutated winding. The rotor stampings are arranged so that the two sets of slots are connected by a narrow opening, in which a non-magnetic strip may be inserted in order to improve the commutation, as will be explained later. The arrangement of the rotor slots is shown in Fig. 2.

When the motor is connected to the supply, the rotor system is penetrated by a flux having primary frequency, this being consequently the frequency of the currents induced in the rotor windings. Owing to the construction of the squirrel-cage it possesses high inductance, and its reactance at primary frequency is therefore large. The commutated winding, however, has low inductance, and it follows that at starting the current flowing in this winding is relatively large, and that the starting torque is produced mainly by this winding, so that the machine has the starting characteristics of a plain repulsion motor. As the rotor speed increases, the frequency of the rotor currents diminishes and the running torque is shared by the two windings, as in the case of the double squirrel-cage motor, and the squirrel-cage construction acts as a damper in preventing any wide change of speed with changing load. In this way the machine gives the advantages of the repulsion motor in the matter of starting torque together with a constant speed characteristic over wide ranges of load, which feature cannot be obtained in a plain repulsion or series commutator motor. The actual speed variation between no load and full load in the new motor is between 5 and 6 per cent.

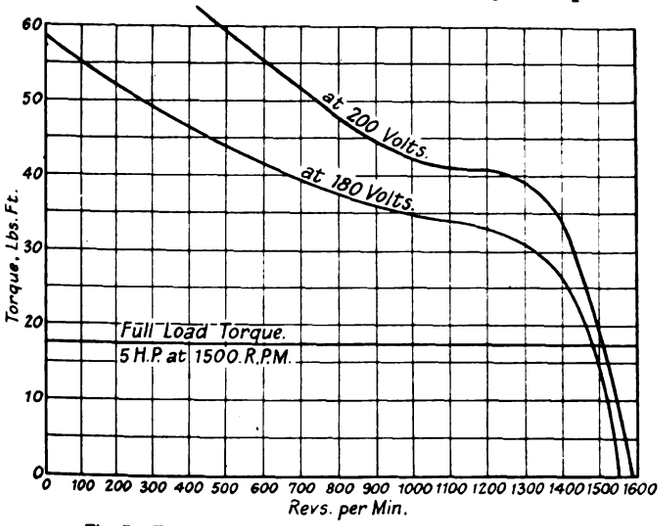

Fig. 5.—Torque-speed curves of squirrel cage repulsion motor.

of full speed. In addition to the foregoing features, the commutator and brushgear carry only a small current while the machine is operating near normal speed, with the result that commutation troubles are minimised.

No special starting arrangements are required, and the machine is very suitable for automatic operation, since it may be connected directly to the supply mains, when a torque of two to three times full load value will be developed with an initial inrush current of two to three times that corresponding to full load. The starting current taken by the motor may be reduced by the insertion of a suitable resistance, but this is rarely necessary, and since the starting torque is proportional to the square of the applied voltage, the method is undesirable in machines with ratings below about 5 H.P.

The stator winding, of course, has no electrical connection with the rotor system, and for this reason the machine may be used on higher voltages than would be desirable for the operation of series motors, where the stator and rotor windings are common, and difficulties are encountered with rotor insulation on high voltages.

In the double squirrel-cage motor, as already described, the secondary currents react on the primary currents with primary frequency, since their location in space is such as to oppose the primary currents. Owing to this fact the introduction of secondary reactance has undesirable effects, since the primary and secondary may be considered as series circuits.

The presence of the reactive squirrel-cage system in the squirrel-cage repulsion motor, however, has the effect of reducing the phase angle between the terminal voltage and the primary current, and hence improving the power factor.

A further advantage of the new motor arises from the fact that the field flux tends to increase with the line current, and the machine has, in this respect, the characteristic of a series motor, whereas converse conditions obtain in the double squirrel-cage machine.

In the plain repulsion motor there exists an electromotive

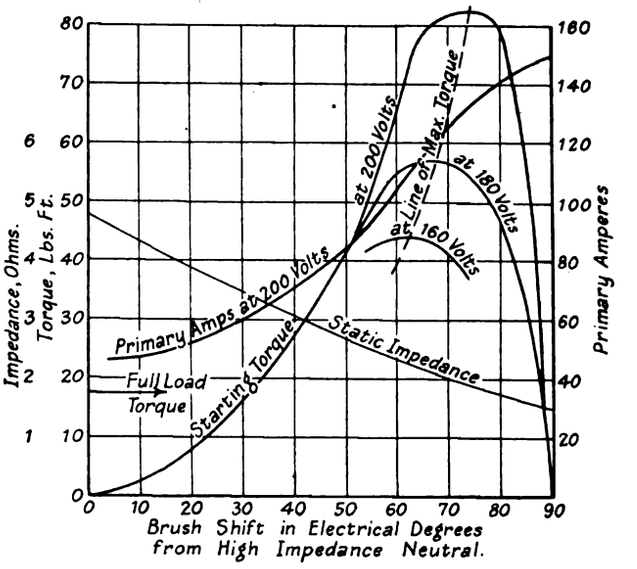

Fig. 6.—Variation of starting torque with brush position in squirrel-cage repulsion motor.

force of self-induction in the short circuited rotor coils which tends to produce sparking at the commutator.

In the squirrel-cage repulsion motor the rotor flux is distributed with respect to the slots as shown in Fig. 4, from which it will be seen that the leakage flux which produces self-induction in the rotor coils is interlinked with the squirrel-cage, and consequently the energy which would otherwise manifest itself as a spark at the commutator is transferred to the squirrel-cage. The portion of the leakage flux lying between the commutated winding and the squirrel-cage, however, is obviously unable to transfer energy, and in order to overcome the sparking which would otherwise result from the action of this portion of the flux, the commutating strips already referred to are introduced. These strips, which are of high resistance material, are inserted in the slot provided, as shown at *B* in Fig. 4, and form a medium for the dissipation of the energy due to the slot leakage flux over the distance *A*. In this way the energy which would otherwise appear as a spark at the commutator is used in producing heat in the commutating strips, which are hence found to be valuable aids to commutation.

The torque-speed curves of the new motor obtained by a

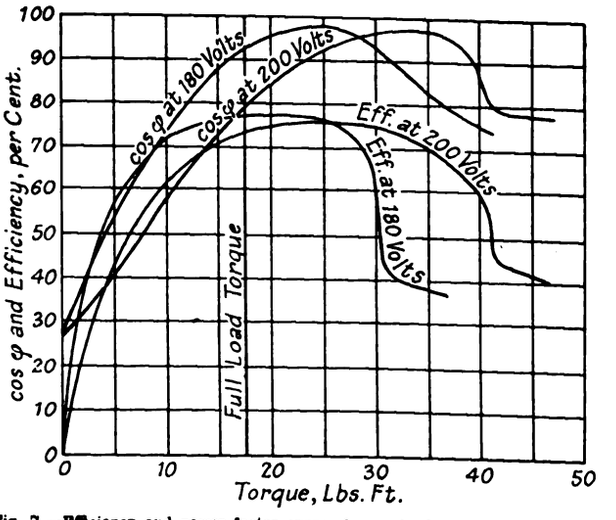
cos φ and Efficiency, per Cent.
cos φ at 180 Volts
cos φ at 200 Volts
Eff. at 200 Volts
Eff. at 180 Volts
Full Load Torque
Torque, Lbs. Ft.

Fig. 7.—Efficiency and power factor curves for squirrel-cage repulsion motor.

brake test are given in Fig. 5, where the torque characteristic peculiar to this type of machine is clearly shown, together with the manner in which the torque varies with the applied voltage. The shape of the torque curve indicates that the

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motor develops a high pull-out torque, thereby ensuring that it will accelerate the load which it starts. The dip in the torque curve produced by the squirrel-cage torque is also seen and the effect of this torque upon the speed regulation near synchronism is also obvious from the curves.

In Fig. 6 the manner in which the starting torque varies with the brush position is shown, together with the manner in which the starting torque for a given brush position is affected by variation of the applied voltage. Efficiency and power factor curves are given in Fig. 7, and these, taken with the torque characteristics, are conclusive in indicating the superiority of the new machine over the majority of existing single phase types.

The squirrel-cage repulsion motor has been developed here by the British Thomson-Houston Co., to whom the writer is indebted for much of the information in this Paper.

Particulars of machines standardised by the above company are as follows :—

3 000 revs. per min., 2 pole, 50 cycles, 1 and 2 H.P.
1 500 revs. per min., 2 pole, 25 cycles, ½, 1, 2½, 5 and 10 H.P.
1 500 revs. per min., 4 pole, 50 cycles, ½, 1, 2, 5 and 10 H.P.
1 000 revs. per min., 6 pole, 50 cycles, 1½, 3 and 6 H.P.

Machines may be wound for all standard voltages up to 600, as there are no rotor insulation difficulties. Commutation strips are included in all machines of 2 H.P. and above.

VOLTAGE HARMONICS.*

Their Influence on Power Factor Correction by Condensers.

IN the initial part of the Paper the author summarises the results of experiments on an a.c. fan motor, with a power factor of 0·51. When a capacity of a value calculated to increase the power factor to unity was connected in parallel, and the supply was taken from an alternator of fairly good wave form, the power factor was 0·815. On another alternator it was 0·74. It was found that by connecting a three-phase balanced non-inductive load of a certain capacity the wave form could be modified to give a power factor of 0·99.

There are in practical use many alternators, especially salient pole machines, the voltage waves of which contain prominent harmonics. The author accordingly undertakes an analytical survey of the problem, showing, under the specified conditions, the improvement in power factor possible with the 3rd and 25th harmonics of different amplitudes.

In the next section of the Paper the author considers the effect of the power factor upon the cost of electricity to a consumer for tariffs of two classes :—(*a*) those involving a charge per kVA of max. demand as indicated by a kVA demand meter, and (*b*) those involving an adjustment of the charge depending on the power factor of the system. The effect of max. demand indicators of the thermal and induction patterns is also considered. The chief conclusions are :—

(1) The power factor of a system having harmonics in the voltage wave cannot be increased to unity by means of condensers.

(2) With sinusoidal waves, the maximum rate of change of power factor with the kVA capacity of the phase-advancing apparatus occurs at a power factor of 0·82, independently of the initial power factor ; but, with non-sinusoidal waves, the lower the initial power factor the lower is the power factor at which the rate of improvement attains its maximum value ; also, the greater the magnitude and the higher the frequency of the harmonic, the lower is the power factor at which the maximum rate of improvement occurs.

(3) It is possible that after the capacity calculated to give unity power factor for sinusoidal waves has been installed, the final power factor may be lower than the initial value.

(4) When a consumer is being charged on the kVA of maximum demand as indicated on a demand meter, he is penalised by the presence of harmonics in the condenser current, particularly if the demand meter is of the induction type. Under these circumstances, his most economical power factor will be less than that based on sinusoidal wave forms.

(5) When the power factor determining the charge to the consumer is taken from a power-factor meter, or from the ratio of meter readings, the consumer may obtain practically full benefit from the installation of condensers, and his most economical power factor is, for practical purposes, the same as that based on sinusoidal wave forms.

* Abstract of a Paper by Edward Hughes, B.Sc., Ph.D., read before Section G of the British Association.

CONDUCTION PHENOMENA.

Some New Arguments Detailed by Prof. Cramp.

ELECTRIC conduction phenomena were dealt with in a Paper read by Prof. Wm. Cramp before Section G of the British Association. An electric current, he said, was generally held to be due to the *relative* motion of protons and electrons. Thus, if $-e$ be the electronic charge, N the number of protons or of electrons per cubic cm., U the drift of the protons, and V the parallel drift of the electrons, then the current density is

$$-NeV+NeV=Ne\,(U-V)$$

This argument received support from the work of Rowland, but his experiments were not conclusive. It was also in accord with the general facts of electrolysis. But there was no experimental proof of the assumption that a negative charge of given magnitude moving at a given speed produced the same magnetic effect as a similar positive charge moving at the same speed in the opposite direction. In metallic conduction it was generally supposed that the electrons only drift. In electrolytic conduction both anions and cations drifted. The question arose, therefore, " is the magnetic field produced by an electrolytic conductor the same as that obtained when a metallic conductor of similar form carries the same current ? " Sheldon and Downing in 1898 attempted experiments to settle this question, and found no difference between the two cases, but their method was open to much criticism. Physics text-books generally stated that there was no difference, but they gave no proofs. The author's plan was to compare the magnetic field produced by a tube of electrolyte carrying a given current with that produced by the same current when the tube was full of mercury. The electrolytes used were respectively silver nitrate and hydrochloric acid. Two methods of measurement were adopted for the magnetic field, viz. :—(1) The ballistic galvanometer method, and (2) the direct-reading magnetometer. In all cases the magnetic field due to the silver nitrate was less than that due to the mercury, and that due to the hydrochloric acid was slightly less than that due to silver nitrate. Further, by both methods the percentage difference was very nearly the same, viz., just under 2 per cent. as between mercury and hydrochloric acid.

Examination of the possible causes of this difference showed that if the field were produced by electrons only the difference should be far greater. If it were due to the fact that in the electrolyte the drifting charges were loaded with drifting masses of matter, while in the mercury they were not, the differences should be much less. The results were not in harmony with the supposition that there is a difference between the magnetic field produced by the proton drift and that due to an electron drift. The author was finally driven to the conclusion that the difference is due to the fact that in concentrated electrolytes a storage of energy is proceeding side by side with conduction. Thus electrolysis was not an example of simple convection. The existence of the store could be proved by apparatus which allowed of the discharge of the energy through a ballistic galvanometer, and it was then found that the energy stored depends largely upon the time that electrolysis has been proceeding. The curve of discharge was very similar to that of a condenser with a high resistance in series, suggesting that the electricity was stored directly and not by a chemical transmutation. Change of resistance due to temperature and of density due to decomposition might account for the facts observed.

The conclusion was that the usual assumptions concerning the relationship between current and electron or proton movement are correct for metallic and for electrolytic conductors ; but that where a circuit contains both, the new phenomena must be taken into account.

Discussion.

PROF. A. E. KENNELLEY (Cambridge, Mass., U.S.A.) said the matter discussed in the Paper was of very great importance from the theoretical point of view. The question was, first, whether a wire in the form of a glass tube containing an electrolyte would have the same magnetic field at a perpendicular distance from it as the same wire converted into copper. If we assumed that it would have just the same magnetic field, then the question involved was whether the current entering the two wires, as read on an ammeter, would show the same phenomena, or whether there would be storage of electricity going on inside the liquid wire, and no storage of electricity going on in the case of the copper wire. That was quite conceivable, and it was a matter of very great theoretical interest.

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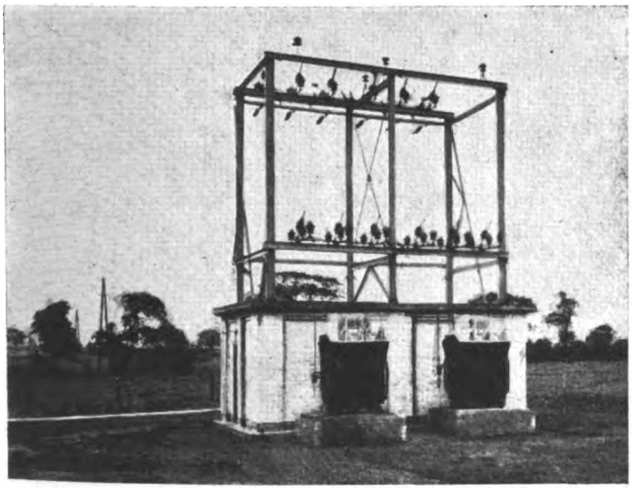
MID-CHESHIRE ELECTRICITY.

Inauguration of a New Rural Supply Scheme—Constructional Economies—New-type Terminal Structures and Sub-stations.

A FURTHER step forward in the development of electricity supply in rural areas is marked by the inauguration, briefly recorded in our last issue, of the Mid-Cheshire scheme of the Mid-Cheshire Electricity Supply Co., Ltd., formerly the Northwich Electric Supply Co., Ltd. In connection with this scheme there exist, or are being constructed, 21 sub-stations, including two converter sub-stations for Northwich. Up to date there are 15¾ miles of single circuit 33 000 V three-phase line, and 5½ miles of double line. In addition, there are 23 miles of overhead branch lines and eight miles of 3 000 and 6 000 V underground mains, apart from the distribution mains in towns, larger villages and suburbs. Interesting features are the economies that have been effected in construction costs, enabling a 33 000 V line to be tapped safely at a cost of £60 single phase, and £75 three-phase, exclusive of the transformer; and the new-type combined terminal-structures and distribution sub-stations.

The company's main bulk switching and metering station, which is at Gravel Farm, Winsford, is one of two points on the North Wales Power Co.'s duplicate transmission line (Runcorn to Crewe) from which a bulk supply is taken at 33 000 V, three-phase. The bulk supply so obtained is provided by the Mersey Power Co. from its Western Point power station, and connects *via* Middlewich and Davenham to the Northwich ring main. The second similar bulk station is at Hartford,



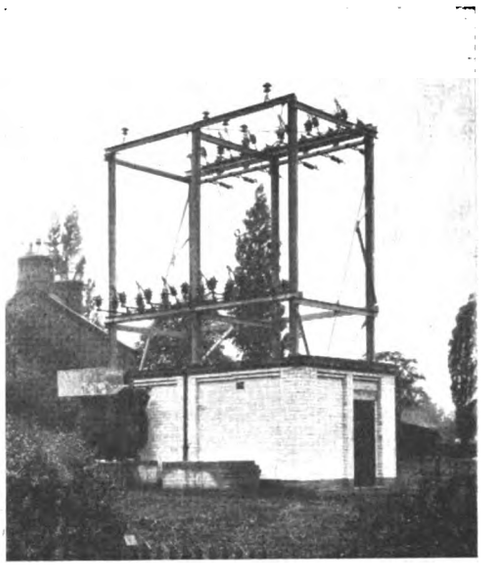
The Mid-Cheshire Co.'s terminal and distribution station at Knutsford.

and connects the Northwich ring main direct to the North Wales Co.'s line.

The 33 000 V enclosed oil-break switchgear in the main building at Winsford controls the two main connections, and is capable of dealing with a short circuit of 500 000 kVA. The sub-station also carries on its roof the 33 000 V outdoor-type oil-break gear. This switch will deal with the overhead line to Middlewich, and thence it connects through to the Northwich ring main at Davenham. The switches are operated by lever gear in the control room mounted to the metering gear for the bulk supply.

Sets of horn break gear built specially to the requirements of Mr. W. Fennell, the company's general manager and engineer, act as isolators for the out-going oil switch, and control the two transformers for the Winsford supply. These are all operated by controls situate in the building below the switches, and a 33 000/3 300 V transformer provides a high pressure supply for a feeder, which is connected to the distributors at a central point in Winsford through a step-down transformer. The Winsford supply distributor is connected to the 33 000/380/220 V transformer at the sub-station. The 3 300 V high pressure cubicle gear and the medium pressure switchboard for dealing with the local supplies are located in the control room.

Specially designed by Mr. Fennell, the Croxton Lane sub-station at Middlewich combines a live terminal with a switch structure and a town supply sub-station. The special 33 000 V horn break switches fixed on top of the structure can be used to isolate the Winsford-Middlewich-Davenham sections. The lower switches and fuses control the transformers, and all the switches are operated from inside the building. The low pressure switchboard will deal with two transformers and two supply mains. It also contains a master meter and recording ammeter, so that a check is kept of conditions without any necessity for continual attendance.



A view of the Middlewich terminal and distribution station.

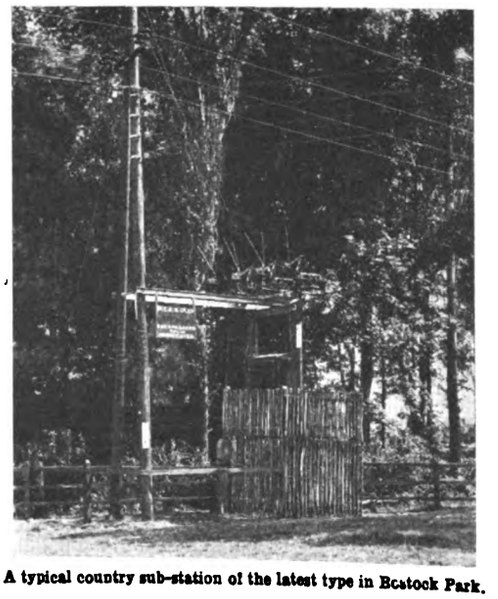
The duplicate 33 000 V transmission line to Knutsford is connected to the ring main at Lostock station. The special switching structure there contains five switches, and several alternative connections can be made.

Construction of the main system was entrusted to British Insulated Cables, Ltd., the Foundation Co., Ltd., and Siemens Brothers and Co., Ltd., and the cables, both high and low pressure, were made by British Insulated Cables, Ltd.; the low pressure street boxes being supplied by Sykes and Dyson.

The smaller sub-stations with their gear and hand lines were erected by the Mid-Cheshire Co.'s staff, who also laid the 15 miles of distributing mains in Winsford, Middlewich and Knutsford.

Transformers were supplied by the English Electric Co., Ltd., the Metropolitan-Vickers Electrical Co., Ltd., Ferranti, Ltd., and the Hackbridge Electric Construction Co., Ltd. The air-break switches on the first constructed section were by the Metropolitan-Vickers Electrical Co., Ltd., and on the newly-opened sections by Ferguson Pailin, Ltd. For the 33 000 V oil switchgear at the two bulk sub-stations Ferguson Pailin Ltd., were responsible, and the Metropolitan-Vickers Electrical Co., Ltd, supplied the 33 000 and 6 600 V cubicle gear at Northwich and Winsford.

The open-type switchboards for all the town supplies were by the Metropolitan-Vickers Electrical Co.; the motor converters by Bruce Peebles and Co., and the meters by Ferranti, Ltd., the Metropolitan - Vickers Electrical Co., Ltd., and British Insulated Cables, Ltd.



A typical country sub-station of the latest type in Beatock Park.

We are in debted to Mr. W. Fennell, general manager and engineer of the Mid-Cheshire Electricity Supply Co., Ltd., for the information contained in this article.

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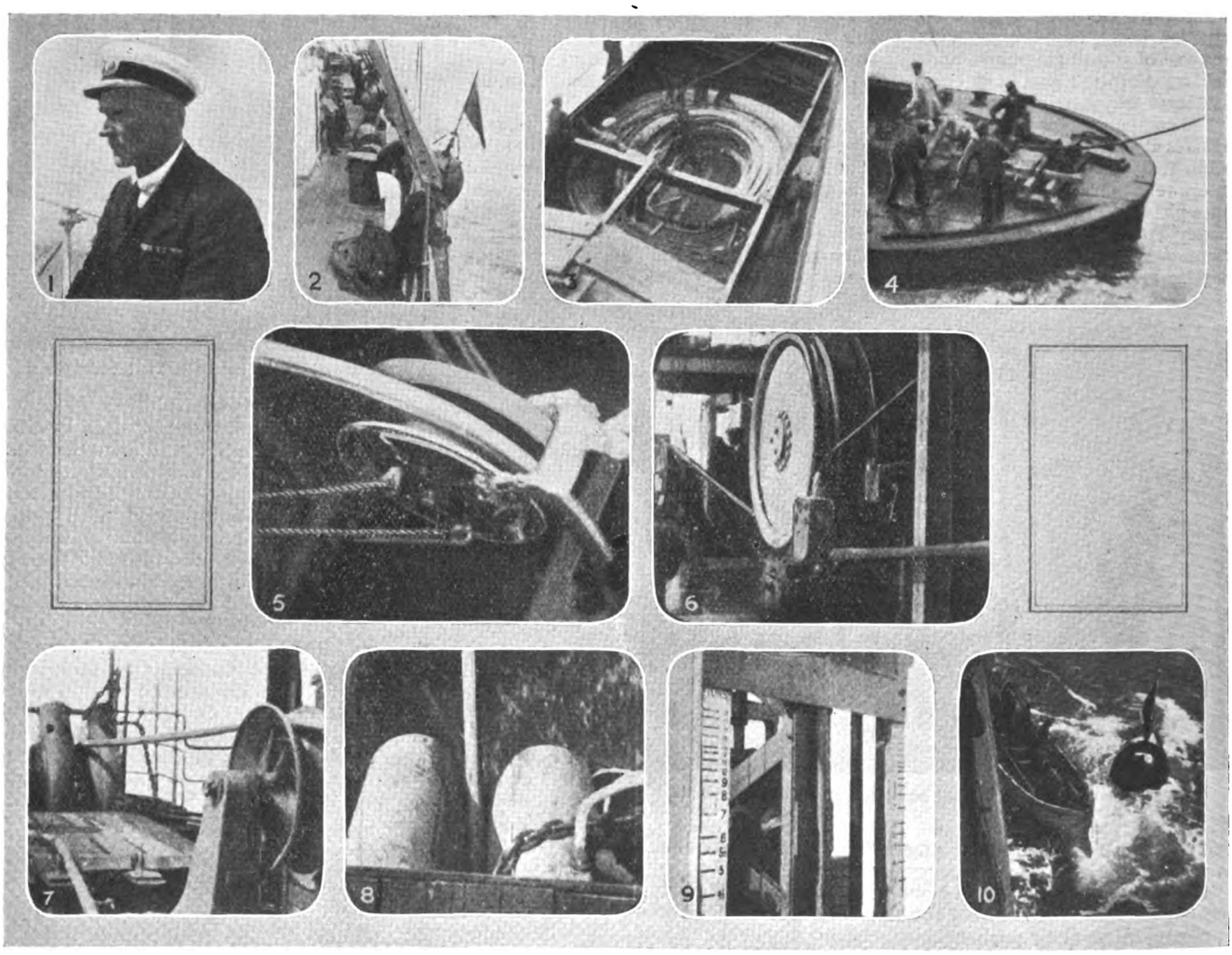
LAYING THE ANGLO-BELGIAN CABLE.

The Work of the C.S. "Faraday"—Details of the Recent Operations—Some Interesting Cinematograph Illustrations.

BY successfully laying the new Anglo-Belgian telephone cable the famous vessel "Faraday" has gained new laurels for its owners, Messrs. Siemens Brothers, the well-known Woolwich firm. About 55 miles in length, this cable weighs approximately 26 tons to the mile, and carries 28 wires in pairs. On the English side the shore-end was landed at Dumpton Gap, near Broadstairs, and the Belgian at Lapamme, quite close to the French frontier. In addition to it being only the second of its type in existence, the Anglo-Belgian has a much greater capacity than its forerunner, the Anglo-Dutch, and therefore marks a great step forward in this industry. It seems quite feasible that the day is not far distant when all countries will be linked together by this method of communication.

The "Faraday" left London under the command of Capt. B. Allen on July 18th, but owing to bad weather no work was possible until the 23rd. The "final-splice" was made at 4 a.m. on July 30th, so actually the job occupied rather less than six days. The Belgian end was tackled first, and here the services of a smaller vessel had been requisitioned, there not being sufficient depth of water for the "Faraday" to approach close in shore. Choice had been made of the "Homedale," a coaster of six or seven hundred tons, and drawing seven or eight feet of water. This vessel, having been chartered, was fitted out by the company with the necessary machinery and instruments, and loaded with twenty miles of cable. Under the direction of members of the "Faraday" staff, and accompanied by British and Belgian Government officials, the "Homedale" on a flood-tide was able to approach close enough to the shore to float the cable end in. This was effected by attaching barrels in pairs to the cable, which was then hauled in and laid in the trench already prepared. Having made the end fast on shore, the "Homedale" put out to sea, "paying out" the cable as she proceeded, until the twenty miles was all in the water. The end was then "buoyed off" and a number of buoys put down as a warning to shipping and to assist the "Faraday's" own navigators in finding the position again. This done, the "Faraday" immediately proceeded to the English coast and took up a position five miles off Dumpton Gap.

To float this shore-end in, use was made of an open steel lighter attended by the tug "Commonwealth" of London. This lighter having been made fast alongside the "Faraday," work immediately commenced transferring to her the necessary amount of cable to reach the beach. Having accomplished this, and the weather being favourable, the lighter was towed slowly to the beach, the cable being "paid out" by hand as she proceeded. On receiving the signal from the shore that the end was fast, the "Faraday," setting a direct course for the buoys which marked the Belgian end, proceeded to lay the major portion of the cable. The weather continuing fine, the "Faraday" was able to proceed at eight knots, and in less than



SOME "STILLS" TAKEN FROM THE ANGLO-BELGIAN CABLE-LAYING FILM.

(See accompanying article.)

1.—Capt. Robert Allen, commander of the cable ship "Faraday."
2.—"Buoying off the shore-end" near the Belgian coast.
3.—The English "shore-end" is seen coiled down in the lighter.
4.—Lighter taking the "shore-end" of the new cable into Dumpton Gap.
5.—Cable is here shown passing from the chamber to the main deck.
6.—The drum of the engine used for hauling cable from the chamber.
7.—Cable passing aft to stern sheaves.
8.—Cable passing over sheaves at the ship's stern. Speed 8 knots.
9.—The dynamometer which is employed for registering the pressure on the cable.
10.—Ship's cutter unrigging the gas buoy.

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four hours reached the desired position and buoyed off the final end. The greater part of the following day was occupied in picking up the "mark-buoys," and it was quite late in the evening before the two cable-ends were hoisted on board for the "final splice."

This "final splice," and the testing which precedes it, form a highly important part of laying a cable. Intense concentration of mind is required for those taking part, and elaborate precautions are taken to ensure this. The two "ends" when hoisted were brought inboard over the "sheaves" in the stem of the ship and the weight accepted by special steel-core ropes made fast to the cables just clear of the water-line. Several feet of each end having been stripped of all outer covering, the two were brought together and clamped down on the "jointers'" bench. Over this a canvas tent was erected as a protection against weather and any other disquieting influence. The wires being now all exposed, telephonic communication was immediately established with the shore stations, and after being tested, each wire was mated with its component and held so with a special clamp. When all wires were paired the ship kept in touch with her wireless. The "jointer" and his assistants now took charge, and rapidly transformed what had till then appeared a bewildering maze of wires, into a neat waterproof and practically indestructible "splice." It only remained now for the cable to be slipped clear of the ship and allowed to sink to the bottom. This last operation is usually attended by some ceremonial and general "toasting" all round. The senior representative of the Government or company for whom the cable is being laid has the privilege of severing the last rope holding the cable, and the axe used is suitably inscribed and presented to him. On this occasion, however, the "splice" took place in the early hours of the morning, and having been hard at it for several days all hands were glad to turn in.

The photographs on the preceding page are from a cinematograph film "shot" by Mr. C. V. Petit during the operations we have just described.

It may be added in conclusion that great activity prevails in the cable world at the time of writing, and it will not be many weeks before the "Faraday" again sets out on her task of linking all countries together. The old "Faraday," with over fifty years' service, was probably the best-known cable-laying vessel in the world, and we shall not be far out in predicting that her successor will worthily maintain and augment the respect due to this great name.

CORRESPONDENCE.

STATION DESIGN.

[To the Editor.]

Sir,—In going through Mr. David Brownlie's interesting article in The Electrician of August 20th, entitled "Station Design in the Melting Pot," I note that in the paragraph headed "Steam Turbine Progress," he states "although the limit has nearly been reached in the way of bleeder heating the feedwater to minimise the latent heat of steam loss in the condenser," etc.

This statement appears to confuse elementary physical principles. It can be taken to imply that with "bleeding" we abstract a certain number of B.Th.U.'s from every pound of steam in the turbine, whereas we "bleed" a certain proportion of steam from the lower stages and the rest goes on through the l.p. stages to the condenser where it presents its latent heat intact to the circulating water. Latent heat loss is inherent in the steam cycle.—I am, etc.,

S. Drape.

Heaton, Newcastle-on-Tyne,
August 21st.

POWER COST AND WEALTH PRODUCTION.

[To the Editor.]

Sir,—While it is not the place of English manufacturers to dictate to Australia with regard to her policy on the establishment of manufacturing industries, there are some who criticise both on economic and on general grounds her endeavours to become industrially self-supporting. This criticism is based on the not unnatural view that a country in Australia's position would do better to concentrate on the exportation of foodstuffs and to import her manufactured goods, which she can get both good and cheap from England. Due sympathy must of course be accorded to an importing country in the difficulties experienced in the late war, and there are considerable disadvantages in the conduct of long-distance trade—these facts, combined with the suitability of certain of their goods for colonial markets, go far to account for the success of American exporters in Australia. Copies have reached this country of an address given by Mr. G. A. Julius to the Australian Institution of Engineers at Hobart, and it is of particular interest, both on account of its novel method of attack and on account of its conclusions, which have considerable value here.

The author shows a curve in increase of wealth per capita in Great Britain and the United States. The British line is practically straight, rising from £150 per head in 1833 to £320 in 1914. The first part of the American line is also straight, rising from about £60 per head in 1850 to £240 in 1900, thus gradually approaching the British line. At this point it takes an extraordinary bend upwards, and crosses the British line in 1906 at £300 per head, and in 1922 reaches a figure of no less than £600.

The American curve is then compared with another, that of the horse-power installed per employee in manufacturing industries over a period of similar duration. The similarity between the two curves is very striking, for they are virtually parallel, the wealth curve bending up to follow the power curve; the time-lag between them being fifteen years. The presumption follows that the remarkable rate at which wealth has increased in the States is due to the extent to which its operatives have been provided with mechanical power.

It is furthermore shown that wages increase continuously and steadily as the available power is increased, and that the value added in the process of manufacture per employee increases at a greater rate than either wages or power.

The author also classifies Australian industries into seven groups, from Group A employing less than ¼ H.P. per employee, to Group G employing more than 4·5 H.P., seventy-five industries being thus grouped. It is shown also that the value added in manufacture is greatest in the case of industries employing the most power. There is one significant exception to the general curve, and that is the group representing the engineering and iron and steel industry, for this group, employing 2 H.P. per employee adds least to the product in the process of manufacture. This is attributed to the large number of small and inefficient establishments, fostered by protection, and is particularly striking, as iron and steel represents an industry which Australia is naturally fitted to undertake.

Mr. Julius draws the main conclusion that Australian industries are to be fostered, and the rate of wealth production and wages increased, not by tariffs, but by the freer use of electrical power, which multiplies the productivity of the worker. But from this there are two more general conclusions that may be developed. The first is that this aspect of the value of power in developing an industry may well be pondered by the British manufacturer, tempted though he is to make use of greater craft skill, more varied market requirements, and so on to avoid the introduction of machinery. The second point emphasised by Mr. Julius is that any factor that obstructs power development is in itself bad, and in this connection he suggests the undesirability of the existing Australian tariff on imported electrical manufactures.—I am, etc.,

"Power User."

Birmingham,
August 22nd.

"ELECTRICAL CONTRACTIONS."

[To the Editor.]

Sir,—In expressing my appreciation of the sound commonsense displayed by your contributor "Feeder Box" in his articles under the above title, I would like to back up his plea for the omission of unnecessary discussion about the exact length of flex that is included in the price of a piece of domestic apparatus. I have seen several promising prospects turned away by such discussions and I would prefer to see a price quoted including any reasonable length of flex, for after all it is a necessary part of the appliance, and as such should be included in the standard price.

On the question of window displays, I have never yet been able to understand why electrical shopkeepers, with every facility for obtaining movement in their windows, fail to exploit this remarkably effective method of attracting the attention of the passer-by.—I am, etc.,

"Nufflex."

Sunderland.
August 23rd.

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INSTALLATION WORK IN PETROL DEPOTS.

Points for the Wiring Contractor—Neglecting Elementary Precautions—Treatment of Lamp Fittings in the Danger Zone.

By B. PONTIFEX

THE entire lay-out of electrical work in petrol depots is complicated by a number of difficult points, of which the average wiring contractor is ignorant. This seems to be an emphatic statement, but it is justified by the number of tenders which have been rejected, because they have disregarded the most elementary precautions against trouble which arise from the inflammatory nature of the material handled in these places.

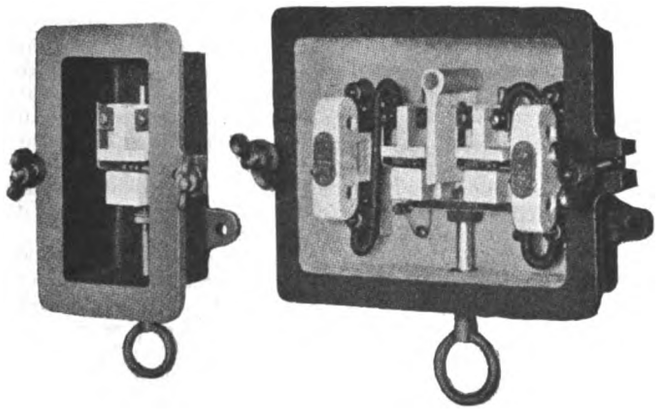

Fig. 1.—Open switch cases showing wide machined flame-proof flanges. (Dorman & Smith, Ltd.)

Petrol vapour has been known to " fire back " over a distance of 40 ft. in extreme cases, so it is obvious that too many precautions cannot be taken to prevent a mixture of vapour and air from being ignited by a spark from a switch, commutator or broken lamp. Otherwise, there would be numerous destructive fires with heavy loss to surrounding property as well as to the petrol storage plant.

The wiring is almost invariably carried in heavy galvanised screwed steel conduit to avoid risk of accidental breakage through a barrel or other heavy object being rolled against any of the leads, since the work is all on the surface, except where underground conduits are laid across yards, etc. All

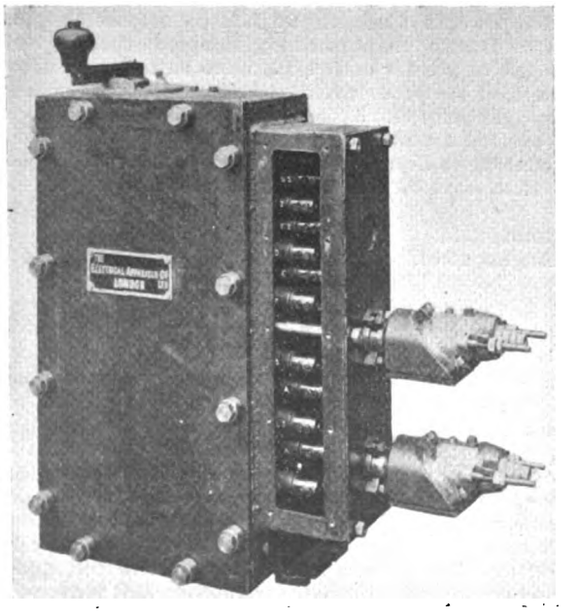

Fig. 2.—Flame-proof controller, showing relief bolts. (Electrical Apparatus Co.)

buried metallic conduit should be coated with bituminous paint, and care should be taken that no ashes are in contact with it. These points are usually specified.

The switching arrangements are such that the main control switch is either in, or close to, the manager's office and, in small depots, every circuit switch is in the same position. In larger depots, distribution boards are placed *outside* the more important building in each group and the switches controlling these boards are placed close to the master switch.

Local switches are only permitted in offices, fitting shops, mess rooms, etc., and, if within 50 ft. of tanks or piping, must be flameproof.

A similar precaution is taken in the case of distribution boards or lamp fittings in the danger area.

" Flameproof " cases for switches and distribution boards have wide machined metal to metal flanged joints, at least 1 in. width between the bolts and the inner edge of the joint. (Fig. 1.)

A Further Precaution.

A further precaution is taken in the flanges of starting switches for motors, Fig. 2, in which case a width of 1½ in. is specified, together with the use of relief bolts, giving a lift of 1/50th in. under 10 lb. pressure per sq. in. according to the calculated spring pressure. This is to prevent an explosion inside the starting switch from firing any surrounding vapour

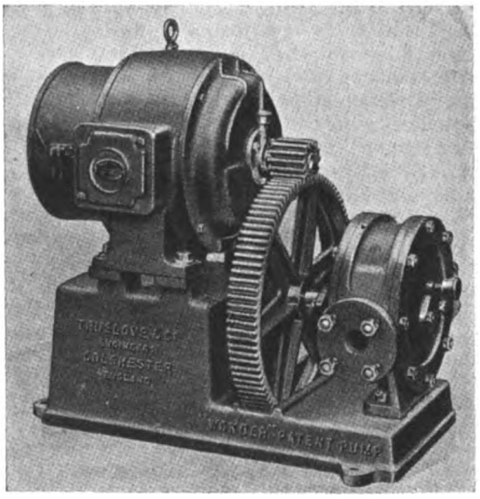

Fig. 3.—Flame-proof motor driving spirit pump. (Truslove & Co., Ltd.)

by extinguishing the flame through cooling, as it passes over the wide metal joint surface. After the explosion the cover closes immediately.

All joints on motor casings and terminal boxes have to be provided with similar wide flanged joints (Fig. 3), unless the motor is connected to the pump by a long shaft extension which passes through a special wallbox in the partition separating the motor and pump chambers. This partition must be fireproof, and without any door or window. All leads between the starting switch and the motor must be entirely covered with conduit, screwed home into casings at either end, and, naturally, the motor itself is without any ventilating opening whatever. The cover over the brush gear should have wide metal to metal joints, and be held in position by set screws and not by any form of clamp.

Danger from Heat.

Lamp fittings in the danger zone, i.e., within 50 ft. of any tank, pump, filling machine or unloading point, should be fitted with double glasses, each glass being screwed into position against a rubber ring to make a gas-tight joint. It is not advisable to use any lamp taking more than 60 W in a single fitting, owing to danger from the heat generated. In some cases, the size of the inner globe is deliberately kept down, so that a 100 W lamp cannot be inserted.

Any electric heating device should be carefully chosen so that no luminous filament is exposed, though there are cases where heaters of this class are installed close to petrol filling pumps. It is reported that there is an air of expectancy in the opposition depots in those neighbourhoods.

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TO-DAY AND TO-MORROW.*

Sound Discussion of Some Current Industrial Problems—Why Wages Must be Higher—A Stimulating Book for Business Men.

By SIR ERNEST BENN, Bt.

THE jaded industrialist, his mind oppressed with all the bemuddled sophistications which pass with us for political economy, who wants a refresher, should read "To-day and To-morrow," by Henry Ford and Samuel Crowther. Here are 270 pages of serious discussion of industrial problems, and nowhere in them is to be found the blessed word, "Committee." Here is the largest employer of labour in the world, entirely free from trade union pressure, and comparatively free from legislative interference, writing a whole book to argue that wages must be higher. The motive of industry must be the "wage-motive," but, "of course, if men are under some outside influence or control by which the amount of work which they do in a day is limited—if they have to answer to an outside authority, then management is impossible, and consequently, high wages cannot be paid for the production of low-priced products. The whole wage-motive fails."

In "My Life and Work," Mr. Henry Ford gave us a sufficient insight into his views on wages and production and prices, but the present volume gives valuable corroborative evidence inasmuch as the minimum wage of five dollars a day has now become six, while the "Ford touring car may be bought at about twenty cents a pound—a highly refined piece of machinery, built with the greatest care and of the best material, costs less per pound than beef-steak."

But it is in the freshness of its industrial philosophy that this book will come as a boon and a blessing to the Englishman seeking a holiday from false issues. American freedom of thought and action enable the authors to roll off trite wisdom, much of which, although written in what seems to be the English language, sounds to English ears as if it came from another world.

Illuminating Examples.

Here are a few samples:

"It is necessary and will be necessary to put men in jail until the news gets about that the profits of dishonesty do not compare with the profits of honesty."

"It is not easy to get away from tradition. That is why all our new operations are always directed by men who have had no previous knowledge of the subject, and, therefore, have not had a chance to get on really familiar terms with the impossible. Our invariable reply to "It can't be done" is, "Go, do it."

"With the growth of real industry, money is slowly receding to its proper place as one of the cogs in the wheel, not as the wheel itself."

"Business—that is, the whole material side of life—is threatened by two classes of people who think they are in opposition, but who actually have a common cause—the professional financier and the professional reformer. These two classes are real menaces. The professional financiers wrecked Germany. The professional reformers wrecked Russia. You can take your choice as to who made the better job of it. These two classes, working either directly or through politicians, are in control of Europe, and are responsible for its poverty. Under no system which they devise do the people have a chance."

Ford, unlike most of us, is looking at the industrial picture the right way up. He realises that wages come out of production, and that they can come from nowhere else. He makes the customer the first consideration, another way of expressing the same idea, and works it all out in this simple but original way.

"The public and only the public can make a business. If we have good steel to-day, it is because the public bought steel when it was faulty, and thus helped the steel masters to perfect their science and production. Since the public makes a business, the primary obligation of business is to the public. Suppose an industry, through efficiency and approved service, is able to reduce costs to the consumer. It gives the benefits of its improvements to its customers. If an article cost a dollar less to produce than formerly, a dollar comes off the price charged the customer. By that process more people are able to buy. More buyers make a still larger business. A larger business still further reduces costs, which, in turn, increases the business still more. Now, it is obvious that, however efficient the idea of economical production in that factory may have been, no such growth would have followed had the economy not been shared with the public. Suppose that the one dollar saved was added to profits, the price to the consumer remaining the same. There would have been no change in the volume of business. Suppose the dollar saved had been added to wages, there would have been no change in the volume of business. By starting at the right end, prices go down, which is to say that, to the public, values go up, wages go up, and surplus goes up."

The American Viewpoint.

The point for us to remember is that Ford only expresses the commonly accepted view of a hundred and ten million Americans, which is the whole explanation of the wealth of that progressive place. We in Europe, take another view.

"They (we) do not understand this. They think that politics can do what only industry can do, and they propose regulations of prices and of this, that, and the other thing, on the ground that thus they can bring prosperity. There is a craving for a prosperity ordained by law, and it is entirely natural that there should be. For the idea is rather general that the chief curse of life is to work for a living. Thinking men know that work is the salvation of the race, morally, physically, socially. Work does more than get us our living; it gets us our life."

The worker, like everybody else, wants "good food, good clothing, good housing, and a reasonable amount of pleasure, both for himself and for his family. He cannot get these things by any political device, or through any bargaining organisation, such as a labour union, for goods are created neither by law, nor by bargaining—which, strangely enough, does not seem generally to be recognised."

One could quote indefinitely from this timely and welcome volume. Mr. Ford appears to be looking for an English sale, and he will not be disappointed; and we should be ungracious if we failed to acknowledge the delicate compliment of spelling "labor" our way, as "labour." We need more of the industrial literature of America on this side of the Atlantic. It might be made popular with us if it were offered as a holiday from our way of thinking.

The politicians tell us that the workers want to know the facts of industry, and if that is so, Mr. Ford must satisfy the most exacting of these inquirers, for the book is a mass of readable technicalities. No effort is spared to explain how the Ford car, in the short space of 18 years, has reached the thirteenth million. That is the work of Henry Ford, who now tells us with natural parental pride that his son Edsel is going to do even more wonderful things in aviation, and that it won't take so long to popularise the Ford plane as it has done to multiply the horse-power of the whole world seven times.

And it will all be done by a frank recognition of the truth that "Labour is more of a buyer than a seller. The point at which to start the wheel a-rolling is the buying end. Make things easy for the plain people to buy. That makes work. That makes wages. That makes surplus for extension and greater service."

* "To-day and To-morrow," by Henry Ford and Samuel Crowther. (New York: Doubleday, Page and Co., $3.50.)

WELL-TYPE FIRES.

Facilities for Cleaning a Feature in Cheap Domestic Model.

A NEW design in well-type fires now being marketed is the "Imp" fire manufactured by the Bastian Meter Co., Ltd., 58, Haymarket, London, S.W.1. In this model, which is introduced at a very competitive price, the element consists of specially close wound nickel-chrome wire on a quartz tube, which is positioned in a well formed of polished sheet copper, This is extended upwards at the back to throw the heat forward. The loading is 1 kW.

Toast can conveniently be made over the glowing element, and metal crossbars are provided just above the elements for supporting a kettle or other utensil. A useful feature is that the various parts of the fire can easily be taken apart for cleaning purposes.

As single heat only is provided, the fire can, if desired, be supplied without a switch. With a polished copper reflector and case finished in black enamel, the price, including 2 yd. of flex and adapter is £1 15s. An attractive model of this fire with base of hammered copper sells at £2 7s. 6d. Suitable tumbler switches are fitted, when particularly specified, at an extra cost of 3s. 6d.

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ELECTRIC IGNITION EQUIPMENT.*

Good Performance of British Apparatus—Magneto v. Coil Ignition—Materials for Contact-breaker Points—Use of Impulse Starters.

By A. C. BURGOINE.

WHILE there is no general agreement regarding the precise laws covering ignition by the electric spark it is now generally agreed that the process is a thermal one. All attempts to fire a charge experimentally by ionisation alone have failed. In order to cause ignition under perfect conditions only a very small amount of electrical energy is required, and an ordinary magneto gives one or two thousand times as much as is needed. But in order to cope with working conditions a reserve of energy is necessary. Spark-energy is usually determined in "joules per spark." In the original paper, curves for several typical magnetos and for a coil system are given. The heavy magneto gave more energy than the lighter one at speeds up to 100 sparks per sec. but then fel off rapidly owing chiefly to the pole-shoes being solid. Contact-breakers of modern British magnetos are capable of operating at high speeds; by special design the author has run one machine for some time at 14 000 revs. per min. In order to cope with the conditions of moderately dirty plugs a magneto or coil should be capable of giving not less than 0·02 joules per spark at the fairly low speed at which it is turned for starting, and a high enough voltage to jump the plug-gap, say 5 000 V. Probably 120 revs. per min. can be taken as a fair starting speed.

Magneto's Advantage at High Speeds.

Magnetos of the ordinary rotating armature type give two sparks per revolution. In the original paper, voltage-curves for three types of magnetos are reproduced. Attention is drawn to the good performance of a British made machine weighing only 2¾ lb. Coil ignition is usually superior to magneto ignition when starting or running at low speeds on dirty plugs, and the energy curves for the two types are quite different. The spark-energy of the coil system falls off rapidly at high speeds owing to the high inductance of the coil windings and the small time interval during which the contact-breaker is closed. In general, the spark-energy is proportional to the square of the primary current at the instant of break. At about 35 sparks per sec. the coil and magneto systems were found to be approximately equal, but at higher speeds the magneto has the advantage.

Although the magneto is an exceptionally clever piece of work electrically, its practical success or failure depends mainly on mechanical conditions. Standardisation has been of great value to magneto manufacturers, yet the necessity of adhering to standard dimensions has prevented some promising types from reaching the practical stage. However, within the B.E.S.A. standards great advances in mechanical and electrical design have been made. Two factors which have revolutionised design have been the use of laminated pole-shoes and of cobalt steel for magnets. Magnetos may be of three types, the rotating armature, the polar inductor, and the rotating magnet. The latter are now coming into general service and appear to be quite satisfactory. Trouble in connection with distributor mouldings has now been largely overcome. Magnetos require little lubrication. It is common practice to pack the ball bearings with grease upon assembly and to rely upon this until the machine is stripped for overhaul. But as most owners expect their magnetos to run for at least five years without attention it is doubtful if this is good practice.

Intermediate Shaft Drive.

Speaking generally, the driving of magnetos by gears or chain wheels mounted directly on the spindles is to be avoided. It is better to drive the magneto through an intermediate shaft which runs in its own bearings, the connection being made by some form of coupling with a certain amount of resilience. Noise from magneto-drives is frequently found to come from the timing gears which are affected by the irregularity of the torque of the magneto. Couplings should never be of the solid bolted up type, but there should be no slack between the driving and driven members. The Simms coupling is capable of excellent service if properly selected and fitted. Every effort should be made to get magnetos correctly in line. It is also of great importance to avoid end-thrust in either direction. One of the very first considerations in arranging a magneto-drive is to secure accessibility to the machine as a unit. The machine, and particularly the moulded distributor, should be well shielded from the heat of the exhaust manifold, and there should be no risk of petrol dripping on the contact-breaker, or, indeed, anywhere near the machine.

Contact-breaker points for magnetos are almost invariably of an alloy of platinum and iridium, the standard mixture being 75/25 per cent. American makers of coil-equipment generally fit tips of tungsten. This material is suitable for coils but not adapted to magnetos for the same reason, i.e., that they function only at a moderate current density. The possibility of using this less expensive material has been claimed as an advantage for the coil-system. Perhaps the greatest objection to coil ignition is the absolute dependence upon the battery for starting, together with the risk of the current being left on with the engine standing. Essentially, the system contains as many elements as a magneto. Probably the only real technical advantage that can be claimed for the coil is that there is, within reason, no limit to the dimensions of the coil itself, which may therefore be heavily insulated. But in practice this is apt to result in the use of cheap insulating material, with the result that the coil is as liable to breakdown as the magneto.

Combined Lighting and Ignition.

Combined lighting and ignition machines are of three types, the magneto, with which is incorporated some means for the use of battery ignition at starting, or as a stand-by; the dynamo with magneto attached, the armatures being coupled together and operated from a single drive; and the true combined unit, in which a magneto and dynamo are arranged with common parts, such as the field or magnets. Machines of the second class are now fairly common. An ingenious type of dual machine has been rendered possible by the use of cobalt steel magnets, the magneto being of the inductor class, and the rotating armature serving only for the generator and as an inductor for the magneto coil. The output of the magneto has to be kept fairly small, but the lighting current output may be as large as required; machines are built giving up to 20 W. Owing to the comparatively low voltage and spark-energy given by magnetos when turned at low speeds, the starting of large engines, particularly of the commercial vehicle and marine types, is not readily effected. By the use of a special driving coupling, in which is embodied a spiral spring, it is possible to cause the magneto to rotate for a high speed during a portion of each revolution. Many designs of such "impulse starters" have been evolved. Impulse starters have proved themselves to be of very great assistance in the driving of the heavier types of vehicles, but it cannot be said that they are well suited to all forms of service, one objection to their general use being the clicking noise that is produced when running very slowly.

The position end of sparking plugs should be settled only after careful experiment on all new designs. It is most important that the dimensions and positions of tapped holes should permit the use of standard plugs covered by B.E.S.A. standards. In the original paper, curves showing the combined effects of running an engine on one, two or three plugs per cylinder are shown. With short plugs, the power on one plug only was very considerably reduced at high speeds, but the addition of the third plug did not make any great difference. Over-oiling of plugs is a frequent source of trouble. The insulation of a clean dry plug when measured by an ordinary 500 V megger should be practically infinity. But quite different results are obtained if the test is made with a high voltage. Plugs will generally continue firing on a good magneto down to 100 000 Ω, but the engine may not restart after a stop.

On coil-ignition plugs may cut out at say 500 000 Ω, but it is then generally possible to get a start. Spark-plugs are by no means uniform in their breakdown voltage for a given setting and there may possibly be a difference of as much as 2 000 V for two plugs which are to all appearances apparently identical.

*Abstract of a Paper read before the Institution of Automobile Engineers.

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NEWS IN BRIEF.

Electric Luggage Conveyors for Railway Stations—A Surprising American Confession—Floodlighted Prisons—Paying Refrigerator Load.

BOLTON is to have an ambitious shopping festival, with a special prize of £1 000.

An Irish electrical firm has installed the first electric crane ever erected in a Dublin coal yard.

German foreign trade figures for July show an excess in imports over exports of 126 million marks.

A new underground luggage hall at Victoria (London) station is to be equipped with an electric conveyor.

Extending and improving battery charging facilities is among the objects of the newly formed Electromobile Association.

Gainsborough Council invites applications by August 30th for the position of engineer-in-charge of the Council's electricity undertaking.

Experiments are being carried out in the U.S.A. by the Milwaukee Co. on the possibility of the combination of electrical generation with low-temperature carbonisation.

Appliance saturation in American homes is falling instead of rising (states "Electrical Merchandising"), and the number of electrically lighted houses that are without appliances grows steadily.

So great has been the number of manufacturers demanding space in the Birmingham section of the British Industries Fair that new buildings are to be erected to give an added letting area of about 30 000 sq. ft.

Floodlighting of banks and prisons to prevent robbery from the former and escape from the latter is a new method of utilising electricity in New Jersey, U.S.A. The local gaol is lighted by twelve 500 W floodlight projectors.

Of electric heating and cooking apparatus of the total value of £35 506 imported into South Africa during 1925, the United Kingdom provided £23 927 worth. Germany came next with £5 765, followed by the U.S.A. with £3 843.

The first meeting of the Meter Engineers' Technical Association will be held at the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, London, on September 23rd, when Mr. G. F. Shotter will deliver his presidential address.

A record of the current consumption of 94 electrical refrigerators kept by the Kansas City Power and Light Co., gives a grand monthly average of 69 kWh for each refrigerator. Eighty-seven of the installations under observation had a capacity of 30 cu. ft. or less per refrigerator.

The Midland Electrical Engineers' Ball will be held at the Grosvenor Suite, Grand Hotel, Birmingham, on November 19th. Tickets (£1 1s. each) can be obtained from Mr. R. A. Chattock (president), or from Messrs. W. H. Heaton, of the General Electric Co., Ltd., Witton, and W. Y. Anderson, 14, Dale End, Birmingham.

A consumers' engineer is required by Worthing Electricity Department.

America supplies the bulk of the electric pocket lamp requirements of South Africa.

Preston Chamber of Trade is organising an ambitious trades exhibition to be held in October.

Tucker's Athletic and Recreation Club will hold its annual sports in Birmingham to-morrow (Saturday).

In collaboration with the S.M.M.T., the War Office has issued a specification (No. 23) for electric lighting systems for mechanical transport vehicles without self-starters.

A daily paper's "Postal Bargain Corner" offers electric irons and toasters, electric lamps at 1s. 2d. each, and wireless receiving sets direct from the makers, "cutting out the middleman."

As there has been no meeting of the Executive of the National Register of Electrical Installation Contractors this month, our usual monthly list of newly registered contractors will not appear until September.

This group of the electrical staff and students at the Finsbury Technical College is of particular interest, as it was taken on the day the college closed down. Dr. W. H. Eccles is seen seated in the front row, next on the right is Mr. Lewis W. Phillips, and on the left is Mr. C. R. Darling.

Sir Hugo Hirst will preside at the annual festival dinner of the Electrical Trades Benevolent Institution, to be held this year at the Trocadero Restaurant, London, on Wednesday, November 17th, at 7.30 p.m.

Members of the National Union of Corporation Workers employed by Edinburgh Electricity Department are demanding the increase of their minimum wage from £2 10s. 11d. to £3 11s. 6d., together with improved conditions.

A steam turbine generating plant, built for the Edison Co., at Boston, Mass., designed for a working pressure of 1 200 lb. per sq. in., has been opened up after 1 600 hours' commercial service and found to be in reasonably satisfactory condition.

In an Indian jute mill there is a rule that no employee may go unaccompanied in the vicinity of certain electrical apparatus. A "Safety First" notice enforcing this regulation reads: "Halloa, Halt. See that you are two whenever you go either on reactor gallery or oil switch gallery."

AT a conference of representatives of unions concerned in the national and local wages' application for a £1 advance to those employed in the engineering industry, it was decided, having regard to the industrial situation, to adjourn the conference and to recall it when conditions are more favourable.

Candidates with practical experience of the design and erection of electricity supply undertakings are required for a vacancy in the Electrical Department, Buildings and Roads Branch, in the Punjab. Particulars are obtainable from the Secretary to the High Commissioner for India, 42, Grosvenor Gardens, London, S.W.1.

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SWISS ELECTRIC TRACTION.

The Present Railway Position and Prospects Reviewed.

IT is a well-known fact that electric traction is now in use on the greater part of the Swiss Federal Railways, but some details of the present position taken from an article in "La Suisse" will be of interest.

Since the end of 1925 electric trains have been running between Berne and Olten, thus linking up by electric lines the capital of Switzerland with Zurich, Basle and Chiasso and also Basle with the Simplon line. The section from Renens to Geneva is also now electrified, and in a few months the section from Lausanne to Palézieux will be completed. Thus, from next summer, electric traction will be in use on the diagonal Geneva-Rorschach, with the exception of the sections Palézieux-Berne and Wintherthour-Rorschach, which will be electrified in 1927.

The end of 1925, therefore, marks an important date in the history of the electrification of the Swiss railway system and it will be interesting to glance back over previous events. The first line to be electrified was that from Brigue to Iselle in 1896. The decision to carry this out caused a great deal of excitement and even consternation, for here was the Simplon tunnel finished only six months before, and it was proposed to electrify at the very outset the railway through it! Objections were at once raised, the chief being the question of the type of engine to use. A commission had already been working for some time examining the relative merits of the mono-phase and the three-phase systems and they declared in favour of the latter, being doubtless influenced a great deal by the fact that the Italian railways were already using it. Several Italian locomotives were borrowed, and, in spite of all pessimistic forebodings, the railway was a great success.

A Venturesome Undertaking.

Next came the turn of the Loetschberg tunnel in 1913, by which time the commission had definitely decided that the three-phase system was not the better; hence single phase was used. The undertaking was even more venturesome than that of the Simplon, and for a long time doubts were expressed as to the wisdom of it. As a matter of fact, the first locomotives used were unsatisfactory, there being always two under repairs for one in service. Finally, however, all difficulties were overcome, and the regularity of the service, the speed, and the comfort of the travellers, soon convinced everyone that the mono-phase system was preferable.

The war interrupted further progress, but was instrumental in demonstrating the dependability of the Swiss on coal. For this reason two large stations were built at Amsteg and Ritom for the generation of electricity by water power and to allow for the electrification of the Gothard line. As at this time everything was so costly it was decided to divide the programme of electrification into three stages, the first to finish in 1928 and the second in 1933. But work was required so badly by the electrical industry that in 1923 the plans were altered so that the work scheduled for the first two stages should be concentrated into the one. Thus in 1928 electric trains will circulate from Geneva to Rorschach by either Berne or by Neuchâtel and also on the section Basle-Buchs.

It is far too early yet to compare electric traction with steam traction, but it seems certain that the former will be the cheaper. By means of electric traction, an intense traffic can be coped with, at exceptionally cheap rates, for, the more the traffic the cheaper the rates will become. The results achieved here will be closely followed by al interested in electric traction, and will undoubtedly influence those countries where coal is scarce and water prevalent.

WORK IN PROSPECT.

Trade Possibilities for Electrical Installation Contractors.

ASHTON-UNDER-LYNE.—Housing scheme (130), Oakfold Estate, for Town Council. Particulars, the borough surveyor, Mr. J. Rowbottom.

BRIDGWATER (SOMERSET).—Houses (98), for Town Council. Particulars, the architects, Sampson and Colthurst, 51, High Street.

DEWSBURY.—Infirmary, to cost £70 000. Particulars, the architect, Mr. Sharpe.

DITTONS.—Additional 140 houses, for Urban Council. Particulars, the surveyor, Mr. H. C. Fread.

HAMPTON.—Houses (24), for Urban Council. Particulars, the contractor, Mr. W. H. Pecover.

HOUGHTON-LE-SPRING.—Additional 100 houses, for Rural Council. Particulars, the Surveyor.

LEITH.—Secondary school, Duke Street, to cost £70 000, for Edinburgh Education Committee. Particulars, the Clerk.

LEYLAND.—Parochial hall. Particulars, the architect, Mr. F. Howarth, Preston.

LIVERPOOL.—School chapel, to cost £10 000, for Liverpool College for Girls, Huyton. Particulars, the head mistress, Miss Anthony.

LUDDENDENFOOT (YORKS).—Houses (12), Warley Wood, for Mrs. L. A. Willson.

NEWPORT (ISLE OF WIGHT).—Houses (22), Elm Grove, for Town Council. Particulars, the contractor, Mr. T. E. W. Phillips.

NORTH WINGFIELD.—Miners' Welfare Club. Particulars, the architects, T. Bamber and Son, Derby Road, Heanor.

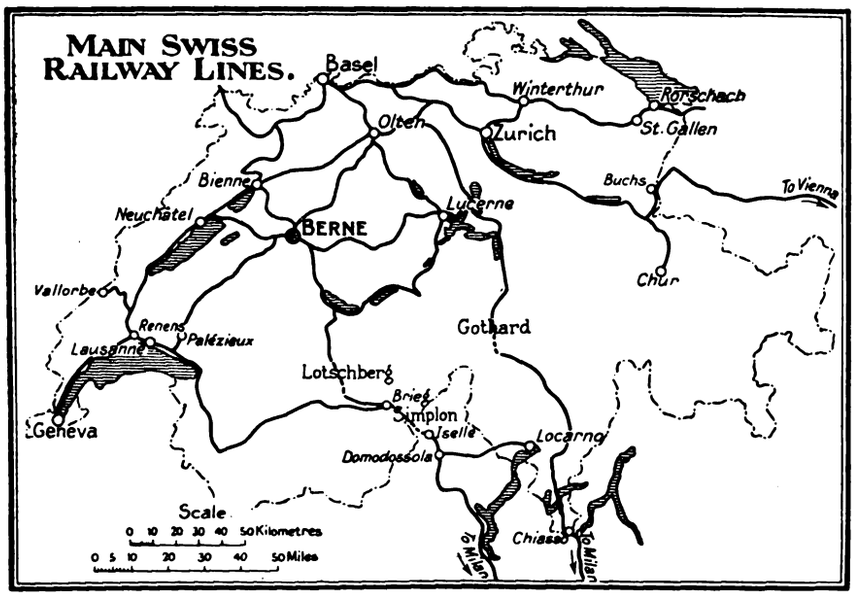
OSSETT.—Extensions to Healey Mission Room. Particulars, the architects, C. H. Marriott, Son and Shaw, Church Street Chambers, Dewsbury.

STEWARTON.—Housing scheme, Cocklebie Croft, for Town Council. Particulars, the architect, Mr. W. F. Valentine, 5, John Dickie Street, Kilmarnock.

WASHINGTON.—Housing scheme (18), for Urban Council. Particulars, the surveyor, Mr. R. J. Swaddle.

WILLINGTON (CO. DURHAM).—Additional 30 houses, for Urban Council. Particulars, the Surveyor.

WOODSTOCK.—Housing scheme, Pidlington, for Rural Council. Particulars, the architect, Mr. F. E. Openshaw, 65, St. Giles', Oxford.



IN view of the fact that the World Power Conference is being held at Basle this year the accompanying account of the present position of electric traction on the Swiss Railways is of particular interest. The programme includes several papers on railway electrification.

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PERSONAL.

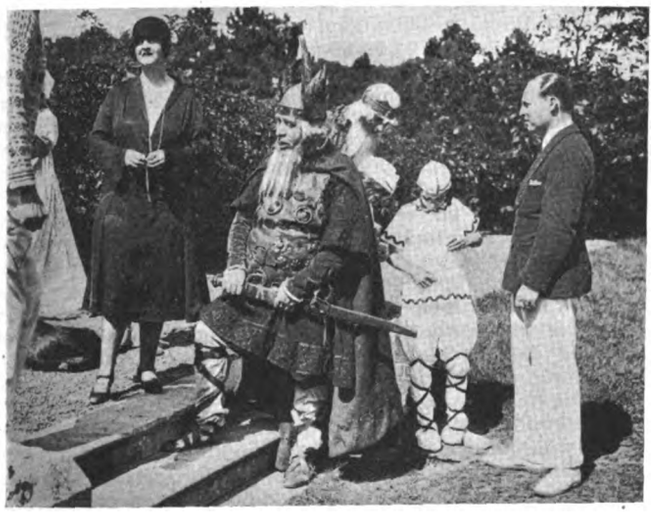
New Appointments, Presentations and Retirements in Electrical Circles.

ALTHOUGH he is not yet 21 years old, Mr. G. T. Schofield has been appointed lecturer in physics at St. Luke's College, Exeter.

Mr. C. A. Vandervell gave prizes for a fête organised by the Pangbourne, Berks, branch of the Junior Imperial League.

Sir Hugo Hirst acted as vice-president of the Reading Horse and Horticultural Show and of the Reading Working Men's Regatta.

Mr. A. M. Eagleston, electrical engineer, of St. Clement's Street, Oxford, has subscribed £5 towards the founding of an Institute of Spanish at Oxford.



Sir William Bull, M.P., well known as a director of several important electrical concerns, "snapped" on Tuesday with the ex-King and Queen of Greece, after rehearsing his role of King Canute for the Cromer Carnival.

Mr. A. C. Minchin, of the Station Design Division of the Philadelphia Electric Co., sailed for the United States on Wednesday after a short holiday in this country.

Mr. B. Brunner, formerly of the telegraphic staff of the (Irish) Great Southern Railways, has been appointed assistant telegraph engineer to the Central Uruguay Railway.

Mr. T. R. Martin, joint managing director of J. H. Tucker and Co., Ltd., expects to sail for home this week, following an extended business tour in the U.S.A. and Canada.

Mr. George Haswell is retiring from the post of rolling stock superintendent at the Hylton Road Depot of Sunderland Corporation Tramways, a position he has held since 1903.

Mr. A. R. Fearnley, general manager of the Sheffield Corporation Tramways, is appealing against the farthing damages awarded to him in the recent libel action in which he appeared as plaintiff.

Mr. David W. R. Knighton, of Thrapston, and formerly with the British Thomson-Houston Co., Ltd., Rugby, has been appointed chief electrical engineer to the Ste. Madeleine Sugar Co., Trinidad.

In place of Mr. A. Latham, second mains assistant, who has resigned, Southport Electricity Committee has promoted Mr. Norman Boydell, third mains assistant, to the position. Mr. E. Cook, test mains assistant, has been promoted to the position of third mains assistant.

Despite the Electricity Committee's recommendation that under the sliding scale of the I.M.E.A. the salary of Mr. C. A. Frost, the electrical engineer, be increased from £705 to £730 per annum as from April 1st last, Bexhill-on-Sea Council has decided to refer the recommendation back.

Mr. G. C. Beadle, of the Durban, South Africa, broadcasting station, has been appointed director of the British Broadcasting Co.'s Belfast station in succession to Major W. M. Douglas Scott, who has resigned owing to ill-health. Mr. Beadle, who was formerly on the B.B.C. staff, takes up his new duties in November.

The following have been elected to corporate membership of the Institute of Physics :—Transferred from associateship to Fellowship: Messrs. F. S. Barton, M. D. Hart, and T. J. Lonsdale. Fellows: V. A. Bailey, Kerr Grant, and P. E. Shaw. Associates: M. C. Bathija, F. P. Bowden, W. M. Holmes, A. E. Knowler, W. Rule, L. A. Sayce, and E. L. Sayce.

Mr. E. H. Merz is a member of the National Fuel and Power Committee which the Government has decided to set up in accordance with the recommendation of the Coal Commission. It will be a Standing Committee of thirteen, with Sir Alfred Mond, M.P., as chairman, and its duty will be to consider and advise upon questions connected with the economic use of fuels and their conversion into various forms of energy, having regard to national and industrial requirements and in the light of technical developments.

Mr. William Makinson, who has left the Sterling Telephone Co., Dagenham, to become assistant manager with Benjamin Electric, Ltd., was on August 19th presented with a gold watch by Mr. C. E. Hunter, works manager of the Sterling Co., on behalf of himself and the staff. Mr. Makinson has been with the company since 1917, and was superintendent of the production of war telephones, being rewarded by the Ministry of Munitions for improvements in their manufacture. He was presented to the King and Queen when their Majesties visited the Sterling works in 1918.

Mr. David Sarnoff, who began his business life as a messenger boy, and who, although not yet 35 years of age, has risen to the position of vice-president of the Radio Corporation of America, and is said to have been the first broadcasting "uncle," has arrived in this country to study radio conditions and has made the Savoy Hotel his temporary headquarters. Mr. Sarnoff predicts that television will give as faithful reproduction of pictures as the microphone now gives of sounds, and that the regular exchange of programmes internationally will become an actual fact. Mr. Sarnoff has discussed with Mr. Reith, managing director of the B.B.C., the question of exchange of programmes, and he believes it will not be long before a system of regular exchange will be established. His Corporation will make new strides forward during the coming winter. In America they have come to believe in "super-power." The Radio Corporation has erected a 50 kW station which it is found gives a greater range. This is W Y Z on 455 metres, and they are about to experiment on 40 metres to see if the Atlantic can be bridged more effectively.

Obituary.

The following deaths have been announced :—

MR. C. S. BAYNTON, aged 60 years. He was the holder of the first wireless licence issued to an individual by the Postmaster-General.

MR. ALFRED E. TERRY, a director of Herbert Terry and Sons, Ltd., Redditch, aged 53 years. Entering the business immediately on leaving school, his aptitude for selling was developed "on the road." He travelled extensively for the firm in the U.S.A. and the European continent, and he was largely responsible for the expansion of the organisation to its present international basis. He is survived by his widow, one son, Mr. C. Douglas Terry, and a daughter.

Forty Years Ago.

Electro-Culture Experiments Recorded in "The Electrician" of August 27th, 1886.

IN our issue of August 27th, 1886, reference was made to experiments conducted in Germany by Prof. Holdefleiss in stimulating the growth of root crops by electricity. "Plates of copper were thrust upright into the earth and connected by wires with similarly placed zinc plates about 100 ft. distant." The treated crops were said to give an increased yield of 15 per cent. for beets and 25 per cent. for potatoes.

Other interesting features of that issue included one of the late Oliver Heaviside's articles on "Electro-magnetic Inductance and its Propagation," and the report of a somewhat extraordinary meeting of "engineers, incandescent lamp makers, and important shareholders in the leading electric light companies," held at the Cannon Street Hotel, and convened by Messrs. Shippey Brothers. The meeting discussed electric lamp patents and means of "protecting the interests of the trade."

Other items in this 40-year old issue included the discovery or introduction of: an electrical method of water-marking bank notes to prevent forgery; a process for the separation of glucose and sucrose by electrolysis; a loud-speaking telephone; and electrical foot warmers for railway carriages.

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GOVERNMENT CONTRACTS.

Recent State Orders for Electrical Goods and Equipment.

The following are among recent contracts placed by Government Departments :—

ADMIRALTY.—*Boxes (electrical) :* Engineering and Lighting Equipment Co., Ltd. ; L. Weekes (Luton), Ltd., Hawkers, Ltd. *Cables, Boxes, etc. :* Standard Telephones and Cables, Ltd. *Cables, Electric :* Johnson and Phillips, Ltd. ; Henley's Telegraph Works Co., Ltd. ; General Electric Co., Ltd. ; Anchor Cable Co., Ltd. ; Glover and Co., Ltd. ; Macintosh Cable Co., Ltd. *Crane, Electric Travelling :* Isles, Ltd. *Fans and Spares :* Jas. Keith and Blackman, Ltd. *Fans, Motor-driven :* Turbon Fan Co., Ltd. *Lampholders :* Cable Accessories Co., Ltd. ; General Electric Co., Ltd. ; Edison Swan Electric Co., Ltd. ; Sperryn and Co. *Motors :* Laurence Scott and Co., Ltd.

WAR OFFICE.— *Battery, Secondary, Replating of :* Premier Accumulator Co. (1921), Ltd. *Cable, Electric :* Standard Telephones and Cable, Ltd. *Torches, Signalling :* C. A. Vandervell and Co.

AIR MINISTRY.—*Electric Cable and Accessories*—Egypt : Standard Telephones and Cables, Ltd. ; *Internal Wiring*—Halton—S. Dixon and Sons ; North Weald—T. Clarke and Co., Ltd. ; Upper Heyford—Malcolm and Allan. *Delco Ignition Spares :* Delco, Remy and Hyatt, Ltd. *Generators :* British Thomson-Houston Co., Ltd. *Magnetos :* North and Son, Ltd. *Magnetos and Spares :* Simms Motor Units, Ltd.

POST OFFICE.—*Apparatus, Telephonic :* Automatic Telephone Manufacturing Co., Ltd. ; Ericsson Telephones, Ltd. ; International Electric Co., Ltd. ; Peel-Conner Telephone Works (General Electric Co., Ltd.) ; Phœnix Telephone and Electric Works, Ltd. ; Siemens Bros. and Co., Ltd. ; Standard Telephones and Cables, Ltd. ; Sterling Telephone and Electric Co., Ltd. *Apparatus, Testing, Protective, and Miscellaneous :* Chamberlain and Hookham, Ltd. ; International Electric Co., Ltd. ; Power Equipment Co., Ltd. ; Siemens Bros. and Co., Ltd. ; Standard Telephones and Cables, Ltd. *Battery Stores :* Alton Battery Co., Ltd. ; D.P. Battery Co., Ltd. ; Tudor Accumulator Co., Ltd. *Boxes, Battery :* W. and T. Lock. *Boxes, Coin Collecting :* Hall Telephone Accessories, Ltd. *Cable, Various :* British Insulated Cables, Ltd. ; Callender's Cable and Construction Co., Ltd. ; Connollys (Blackley), Ltd. ; Enfield Cable Works, Ltd. ; General Electric Co., Ltd. ; Hackbridge Cable Co., Ltd. ; W. T. Henley's Telegraph Works Co., Ltd. ; Johnson and Phillips, Ltd. ; Standard Telephones and Cables, Ltd. *Cells, Porous, Leclanche :* Edison Swan Electric Co., Ltd. ; General Electric Co., Ltd. ; Siemens Bros. and Co., Ltd. *Earpieces :* Peel-Conner Telephone Works (General Electric Co., Ltd.). *Handles, Ebonite :* Siemens Bros. and Co., Ltd. *Insulators :* J. Bourne and Son, Ltd. ; Bullers, Ltd. ; Thos. De La Rue and Co., Ltd. ; Doulton and Co., Ltd. ; Taylor, Tunnicliff and Co., Ltd. *Masts, Wireless :* Horseley Bridge and Engineering Co., Ltd. *Wire, Bronze :* Johnson and Phillips, Ltd. *Wire, Copper :* Enfield Cable Works, Ltd. *Wire, Switchboard :* General Electric Co., Ltd., (Peel-Conner Telephone Works). *Batteries, Replacing :* Birmingham H.P.O. : Premier Accumulator Co. (1921), Ltd. *Telephone Exchange Equipment :* Govan (Glasgow) : Siemens Bros. and Co., Ltd. Sub-contractors : Hart Accumulator Co., Ltd., for batteries ; English Electric Co., Ltd., for charging machines ; Crompton and Co., Ltd., for ringing machines. Fitzroy (Museum Relief) : Automatic Telephone Manufacturing Co., Ltd. Whitley Bay : Ericsson Telephones, Ltd. Birmingham (North) : Clyde Valley Electrical Power Co., Ltd. ; Albright and Wilson, Ltd. (Oldbury) : Standard Telephones and Cables, Ltd., The West Riding County Council (Wakefield) ; Anchor Cable Co., Ltd. (Leigh, Lancs) ; D. Gestetner, Ltd. (N.) : Relay Automatic Telephone Co., Ltd. *Telephonic Repeater Station—2 Wire Repeater Equipment :* Edinburgh ; Jedburgh ; Newcastle-on-Tyne : Standard Telephones and Cables, Ltd. *Telephonic Repeater Station—4 Wire Repeater Equipment :* Jedburgh ; Edinburgh : Standard Telephones and Cables, Ltd. *Telephonic Repeater Station—4 Wire Repeater Equipment Extension :* Aldeburgh : Standard Telephones and Cables, Ltd. *Wireless Station—Direction Finding Apparatus :* Port Patrick (Wigtownshire) : Marconi's Wireless Telegraph Co., Ltd.

CROWN AGENTS FOR THE COLONIES.—*Cable :* E. Baylie and Co., Ltd. ; W. T. Glover and Co., Ltd. ; The London Electric Wire Co. and Smiths, Ltd. ; Callender's Cable and Construction Co., Ltd. ; W. T. Henley's Telegraph Works Co., Ltd. *Lux Cells :* The Chloride Electrical Storage Co., Ltd. *Mechanical Stokers :* Underfeed Stoker Co., Ltd. *Spares for Turbines :* The Brush Electrical Engineering Co., Ltd. *Spares for Signaling Apparatus :* Tyer and Co., Ltd. *Switchgear :* The British Thomson-Houston Co., Ltd. *Telegraph Line Materials :* Siemens Bros. and Co., Ltd. *Telephone Materials :* The British L. M. Ericsson Manufacturing Co. *Train Lighting Equipment :* J. Stone and Co., Ltd.

H.M. OFFICE OF WORKS.—*Fuse Boards, etc. :* The Cable Accessories Co., Ltd.

Tariff Changes.

Notifications Altering Customs Duties on Electrical Goods and Apparatus.

ALTERATIONS in Customs duties in various countries notified by the Board of Trade include the following items applicable to electrical and allied goods :—

GREAT BRITAIN.—The key industries duties under Part I. of the Safeguarding of Industries Act will be continued for a further ten years from August 19th, 1926. A modification is that the duty on arc lamp carbons will be at the rate of 1s. per lb. instead of one-third of the value of the goods. Additionally, amorphous carbon electrodes, but not including primary battery carbons or arc lamp carbons, will be charged one-third of the value of the goods.

AUSTRALIA.—The operation of the deferred duty on valves for wireless telegraphy and telephony has been postponed until October 1st, 1926, and that on electrical mining fuses until January 1st, 1927.

AUSTRIA.—Increased import dues on steam and water turbines are imposed. Particulars are given in the Board of Trade " Journal " of August 19th, page 209.

FRANCE.—Dynamo-electric machines (Tariff No. 524) are exempt from the new general increase of duties.

PORTUGAL.—Modifications of import duties effective from August 9th fix a minimum rate of 20 and a maximum rate of 60 cents per kilog. on portable electric lamps. A similar charge applies to " tubes of any filaments, paper or board suitable for protecting wires conducting electric current, with or without metal strengthening." Among new export duties is a charge of 0·05 cents per metric ton on porcelain for electrical purposes, and corresponding metal parts.

ROUMANIA.—Electric accumulators and electric lamps of ead, zinc and brass alloy can now be exported free of tax.

E.T.U. Finance.

Return Shows that Union's Funds were Trebled in Three Years.

AN official return issued by the Chief Registrar of Friendly Societies, gives the following details of membership, income, expenditure and funds of the Electrical Trades Union in the years 1924 and 1925 :—

	Year. 1924.	1925.
Number of branches	286	286
Number of members at end of year	27 589	29 241
Funds at beginning of year	£9 967	£18 699
INCOME :—		
From members	£52 963	£53 334
From other sources	£666	£828
Total	£53 629	£54 162
EXPENDITURE :—		
Unemployment, travelling and emigration benefit	£10 842	£9 697
Dispute benefit	£1 109	£1 177
Sick and accident benefit	£520	£677
Funeral benefit	£712	£805
Superannuation benefit	—	—
Other benefits (including grants to members)	£1 189	£1 226
From political funds	£1 285	£1 051
Grants to Federations and other Societies	£443	£490
Salaries and allowances of officers	£13 400	£15 803
Expenses of Executive Committee	£669	£672
Other working expenses	£14 157	£12 467
Other outgoings	£571	£1 000
Total	£44 897	£45 125
Funds at end of year	£18 699	£27 736

It will be seen from the foregoing figures that the Union's funds have increased very materially from £9 967 at the beginning of 1924 to £18 699 at the beginning of 1925, and still further to £27 736 at the end of 1925.

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PROJECTED FACTORY LEGISLATION.

An Important Bill—Extensions of Provisions Relating to Fencing of Electrical Machinery—Equipment and Inspection of Boilers.

By OUR LEGAL CORRESPONDENT.

THE Factories (No. 2) Bill, which was introduced into the House of Commons by the Home Secretary on August 2nd, and read a second time, follows closely the lines of Mr. A. Henderson's draft Bill of 1924, but the clauses relating to washing facilities and certain minor matters have been excluded. There can be no doubt that a revision of factory legislation is overdue, because of the existing Acts, that of 1901, which was a consolidating and amending enactment, and is the basis of the existing law, is out of date, and certain amendments are necessary in order to bring the law into consonance with modern industrial requirements.

Meaning of Factory.

Of necessity the new Bill is a long one of 140 clauses, divided into 14 parts, and four schedules, compared with 163 clauses and seven schedules in the 1901 Act. Moreover, the order in which the subjects of legislation are treated is not the same, and it is not easy, from a cursory comparison of the two, to discover the proposed changes. We are, however, glad to see that the distinction between factories and workshops and between textile and non-textile factories has been abolished and the definition of a factory has been greatly extended, and includes any premises or part of premises in which electrical energy is generated, converted or transformed for supply by way of trade or for traction on any railway, tramway or other means of public conveyance, or for use in or in connection with any other industrial or commercial undertaking, or for the lighting of streets, public places or public buildings or institutions. Any railway line or siding which is used in connection with a factory is to be deemed part of a factory, and in other directions the meaning of the word has been extended, such as to docks, wharves, quays, warehouses, building and engineering works, etc.

Safety Provisions.

Modifications and extensions of the provisions relating to the fencing of machinery are also contemplated. Every flywheel directly connected to any prime mover and every moving part of any prime mover, the head and tail race of every water wheel and of every water turbine, shall be securely fenced, and every part of electric generators, motors and rotary converters, and every flywheel directly connected therewith, shall either be securely fenced or be in such position or of such construction as to be safe to every person employed or working on the premises as it would be if securely fenced. Similar provisions will apply to transmission machinery, and every dangerous part of any machinery (other than prime movers and transmission machinery) shall either be securely fenced or be in such a position or of such construction as to be safe to every person employed or working on the premises. Where the safety of a dangerous part of any machinery cannot be secured by a fixed guard an automatic device for removing the hand of the operator from, or preventing it approaching, that part may be substituted, and the Home Secretary may, by Special Order, direct the provision of a safety device when available.

New Machinery.

It is also important to notice that in the case of new machinery no set screws, bolts or keys on any revolving shaft, spindle wheel or pinion shall be allowed to project unless so encased as to prevent danger, and all spur and other toothed or friction gearing shall either be so situated as not to be exposed or be completely encased, and any person who sells or lets for hire any machine constructed after the date of the passing of the Bill which does not comply with the above requirements shall be guilty of an offence and be liable to a fine not exceeding £100. This sounds pretty drastic, and whether the provisions be wise or not they should only be enforced after ample notice has been given to the industry affected. The whole of part 2 of the Bill—i.e., sections 16 to 36—require careful scrutiny, but as it is understood the Measure will be hung up until the 1927 session there will be time to consider the effect of the various clauses and to submit suitable amendments.

Steam Boilers.

There is a long clause dealing with steam boilers which contains much that is new. Every steam boiler must have attached to it a suitable safety valve, a correct steam pressure gauge, at least one water gauge of transparent material, a suitable stop valve connecting the boiler to the steam pipe, and, where it is one of two or more boilers, a plate bearing a distinctive number shall be provided with means for attaching a test pressure gauge, and, unless externally fired or of the water tube type, it shall be provided with a suitable fusible plug or an efficient low-water alarm device. The boiler and all its fittings must be maintained in efficient working order, and provision is made for its periodical examination and testing by a competent person.

Sanitary Conditions of Factories.

Provision is made for cleaning the floor of each workroom once a week; the obligation to paint or whitewash walls is extended to partitions, and those walls with smooth, impervious surfaces must be washed with soap and water every fourteen months, but the provisions as to whitewashing or painting will not apply to factories without mechanical power and employing fewer than ten persons, unless the inspector so requires. The existing cubic space for each person is 250 ft. at ordinary times and 400 ft. during overtime, but 400 ft. is to be substituted at all times for rooms not used as workrooms before the passing of the Act, and the clause excludes from the calculation of the cubic space all space more than 14 ft. from the floor. Another innovation is that where the work is chiefly done sitting the temperature shall not after the first hour fall below 60 deg. F., and the Home Secretary may by Order prescribe a reasonable temperature for any class or parts of factories and prohibit means which may be injurious for maintaining temperatures, and he may further prescribe a standard of lighting for factories. All windows and skylights are to be kept clean on both sides and free from obstructions. A new and somewhat vague provision enables the Home Secretary, where in view of the amount of sickness in a factory or a class of factories special provision ought to be made, to require the occupier to make reasonable provision for the special medical supervision of the workers. The rules relating to means of escape from fire are also amplified, and factories employing fewer than 40 hands are now subjected to these regulations. There are a number of clauses dealing with welfare work, first-aid, working hours for young persons and women, meals and meal hours, seating accommodation for female workers, etc., but these are in the main as at present.

Administration Changes.

The regulations as to the sanitary condition of factories, cleanliness, ventilation and overcrowding are, with certain exceptions, now enforced in the first instance by the local sanitary authorities, but under the Bill they will be enforceable by the factory inspectors except in any factory without mechanical power, and which forms part of a dwelling house or shop in the same occupation. It is also contemplated to give the Home Secretary further powers to issue Special Orders and to make regulations to meet altered industrial conditions. The Bill is an important piece of legislation which affects large classes of the community, and it should receive full and careful investigation before it is passed.

Public Lighting Engineers.

Further List of Electrical Men Admitted to the Institution of P.L.E.

NEW members of the Institution of Public Lighting Engineers include:—MEMBERS: Mr. Henry Adam, electrical engineer to Annfield Plain U.D.C.; Mr. J. E. Adams, distribution superintendent with the Paisley Corporation's Electricity Department; Mr. T. G. Bransford, public electric lighting superintendent with Stepney Borough Council; and Mr. H. H. Denton, engineer and manager of Crewe Corporation Electricity Department. ASSOCIATES: Mr. A. E. Jepson, of the Sheffield branch of the General Electric Co., Ltd.; Captain L. B. W. Jolley, research engineer at the G.E.C. Research Laboratories, Wembley; and Mr. T. E. Ritchie, chief illuminating engineer with the General Electric Co., Ltd.

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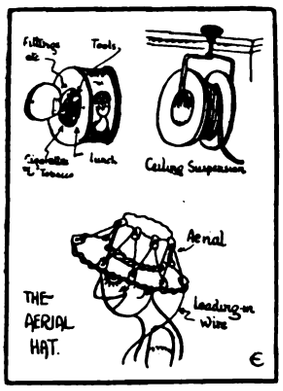
IN LIGHTER VEIN.

Random Comments and Reflections on Electrical Topics.

OH! what a fall was there! Only last week, full of pride, we wrote the "History of the Cable Carton" in quite the professional style, (at least so we thought), and now there comes a letter from one who signs himself a "Ton of Soil," probably meant for "Son of Toil," pointing out that the National Union of Wire-pullers took quite an active part in the designing of the Cable Carton, and that we had not even mentioned them. We hasten to rectify the error, and submit the history, again sifted, condensed and fumigated:—



Illustrating the further development of the Cable Carton.

Following the exciting scenes at the dinner of the Cable Fakirs' Association, when the first design of the cable carton was made, the matter came before the National Union of Wirepullers at their annual meeting, held at the Savoy Hotel, London.

Over the cigars, the chairman, (Mr. D. Short), brought forward the question of the new cable carton. He explained that, recognising the value of the opinions of practical men who used the cable, the Cable Fakir's Association had sent a sample carton and a bottle with a label bearing the inscription "Black and White." He had before him the carton, and invited comments.

Mr. Blotting's remarks were ruled out of order, after which Mr. Fews drew attention to the lack of a convenient carrying handle, and also suggested the provision of suitable space inside the carton to be used for carrying lunch, etc.

Following this suggestion, Mr. Smart proposed that the centre cavity be divided into four compartments to accommodate tools, accessories, lunch and cigarettes.

Mr. C. Dense-Course opposed the motion on the ground that the centre of gravity had been patented by a Mr. Newton, and that use of it would be an infringement. The secretary was instructed to 'phone Mr. Newton on the subject.

Another member suggested the provision of a leather "sucker" or washer, so that the cable could be suspended from the roof, wall, or any other convenient position without trouble. For the convenience of members when handling cable, it was proposed that in future all lead-covered cable should be double silk covered. This could be done in art colours to match the colour scheme of the house.

The Chairman instructed the Secretary to have a model made embodying all the suggestions, and send it along to the C.F.A. with their compliments and the empty bottle.

The result of this innovation is now well known. It is now possible for a wireman to pick up a carton containing the exact gear required to fix a number of lights, and to return in an hour or so, having installed them without any dirt or disorder.

New applications are being developed daily as, for example, the Aerial Hat, the latest model of which, trimmed with silk-covered wire and insulators (on a carton shape), is providing work for many factories. Used in connection with the pocket wireless set, its popularity is increasing daily.

Points of View.

THE average speed of the tramway-car is greater than that of the omnibus.—*Mr. A. G. Fitzgerald.*

* * *

Having resolved matter into electricity the question arises, "What is electricity?"—*Sir Oliver Lodge.*

* * *

Broadcasting is a commercial undertaking and not a philanthropic enterprise.—*Dr. J. A. Fleming.*

* * *

Within five years of national electrification, not only coal but the dole will be as dead as the dodo, the taxpayer will be saved £100 000 000 a year, and, like electrified Italy and the electrified U.S.A., from which I have just returned, and where there is almost no unemployment, British factories will be filled with the unemployed who, instead, now fill Britain's streets.—*Mr. Shaw Desmond.*

BUSINESS ITEMS.

Changes of Address, Representatives, and other Developments.

NO change will be made in the management of Ceag, Ltd., which has taken over the business of the Ceag Miners' Supply Co., Ltd.

The Credenda Conduits Co., Ltd., has removed to larger premises at Oldbury, where the telephone number is Oldbury, 401. The telegraphic address is unchanged.

As from August 7th the business of J. E. Pearn, electrical and mechanical engineer, Sherwell Lane, Plymouth, is being carried on under the style of Pearn and Carson.

A useful piece of publicity matter issued by Mr. Edwin Love, electrical contractor, of Wokingham Road, Reading, is a fixture list of the Reading and District Wednesday Football League for the coming season.

Representation of British manufacturers of electric cranes, boilers, etc., is desired by a Rangoon engineer and machinery merchant. Details will be supplied (Reference No. 218) by the Department of Overseas Trade.

A new trade counter for electrical goods is being provided at the Welsbach Light Co.'s headquarters at Welsbach House, Gray's Inn Road, London, W.C.1. The entrance to the trade counter will be from Wicklow Street.

Yesterday (Thursday) True Screws, Ltd., removed their registered offices and stores to "The Screw House," 107, Clerkenwell Road, London, E.C.1. The new telephone number is Holborn 2618, and telegrams should be addressed "Truescrews Holborn 2618."

The Steam Fittings Co., Ltd., West Drayton, has changed its name to The Drayton Regulator and Instrument Co., Ltd., the old name being no longer indicative of the company's manufactures. There has been no change in the directorate or other reorganisation.

The Lancashire and Yorkshire organisation of the Z Electric Lamp and Supplies Co., Ltd., has been removed to more suitable premises at 6, St. Mary's Parsonage, Manchester, where the telephone number is City 9258. Mr. S. W. Harrison is the manager and Mr. C. C. Derham is assistant manager.

Henderson and Lawson, registered electrical installation contractors, are demonstrating at their premises at 10, Spring Street, London, W.2, a range of "Val D'or" utility tools for home and workshop use. The demonstration can be seen between 9 a.m. and 6 p.m. daily up to mid-day on Saturday, September 4th.

Owing to the expansion of their business in the manufacture of switchgear and other specialities, Isenthal and Co., Ltd., of Denzil Works, Willesden, are moving to Ducon Works, Victoria Road, North Acton, London, W.3. The manufacture of the firm's resistances and the development of some important new lines will also benefit by the improved facilities.

Capt. H. Belbin, until recently managing director of Belbin and Bowden, Ltd., has been appointed manager of the Beko Lamp Co., Ltd., Fitzalan House, Arundel Street, London, W.C.2. Capt. Belbin has just returned from a visit to the Continent and wishes to get in touch with firms or agents interested in non-combine electric lamps of high quality.

Worksop Municipal Trading.

Criticisms of Electricity Committee's Wiring and Appliance-hiring Policy.

BREEZES of an electrical nature, but not of the cooling kind, were aroused at the last meeting of the Worksop U.D.C. when Mr. H. Hartland, chairman of the Electricity Committee, said that as the result of criticisms of the committee's policy in respect to wiring and the hire of electrical appliances, a sub-committee had been appointed to investigate the matter.

Mr. John White, who pointed out that the district fund had had to supply a deficiency of £3 388 on the year's working of the Electricity Department, said the account for the purchase of electrical appliances for hiring purposes amounted to £4 000. He found that they were purchasing, out of the ratepayers' money, such things as electrical marcel wavers for letting out to the barbers of the town, a large number of electrical ironers, washers, wringers and kettles. He would say that there was some bad management somewhere and there should be a radical change.

Mr. J. Weaver said it was known that shopkeepers could get better value from the Council in domestic appliances than they could if they bought them through the trade.

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LEGAL INTELLIGENCE.

Further B.T.-H. Lamp Patent Litigation—Two Injunctions Granted.

IN the Vacation Court last week, Mr. Justice Fraser had before him the action of the British Thomson-Houston Co., Ltd., *v.* H. Walker and Co., on a motion to restrain the defendants from infringing two of plaintiffs' patents, viz., the leading in wire, and the gasfilled lamp.

Mr. Geoffrey Tookey, for the plaintiffs, said that no appearance had been entered by the defendants, and they were not represented in Court.

His lordship granted the injunction asked for.

An injunction was also granted in a motion by the same plaintiffs against the Expert Electric Fittings Co., Ltd., Mr. Tookey stating that it was a similar action to the previous one, and that there was no appearance entered by the defendants.

A House Wiring Point.

In the Arundel County Court recently before Judge Moore Cann, Edward and Beatrice Martin, 37, South Terrace, Littlehampton, sued the Sussex Electricity Supply Co., Ltd., for £4 17s. damage alleged to have been caused by the company's employees while wiring the premises.

For plaintiffs it was stated that the sum sued for was incurred in putting the house in order after the wiring had been done. For the defence it was contended that it was not the practice of electricians to make good after the wiring was completed, and particularly it was not done in this case owing to an understanding that the house was to be redecorated.

Judgment was given for plaintiffs for the sum claimed, with costs.

The Irish Patent Case.

Referring to the recent patent action brought by the British Thomson-Houston Co., Ltd., against Litton and Co., of Dublin, in which the Judge decided that patent rights granted in Great Britain to a British firm do not extend to the Irish Free State, and to the B.T.-H. Co.'s appeal lodged in the Supreme Court, the "Irish Electrician" states that the congestion in that Court is so great that the appeal cannot be heard this session.

A Generous Offer.

Reader Prepared to Present 65 Bound Volumes of "The Electrician" to Libraries.

HEARING of the opening of the Reception Room at Bouverie House, one of our very good friends, Mr. J. W. Kempster, of Greenock, kindly offered to give us bound volumes of THE ELECTRICIAN, from Vol. VIII (1881) to Vol. LXXVI (1916) inclusive, for the convenience of any of our readers who might wish to refer to them. As there was already a complete set of THE ELECTRICIAN files available in our Reception Room we were unable to take advantage of this generous offer, except for Vols. LXXIII to LXXVI, which were needed to complete a second set, and these volumes Mr. Kempster is sending us without charge in view of the great interest he has derived "from reading THE ELECTRICIAN during many past years."

Still desirous, however, of disposing of the remaining 65 volumes for the common good, Mr. Kempster has very kindly offered to present them to a technical or other library which requires these valuable books, but is unable to obtain them owing to their rarity and high market value.

Librarians wishing to acquire the whole or a part of this collection are asked to apply in writing to Mr. Kempster, c/o The Editor, THE ELECTRICIAN, Bouverie House, Fleet Street, London, E.C.4, stating the volume or volumes required. These applications will be forwarded to Mr. Kempster, who will decide upon their final allotment.

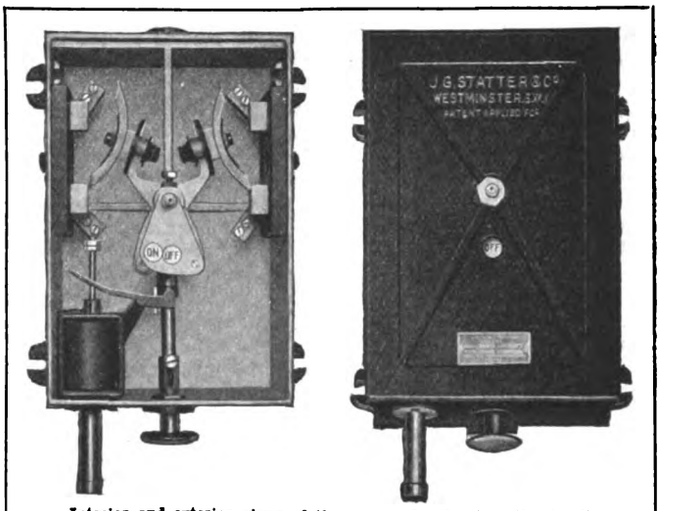
A leaflet entitled "Aids to Better Reception," and a price list of a complete range of radio measuring instruments are to hand from the Sifam Electrical Instrument Co., 95, Queen Victoria Street, London, E.C.4. The former publication gives many useful hints and diagrams, and the latter contains details of S.I.F.A.M. pocket voltmeters, moving iron instruments, moving coil instruments and extra high resistance voltmeters.

CIRCUIT BREAKERS.

A New Enclosed Protective Device for Power Services.

THE two illustrations below show, respectively, an interior and an exterior view of a new enclosed automatic circuit breaker which has been introduced on to the market by J. G. Statter and Co.

It is intended to deal with small currents up to 75 A at 440 V, and has a breaking capacity of 100 kW. It is made for use on either a.c. or d.c. circuits, is double pole, and has



Interior and exterior views of the new enclosed automatic circuit breaker described above.

laminated brushes. The millivolt drop across contacts is 4, or 8 mV for both poles.

A no volt release only is shown in the illustration, but space for an overload trip coil is left in the right-hand lower corner of the box, and is fitted where required. Alternatively, two overload trip coils can be fitted.

The design is adapted for small power or lighting services, and the breaker has already been supplied for central station service. The standard B.E.S.A. range of calibration is given on the overload trip.

We understand that mass production is being organised by the manufacturers to enable the breakers to sell at prices little in advance of those current for switch fuses of the pull-push or similar types.

Electric Vehicles.

Interesting Working Results at Glasgow—Municipal Fleet to be Largely Extended.

VERY favourable opinions on electric vehicles for the collection and removal of refuse are expressed by Mr. W. Grieg, Superintendent of Cleansing at Glasgow, in his report for the year 1925-6.

The department employs 23 electric vehicles, petrol vehicles having been found more expensive to run than either horse or electrically-propelled vehicles.

At Glasgow, electric traction, while costing more than horse haulage within a radius of 1¾ miles, has given very satisfactory results beyond that distance, both as regards reliability and economy. At present the electric vehicles require a loader and packer in addition to the driver, which method adds considerably to the cost. In the case of horse vehicles, however, the driver assists in the work of loading and packing the wagons.

In the near future the fleet of electric vehicles will be largely extended, in order to meet the requirements of the new power station at Govan, at present in course of erection.

The erection of the new refuse power works at Govan proceeds steadily, and good progress is being made. In consequence, however, of the extra work required, due to difficulties encountered with the foundations, and to the alterations consequent upon the Committee acting upon the advice of the Electricity Commissioners to instal 50-cycle plant, with frequency changers, instead of 25-cycle plant as originally contemplated, the opening of the new station will be considerably delayed.

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SMOKE ABATEMENT.

Notable Electrical Exhibits at Forthcoming Birmingham Exhibition.

THE steady progress through both Houses of Parliament of the Government Bill to combat the smoke nuisance gives added importance to the expert demonstrations to take place at the Universal Smoke Abatement Exhibition opening in Birmingham on September 6th. These demonstrations, which will continue for a fortnight, show the remarkable advances recently made in the scientific application of new methods towards the elimination of polluting substances emitted from the chimneys of both factory and home.

Among the more notable exhibits will be a large industrial boiler-house which is believed to be practically perfect from the points of view of efficiency, fuel economy, labour-saving and elimination of smoke. No fewer than twenty prominent manufacturing firms in Great Britain have co-operated in the creation of this model boiler-house. While one famous firm provides boilers, another supplies mechanical stokers, a third the pulverising machinery; others have installed the latest types of flue dust collectors, fuel economisers, super-heaters coal and water meters, coal-weighing apparatus, water softening plant, packings, furnace arches, instruments and accessories of various kinds. This exhibit, occupying an area of approximately 100 ft. by 60 ft., has been planned to give a thorough working demonstration, as a whole, of the most approved methods of securing maximum power at minimum cost, and with the least possible waste in the form of smoke.

Other important exhibits in the Industrial Section show the latest improvements in the applications of electricity for power purposes, and there will also be many demonstrations of new devices and apparatus in connection with heat production generally.

Pen Nibs by Electricity.

There will be on view for the first time an electric furnace for hardening and annealing pen nibs, of which Birmingham provides three-quarters of the world's supply. This is the very latest development in pen manufacture, and supersedes the open hearth process hitherto employed, in which there is necessarily much wastage and pollution through smoke.

Kilning china by electricity is a new process of special interest, and another new feature is the introduction of underfeed stokers which automatically powder the coal so that ashes and smoke are virtually eliminated in raising steam to provide electricity for all purposes.

It is significant that the Domestic Section is on a similarly extensive scale, and will include the most modern appliances for lighting, heating, cooking and hot water supply.

The Exhibition, which will remain open until September 18th, has been organised under the auspices of the Smoke Abatement League of Great Britain, and is held under the patronage of thirty of the leading societies and institutes which have interests in common with those of the League. Many authorities will take part in the conferences to be held concurrently at Bingley Hall, Birmingham, the largest centrally-situated permanent exhibition building outside London. The subjects for debate cover all phases of scientific research, invention and proposed legislation having for their objects the securing of a cleaner, brighter atmosphere in the interests of efficiency, economy and the national health.

A Good Time Coming!

Electrical Engineers to be as Prosperous as Bricklayers, says London Magistrate.

LAST week we recorded that in the New York building trades electrical workmen receive $12 daily, while bricklayers are paid $2 more. We are therefore relieved to hear on the authority of a London magistrate that such a shameful state of affairs will not be allowed in this country.

This reassuring statement followed the bringing by a father of his 15-years-old boy to the police court with the complaint that the lad refused to complete his apprenticeship as an electrical engineer. Asked his objection to becoming an electrical engineer, the boy said "I want to be a hotel chef. My foreman says the electrical business is finished."

To which the magistrate replied "That is absolute nonsense. The electrical profession is full of promise. In a few years everything will be done by electricity, and electrical engineers will be as prosperous as bricklayers and bookmakers are to-day."

TRADE PUBLICATIONS.

Details of Catalogues and Dealer-Helps Issued by Manufacturers.

BRITISH Insulated Cables, Ltd., Prescot, Lancs, send us leaflet P. 202 (replacing P. 177) on Prescot jointing compounds. Prices are quoted for compounds suitable for various purposes and for withstanding various temperatures.

Houghtons the Wholesalers, High Holborn, London, W.C.1, have issued a supplement to "Houghton's Radio News," containing particulars of revisions of prices of headphones, loud speakers, valves, anode resistances, valveholders, switches, etc., revisions of discounts, and details of new lines.

Constructors' Steel Equipment, Ltd., Imperial House, Charlotte Street, Birmingham, have sent out list No. 100, giving details of their adjustable steel shelving and containing an illustration of the use of this shelving for the storage of a range of "Belling" fires. List SS10 deals with slotted steel meter and cubicle frames, and illustrates an electric meter rack—on which every meter is in view—installed at the Blackpool electricity works.

A mailing card issued by the Pyrex Engineering Co., Adelaide Buildings, Docks, Cardiff, enumerates the advantages of using Auto-Pyrex fire extinguishers. Type B, it is stated, can be used on all classes of "electrical fires," such as transformers and motors, without turning off the current, the liquid being a non-conductor of electricity and innocuous to the most delicate machinery. Another card from the same firm gives particulars of "Wex" electric arc welding appliances.

The Siemens and English Electric Lamp Co., Ltd., 38-39, Upper Thames Street, London, E.C.4, send us a new catalogue, No. 152, dealing with "Benjamin" reflector fittings. In addition to numerous illustrations, and the prices of the various fittings, the book gives useful information as to the foot-candle intensity required for various industries, and charts which assist in determining the area-intensity or size of lamps and the mounting height and spacing ratios for uniform illumination.

The "Adaptalite" is described in a folder produced by the Wolf Safety Lamp Co. (Wm. Maurice, Ltd.), Star Works, South Street, Park, Sheffield. The "Adaptalite" can be used as an ordinary electric table-lamp, or fixed to almost anything, either by means of a clamp or a rubber suction disc. The latter procedure is adopted to fix the lamp to a mirror or other flat surface. The 1926 model "Maurice-Wolf" nickel cadmium electric mine lamp is described in another folder entitled "Another Addition to a Famous Family."

Gent and Co., Ltd., Faraday Works, Leicester, have issued a new edition of their Bell, Indicator and Accessories Catalogue, Book I, and dealers can obtain it on application. There are special patterns of indicators for liners, mines and hotels, navigation light indicators and duplicate or tandem indicators, staff signal boards, electric bells for various applications, bell transformers, fire alarm accessories, indoor, hall-door and outdoor pushes, burglar or door alarms, switchboard instruments, telephones, insulators, cable clips, wires, cables, cells, etc.

A new catalogue of "Electrical Accessories of British Manufacture" has been issued by the General Accessories Co., Ltd., 125, High Holborn, London, W.C.1. The book is a large and comprehensive one, and amongst new lines with which it deals are shockproof unbreakable cover switches, coloured cover switches, the Genacco automatic switch plug, Expreso sunk 15 A one and two-way switches, wall plug and lampholder adapters, Genac automatic switch wall plugs, three-pin differential wall plugs, Genacco Home Office fuse units, distribution boards, etc. Electrical contractors can obtain the catalogue on application, but purchases must be made through wholesalers.

Ferranti, Ltd., Hollinwood, Lancs, have produced a new pamphlet Wb 401, giving particulars of their AF3 type intervalve transformers, comprising list Wa 401 brought up to date. The first few AF3 and AF4 transformers manufactured had inductances of 50 and 22 henries respectively. These values, however, soon increased to 80 and 28 henries, the higher figures resulting in the impedances mentioned in instruction leaflet Wa 403, which, with pamphlet Wb 401, can be obtained from the company free of charge. These higher inductances and corresponding impedances have caused the amplification curves of the transformers to be even better than those indicated in previous lists, and the new list shows the curve to which each of the company's transformers is guaranteed to comply.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given.

EX-SERVICE MEN'S CLUB, ELTHAM.—Electric light plant, 25 lights. Particulars from Mr. T. W. Goatman, High Street, Eltham.

HAMILTON TOWN COUNCIL.—Electric light installation at new slaughterhouse, Auchinraith. Particulars from the town clerk, Mr. P. M. Kirkpatrick.

NEWCASTLE-UNDER-LYME CORPORATION.—Supply, erection and connecting up of new feeder panel on main switchboard at the electricity works. Specifications, etc., from Mr. A. J. C. De Renzi, borough electrical engineer.

NORTHWICH BOARD OF GUARDIANS, August 27th.—Rewiring London Road hospital. Particulars from Mr. J. C. Smith, the master of the Institution.

DUNDEE TOWN COUNCIL, August 28th.—Electric lighting and heating work at Public Health Institute. Particulars from the Town Clerk, City Chambers, Dundee.

MILLOM URBAN DISTRICT COUNCIL, August 28th.—High-tension and low-tension mains, h.t. switch cubicle, l.t. switchboard, transformers. Specifications from Mr. A. Lawrence, Council Offices, Millom, Cumberland; deposit £1 1s.

DUBLIN CORPORATION, August 30th.—Supply of single phase and three-phase meters and slot meters for one year. Specification from the City Electrical Engineer, Fleet Street, Dublin; deposit £1 1s.

EDINBURGH ASSOCIATION FOR THE PROVISION OF HOSTELS FOR WOMEN STUDENTS, August 30th.—Electric light and power installations at two hostels at Craigmillar Park, Edinburgh. Specifications from Mr. Frank Wood, architect, 6a, George Street, Edinburgh.

LONDON COUNTY COUNCIL, August 30th.—Electric goods lift and electric service lift at Hackney Institute, Dalston Lane, Hackney. Specifications from the Chief Engineer, L.C.C., Old County Hall, Spring Gardens, London, S.W.1.; deposit £1.

Wiring 50 Houses.

CAERPHILLY URBAN DISTRICT COUNCIL, August 31st.—Electric wiring of 50 houses in course of erection at The Grange, Trecenydd, Caerphilly. Specifications and schedules from Mr. W. C. B. Hillman, electrical engineer, Council Offices, Mountain Road, Caerphilly.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, August 31st.—One 125 kVA transformer (Contract No. 25). Extra high pressure switchgear (Contract No. 29). Specifications from Mr. R. W. Willis, electrical engineer and manager, 37, High Street, Cheadle, Cheshire; deposit £1 1s. for each specification.

DONCASTER CORPORATION, August 31st.—Supply, delivery and erection of one 6 000 kW three-phase turbo-generator, with condensing plant. Specification from Mr. S. R. Windle, Electricity Offices, Greyfriars Road, Doncaster; deposit £2 2s.

DUNOON COTTAGE HOSPITAL, August 31st.—Electric lighting installation. Particulars, the architects, John Burnet, Son and Dick, 239, St. Vincent Street, Glasgow.

GEORGE HERIOT'S TRUST, August 31st.—Electrical installation in connection with the erection of mining laboratories in the Grassmarket, Edinburgh. Specifications from Mr. John Anderson, Superintendent of Works, 20, York Place, Edinburgh.

INDIA STORE DEPARTMENT, London, August 31st.—Supply of 12 000 electric lamps. Specifications from Director-General, India Store Dept., Branch No. 10, Belvedere Road, Lambeth, London, S.E.1.

IRISH FREE STATE DEPARTMENT OF POSTS AND TELEGRAPHS, August 30th.—Automatic and c.b. telephones. August 31st.—Electric light fittings. September 6th.—Paper insulated twin core cable. September 7th.—Enamelled and cotton covered cable.

LIVERPOOL CORPORATION, August 31st.—Supply and installation of closed circuit code-signalling street fire alarm and telephone system. Specification from the Town Clerk.

VENTNOR URBAN DISTRICT COUNCIL, August 31st.—Schemes for electric lighting installation in main Assembly Hall, stage illumination, and lighting of adjacent rooms at Ventnor Town Hall. Particulars from the Surveyor; suggestions and estimates to Mr. James Wearing, town clerk, Town Hall, Ventnor.

SEVENOAKS URBAN DISTRICT COUNCIL, September 1st.—Supply and fixing of electrically-driven syren at the Fire Station, Eardley Road, Sevenoaks. Specification from the Surveyor, Council Offices, Argyle Road, Sevenoaks.

WESTMINSTER (LONDON) GUARDIANS, September 1st.—Electric lamps, fittings and sundries. Tender forms from Mr. W. J. Lickley, Guardians' Offices, Princes Row, Westminster, London, S.W.1.

STEPNEY (LONDON) GUARDIANS, September 2nd.—Six months' supply of electrical fittings, etc. Forms of tender from the Clerk, Raine Street, Old Gravel Lane, E.1. Stamped envelope to be sent.

COVENTRY CORPORATION, September 3rd.—Buildings, foundations and subways; eight 15 000 kW turbo-alternators condensing plant and economisers; eight water-tube boilers, complete with induced draught plant, and chimneys; coal and ash handling plant; switchgear; steam and water pipework; crane; and cooling towers. Specifications, etc., from Mr. Geo. Tough, engineer and manager, Electricity Department, Council House, Coventry; deposit £5 5s.

NORTHFLEET URBAN DISTRICT COUNCIL, September 3rd.—Electric light installation in 88 houses on the Northfleet housing estate. Particulars from the surveyor, Mr. E. Talbot Fox; deposit £1 1s.

SOUTHEND-ON-SEA, September 3rd.—Twelve months' supply (from 5 000 to 8 000 tons) of fuel oil. Particulars from Mr. A. C. Johnson, deputy borough electrical engineer, Electricity Works, London Road, Southend-on-Sea.

GRIMSBY CORPORATION, September 4th.—Supply of 10 000 yd. single way (or equivalent) cable ducts, alternatively of fibre or stoneware. (Specification No. 218.) Supply of about 1 800 yd. paper insulated, lead-covered low tension concentric feeder cable. Specifications from Lt.-Col. W. A. Vignoles, borough electrical engineer, Corporation Electricity Works, Grimsby. (Note.—Tenders only from firms on the King's National Roll.)

CROYDON CORPORATION, September 6th.—Supply of two 50 000 lb. per hour water tube boilers, etc. Specifications from the Engineer and Manager, Electric House, 38, High Street, Croydon.

GRAYS THURROCK URBAN DISTRICT COUNCIL, September 6th.—One 250 kW rotary converter with transformer and high and low tension switchgear; one 500 kW motor converter with high and low tension switchgear. Specifications from the Electrical Engineer, Maidstone Road, Grays, Essex; deposit £1 1s.

LONDON COUNTY COUNCIL, September 6th.—Electrical installation at Hackney Institute, Dalston Lane, Hackney (about 410 lighting and 40 power points, fire alarm bells, domestic telephones, etc. Specifications, forms of tender, etc., from the Chief Engineer, Old County Hall, Spring Gardens, S.W.1; deposit £1 1s.

OLDHAM GUARDIANS, September 6th.—Electric lamps and fittings. Particulars from the Clerk, Mr. F. W. Fletcher.

STOKE-ON-TRENT CORPORATION, September 6th.—Electric light wiring of Fenton Town Hall. Specifications and forms of tender from the City Surveyor.

WARRINGTON CORPORATION, September 6th.—Supply of earthenware conduits to the Electricity and Tramways Departments for 12 months. Specification and form of tender from Mr. F. V. L. Mathias, borough electrical and tramways engineer; deposit £1 1s.

INDIA STORE DEPARTMENT, September 7th.—Two 40 kW d.c. oil engine generating sets, complete with cooling plant, switchgear, cables, etc., for Bhatinda power station. Specifications from the Director-General, India Store Department, Branch No. 14, Belvedere Road, Lambeth, London, S.E.1.

SEDGEFIELD PARISH COUNCIL, September 7th.—Electric lighting of the Parish Hall. Particulars from Mr. F. J. Davison, Clerk to the Sedgefield Parish Council.

STOKE-ON-TRENT CORPORATION, September 7th.—Supply and erection of one 10 000 kW turbo-alternator and condensing plant (contract 2 614); one natural draught cooling tower (contract 2 615); and ironclad l.t. three-phase switch-

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gear (contract 2 616). Specification, etc., from the City Electrical Engineer, St. George's Chambers, Wolfe Street, Stoke-on-Trent; deposit £2 in respect of each contract.

BERMONDSEY (LONDON) GUARDIANS, September 8th.—Six months' supply of electric lamps. Form of tender (No. 68) from Mr. Hy. H. Reeve, Clerk to the Guardians, 283, Tooley Street, S.E.1. Stamped envelope to be sent.

HOLBORN (LONDON) GUARDIANS, September 8th.—Electrical fittings during six months from October 1st, 1926, to March 31st, 1927. Tender forms from Mr. C. J. Cross, 53, Clerkenwell Road, London, E.C.1, after August 23rd.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., September 10th.—Electric wiring in steel conduit at Edinburgh Castle. Specification, etc., from the Architect, H.M. Office of Works, 122, George Street, Edinburgh; deposit £1 1s.

INDIA STORE DEPARTMENT, September 10th.—Supply of power station switchgear and auxiliary plant, in connection with Great Indian Peninsular Railway electrification. Specification (£1) from the Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1.

INDIA STORE DEPARTMENT, September 10th.—One 300 kW d.c. steam driven electric generating set, with boiler, condenser, cooling tower, auxiliaries, switchboard, etc., for Peshawar Cantonment power station. Specifications (5s.) from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1.

STAINES GUARDIANS, September 11th.—Electric light installation in part of the Infirmary, London Road, Ashford, Middlesex. Specification from the Master of the Institution.

TUNBRIDGE WELLS TOWN COUNCIL, September 11th.—Two water tube boilers, superheaters, economisers, mechanical stokers, forced and induced draught plant, steel stack, overhead coal bunkers, coal elevator and conveyors, and truck tippler. Specifications from Mr. R. N. Torpy, borough electrical engineer.

LONDON COUNTY COUNCIL, September 13th.—Three water tube boilers, with auxiliaries. Specifications from General Manager, L.C.C. Tramways, Victoria Embankment, London, W.C.2; deposit £3.

ST. MARYLEBONE (LONDON) BOROUGH COUNCIL, September 13th.—Supply and fixing of electric overhead runway for removing house refuse from storage pit to screening plant. Particulars from the Borough Engineer, Town Hall, Marylebone Road, London, N.W.1.

INDIA STORE DEPARTMENT, September 17th.—One 5-ton travelling electric jib crane. Specification and form of tender (5s.) from the Director-General, Branch No. 14, Belvedere Road, Lambeth, London, S.E.1.

HALIFAX CORPORATION, September 18th.—Wiring 58 houses in Nursery Lane. Particulars from the Borough Engineer, deposit £2 2s.

BIRMINGHAM CORPORATION, September 21st.—Supply, delivery and erection of plant for refuse disposal and salvage works. Specifications from the Superintendent, Salvage Department, 161, Corporation Street, Birmingham; deposit £1 1s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

CITY ELECTRIC LIGHT CO., LTD., BRISBANE, August 27th.—Supply, delivery and erection of one 12 000 kW turbo-alternator. (Reference A.X. 3 085.)

NEW ZEALAND RAILWAYS DEPARTMENT, August 30th.—Supply of slip ring induction 400 V 50 cycle three-phase motors and starters. (Reference B.X. 2 561.)

DEPUTY-DIRECTOR OF POSTS AND TELEGRAPHS, MELBOURNE. August 31st.—Telegraph equipment (schedule C. 109) Reference B.X. 2 653.)

PERNIK STATE COAL MINES, BULGARIA, September 1st.—Electricity generating plant, consisting of two 4 000 kW steam turbo-generator sets, buildings, etc.

VICTORIAN RAILWAY COMMISSIONERS, September 1st.—Equipment for automatic control of two rotary converters at Seaford sub-station.

VICTORIAN RAILWAY COMMISSIONERS, September 1st.—Automatic sub-station equipment (contract No. 39 287), for Elwood sub-station. (Reference B.X. 2 598).

SOUTH AFRICAN RAILWAYS AND HARBOURS, September 2nd.—Electro-pneumatic working of points and day colour light signalling, with alternative current track circuits, in connection with the electrification of the Cape Town suburban railways. Specifications, etc., from the Office of the High Commissioner for the Union of South Africa, Trafalgar Square, London, W.C.2, or from the Chief Railway Storekeeper, Park Station Chambers, Johannesburg; deposit £5 5s.

INDIAN STORES DEPARTMENT, SIMLA, September 6th.—Two 40 kW 240/480 V d.c. three-wire oil engine generating sets. (Reference B.X. 2 782.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, September 6th.—Supply of 66 000 V oil circuit breakers for Barren Jack hydro-electric scheme. (Reference B.X. 2 749.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 7th.—Synchronous condenser for Arapuni power scheme, section 165. (Reference B.X. 2 665.)

DUNEDIN (N.Z.) CORPORATION, September 8th.—(i) Reaction water wheel for direct connection to a.c. generator; (ii) one 3 000 kW, 6 600 V, 50 cycle generator; (iii) four 1 000 kW 6 600/20 000 V 50 cycle transformers; (iv) switchboards, oil-break switches, disconnecting switches, voltmeters, ammeters and wattmeters, current and potential transformers, etc. (Reference B.X. 2 654.)

INDIAN STORES DEPARTMENT, SIMLA, September 14th.—Steam raising plant, feed pumps, oil separator, cooling tower, 300 kW, 440/520 V, steam engine driven d.c. generating set, complete with condensing plant; switchboard and connecting cables and accessories for Peshawar (Cantonment) Power Station. (Reference 20 816/1926.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, September 14th.—Telephonists' telephones and handsets. (Reference B.X. 2 696.)

CAPE TOWN ELECTRICITY DEPARTMENT, September 15th.—Supply of cables. (Reference B.X. 2 802.)

CONSTANTZA (ROUMANIA) PORT ADMINISTRATION, September 15th.—Supply and erection of eight electric portal cranes. (Reference A.X. 3 399.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 15th.—Supply and installation of electricity distribution system for the town of Luxor, including 6 830 metres of h.t. and 1 210 metres of l.c. armoured cable, 6 transformer cabins, 12 transformers (from 10 to 50 kVA), copper cable, poles, cable boxes, cut-outs, insulators, lamps, etc. (Reference B.X. 2 737.*)

JOHANNESBURG COUNCIL, September 18th.—Underwriters' wire. (Reference B.X. 2 766.) Supply of 6 600 V truck-type ironclad switchgear panels. (Reference B.X. 2 767.)

SYDNEY CITY COUNCIL, September 20th.—One h.t., d.c. Kenetron valve testing set for underground cables. (Reference B.X. 2 748.)

POSTS AND TELEGRAPH DEPARTMENT, MELBOURNE, September 21st.—Switchboard keys, and parts (schedule 26/720). (Reference B.X. 2 699.)

JOHANNESBURG COUNCIL, September 23rd.—Switchboard-type overload relays. (Reference B.X. 2 809.)

AUCKLAND ELECTRIC POWER BOARD, September 27th.—One 14-ton electrically-operated crane. (Reference A.X. 3 415.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 28th.—Three motor-driven low lift pumps with control apparatus, for Taieri drainage scheme. (Reference A.X. 3 274.)

NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMWAYS (CHIEF ELECTRICAL ENGINEER'S BRANCH), September 29th.—One drag link ash conveyor. Reference A.X. 3 432.)

VICTORIAN GOVERNMENT RAILWAYS, September 29th.—Two motor-driven disc grinding machines and necessary equipment. (Reference A.X. 3 433.)

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, October 4th.—Pole oil switches. (Reference B.X. 2 795.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 5th.—Supply of one four-motor overhead travelling crane and tramway for the Waikaremoana Electric Power Development, Section 30. (Reference A.X. 3 517.)

POSTS AND TELEGRAPH DEPARTMENT, MELBOURNE, October 5th.—Switchboard cords (schedule No. 115). (Reference B.X. 2 747.)

NEW PLYMOUTH (N.Z.) HARBOUR BOARD, October 16th.—Supply delivery and erection of 30-cwt. portal electric horizontal luffing jib crane, fittings and accessories. (Reference A.X. 3 458.)

SYDNEY COUNCIL, October 18th.—Two 100 ton electrically-operated overhead travelling cranes. (Contract 1 033. Reference A.X. 3 467.)

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CHRISTCHURCH (N.Z.) DRAINAGE BOARD, October 19th.—Supply and erection of three sets of electric centrifugal pumping plants (contract 26 329). (Reference A.X. 3 215.*)

VICTORIAN GOVERNMENT RAILWAYS, October 20th.—Supply and delivery of rail motor equipment. (Contract No. 39 614. Reference A.X. 3 449.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Telephone plugs and sleeves. (Schedule C.120.) (Reference B.X. 2 799.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Lamps, lamp caps, and lamp sockets. (Schedule C.124.) (Reference B.X. 2 800.)

SYDNEY ELECTRICITY DEPARTMENT, November 1st.—Supply, delivery, erection, setting to work, testing and maintenance at Bunnerong power station of boiler feed pumps. (Reference A.X. 3 470.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Supply of 110 000 V transformers for Waikaremoana power scheme, section 17. (Reference B.X. 2 744.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Indoor control gear and switchgear for Waikaremoana electric power development (section 14). (Reference B.X. 2 675.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone transformers. (Reference B.X. 2 797.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 23rd.—Lightning arresters and transformers. (Referenc B.X. 2 792.)

Tenders Accepted.

MIDLAND TRIBUNE OFFICE, BIRR.—V. Powell, alterations to electrical plant.

NEWMILNS CORPORATION.—James Laird and Co., wiring 24 houses for electric light, £114.

LORETTO HALL AND DOMINION COLLEGE, DUBLIN.—Hadens, Ltd., electric light installation work.

GOVERNOR-GENERAL'S RESIDENCE, DUBLIN. — Brooks, Thomas and Co., Ltd., electric generator.

DUBLIN BOROUGH COMMISSIONERS.—Ferguson Pailin Ltd., h.t. switchgear for Pigeon House and Fleet Street Stations, £11 305.

LETTERKENNY COUNCIL.—Blackstone and Co., engine, £2 830; Metropolitan-Vickers Electrical Co., Ltd., switchgear, £385; J. McAuley, erection of overhead distribution system, £2 220 (all provisionally accepted).

MANCHESTER CORPORATION.—Supplies to the Electricity Department until June 30th next: Adhesive tape—Connolly's (Blackley), Ltd. Batteries, dry—Every-Ready Co. (Great Britain), Ltd. Box compound and bittite tape—British Insulated Cables Ltd. Cable covers and tiles, S. H. Bonsall, Cheadle Heath; Callender's Cable and Construction Co., Ltd.; Doulton and Co., Ltd.; J. and R. Howie, Ltd.; Isherwood Bros., Ltd., and G. Woolliscroft and Sons, Ltd. Composition and plastic magnesia—Sutcliffe Bros. and Bryce, Ltd. Dynamo brushes—F. W. Potter and Co. Earthenware pipes—Doulton and Co., Ltd., and J. Place and Sons, Ltd. Anti-sulphuric enamels—Griffiths Bros. and Co., Ltd. Fuse boxes—W. T. Henley's Telegraph Works, Ltd., Scholes and Jagger, Ltd., Siemens Bros. and Co., Ltd. and Sykes and Dyson, Ltd. Rubber goods—L. Andrew and Co.; C. Macintosh and Co., Ltd.; G. Maclellan and Co., Ltd.; Mica Manufacturing Co., Ltd.; D. Moseley and Sons, Ltd.; North British Rubber Co., Ltd., and J. Walker and Co., Ltd. Insulating cloth—E. Macbean and Co., Ltd. Insulators—Doulton and Co., Ltd. Gaskell and Grocott; J. Macintyre and Co., Ltd., and Metro-Vick Supplies, Ltd. Recorder paper—Erskine, Heap and Co., Ltd.; Service boxes—Forrest and Sym; Hardy and Padmore, Ltd.; J. Needham and Sons, Ltd.; Siemens Bros and Co., Ltd., and Sykes and Dyson, Ltd. Auto-transformers and auto-balancers—British Electric Transformer Co., Ltd., and J. G. Statter and Co. Trifurcating boxes—British Insulated Cables Ltd.; Forrest and Sym; Sykes and Dyson, Ltd., and Vono Co. Tubing, etc.—Simplex Conduits, Ltd. Wires—London Electric Wire Co. and Smiths, Ltd. Wire, tinned steel binding—W. N. Brunton and Son. Wire, pure tin fuse and pure tinned copper—Berry's Electric, Ltd., and Concordia Electric Wire Co., Ltd. Tapes—Callender's Cable and Construction Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Hirst, Ibbetson and Taylor, Ltd., and Metro-Vick Supplies, Ltd.

I.E.E. STUDENTS.

Interesting Visits to Works During Summer Tour in Belgium.

BELGIUM and Luxembourg were chosen by the Students' Section of the I.E.E. for its summer meeting this year, and a party of 31 student members left London on July 31st for Brussels. Four days were spent here, and visits made to various engineering works. The Sunday morning was free, the afternoon being spent in a motor trip to the battlefield of Waterloo.

On the Monday morning a short lecture was given by Mr. A. Pescatore, at the offices of the Bureau d'Études Industrielles, on "The Position of the Electrical Industry in Belgium at the Present Time." From Brussels the party visited the

This group of members of the I.E.E. Students' Section and their hosts was taken during the Summer Meeting referred to on this page.

works of the Ateliers de Constructions Electriques, at Charleroi, of which only a small portion was seen, namely, the power and telephone cable shop and the heavy machinery shop.

At Gand the morning was spent at the Anciens Ateliers Vanden Kerchove, makers of "Uniflow" steam engines, turbines and Diesel engines. Part of the afternoon was spent in sight-seeing, and the remainder at the power station of the Centrales Electriques des Flandres.

On the Wednesday the party motored to Antwerp, via Malines, where a short time was spent viewing the cathedral. The works of the Bell Telephone Manufacturing Co. were visited at Antwerp.

Practical Interconnection.

On the fifth morning the party left Brussels for Luxembourg, the journey being broken at Liège, where three visits were made, Union des Centrales Electriques, Charbonnages de Wénster and the steelworks Ougrée Marihaye. The visit to the Union des Centrales Electriques was very interesting, as there does not seem to be a similar concern in England. All large works in the neighbourhood of Liège which generate their own electric power are interconnected and by means of diagrams and similar devices the operator at the Union des Centrales Electriques is able to see if any works at any instant is supplying power to or receiving power from the system.

Luxembourg was reached late on Thursday evening and the whole of Friday was spent at the works of the Aciéries Réunies de Burback-Eich-Dudelarge at Esch. This is one of the largest continental steelworks, the output exceeding two million tons per year. Here the whole process of making steel was seen, the A.R.B.E.D. having their own iron ore mines. The party was entertained to lunch by the firm, and was welcomed by Mr. A. Kipgen, one of the company's directors.

Saturday morning was spent in Luxembourg, the offices of the A.R.B.E.D. being thrown open to the party for inspection, and in the afternoon the party returned to Brussels. A farewell dinner was held in the evening, at the conclusion of which a presentation was made to the hon. secretary by the members of the party. London was reached on the Monday evening after a most enjoyable week.

The Committee wishes to thank all the firms for their courtesy and hospitality, especially Mr. Pescatore for his help in arranging the programme, and last, but not least, Messrs. T. Cook and Son and Mr. Andrews for the travelling arrangements.

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ELECTRICITY SUPPLY.

Two Proposed Changes in Systems—The Electricity Commissioners' Final Word to Southend—"On the Ground Floor" at Chiswick?

LLANDILO R.D.C. is seeking powers to supply electricity in the parish of Llandebie.

Bridport T.C. is applying for an Order to supply electricity in the town and surrounding districts.

Saddleworth U.D.C. is considering the question of obtaining a supply of electricity for the district.

Richmond-on-Tees T.C. has decided to borrow £743 to cover the cost of public lighting by electricity.

The Electricity Commissioners have approved the electricity scheme of Bethesda U.D.C., which is estimated to cost £7 255.

The head offices of Belfast Electricity Department are being extended, and a substation is being erected at Dunville Park.

Bury St. Edmunds T.C. has received sanction to a loan of £4 050 for extension of the boiler-house plant at the electricity works.

Uxbridge R.D.C. has received an offer from the local Electric Light Co. for the supply of electricity to new houses at Moorhall, Harefield.

Newton Abbot R.D.C. has consented to the erection of overhead power lines from Kingsteignton to Bishopsteignton by the Teignmouth Electric Light Co.

New Transformer Stations.

Transformer stations are to be erected by Nottingham Electricity Department in Carrington and Radford. Tenders have been invited for the construction work.

Limerick Corporation proposes to augment its supply of electricity by taking a supply from the temporary power station at the site of the Shannon Works, Ardnacrusha.

Stirling T.C. has decided to give a supply of electricity to the War Department at Stirling Castle on a guarantee for ten years of £300 per annum. The cost of the extension will be £917.

A special meeting of Ripon City Council is to be held to consider the question of applying for a Special Order to supply electricity in the city and parts of Ripon and Wath rural districts.

The Cookham and District Electricity Supply Co. having received the sanction of the Electricity Commissioners to erect overhead cables, Cookham R.D.C. has withdrawn its objection.

The Electricity Commissioners have informed Strood R.D.C. that, following a local inquiry, they will not further consider the application of Gravesend Corporation for power to extend its mains into villages.

Application has been made by the Derbyshire and Nottinghamshire Electric Power Co. for a Special Order to authorise the company to supply and distribute electricity to a number of districts in East Nottinghamshire.

A Dronfield Scheme.

A deputation from Dronfield U.D.C. is to submit to the Electricity Commissioners a scheme for the supply of electricity in the district. The deputation has been instructed to inform the Commissioners that the Council is not prepared to hand over its electricity supply powers to Sheffield.

Dorking R.D.C. has decided to approve the application of the Leatherhead and District Electricity Co., Ltd., for an Order to supply in the rural district. Edmundson's Electricity Corporation, Ltd., who run the Dorking electricity works, have also applied for an Order for the area.

Minehead U.D.C. has consented to the proposal of Minehead Electric Supply Co. to change the system of supply in the town from the present 2-wire d.c. system at 220 V, to the 3-wire d.c. system at 220 and 440 V, subject to the change being carried out in accordance with the Electricity Commissioners' conditions.

The Notting Hill Electric Lighting Co., Ltd., has applied for the consent of the London County Council to an alteration in the company's supply to a 230/400 V, 50 cycles, three-phase four-wire system. Any objections must be sent to the Clerk, London County Council, County Hall, Westminster Bridge, S.E.1, before September 20th.

The Electricity Commissioners have sanctioned the borrowing by Southend Corporation of £10 000 (for a 750 kW M.A.N. Diesel engine and subsidiary plant), on account of the estimated sum of £13 485, on condition that the Council completes the scheme recommended by Mr. Rider or takes a supply in bulk for the borough's future requirements. The Commissioners will not consent to the installation of any additional generating plant at the Corporation's existing generating stations.

In reference to the arrangement to transfer part of Duke's Meadow, Chiswick, to the London and Home Counties Joint Electricity Authority as a site for an electric power station, the Chiswick Civic Association has passed a resolution asking the Chiswick U.D.C. to endeavour to secure conditions that no more than the proposed 45 acres shall be taken by the Authority at any future time, that precautions should be taken to prevent the scattering of dust and grit from the works, that a toll of, say, 6d. per ton on materials carted in or out of the works should be charged for upkeep of the roads, and that a special concession should be made to Chiswick in regard to charges for electricity.

The alleged action of West Ham Corporation in discontinuing electricity supply during the general strike was mentioned when an inquiry was held on behalf of the Electricity Commissioners into the Corporation's application for an extension of its generating station. Sanction was also asked for a loan of £130 826. Mr. Tyndal Atkinson, for the Port of London Authority, who are the largest single electricity consumers in West Ham, said their supplies were cut off during the strike. He warned the Corporation that it might be possible when the agreement came to an end in 1932 for the P.L.A. to make arrangements for generating their own energy. Opposition to the application was offered on behalf of the West Ham Electricity Power Users' Association by Mr. S. E. Baker, who said they were not in favour of the extension unless the Corporation was willing to give an undertaking that the obligation into which it had entered to supply electrical energy to users should be faithfully discharged. The inquiry then closed.

Special Orders.

The Minister of Transport proposes to confirm the Electricity Supply Special Orders granted to the following applicants, and objections must be sent to the Ministry of Transport by the dates given in parentheses:—(1) Norwich Corporation, for North Walsham urban and parts of Aylsham, Blofield, Forehoe, Henstead, Loddon and Clavering, Mitford and Launditch, St. Faith's, Smallburgh and Wayland rural districts (September 11th); (2) Brynamman and District Electric Supply Co., Ltd., for Cwmamman urban district and parts of Llandilo Fawr and Pontardawe rural districts, (September 11th); Dr. J. A. Purves, for Bampton urban district (September 11th); Torpoint Electric Supply Co., Ltd., for Saltash urban and St. Germans rural districts (September 15th); Fife Tramway, Light and Power Co., Ltd., for the burghs of Anstruther Easter, Anstruther Wester, Auchtermuchty, Crail, Culross, Cupar, Earlsferry, Kilrenny, Newburgh and Pittenweem, Elie, Ladybank, Newport and Tayport, and numerous parishes in other parts of the county of Fife (September 11th).

Electro-Deposition of Rubber.

Applications of a New Process for Direct Deposition on Metals and Fabrics.

DESCRIBING a new process for the electro-deposition of rubber in the latest volume of the abridged scientific publication of the Research Laboratories of the Eastman Kodak Co., Messrs. S. E. Sheppard and L. W. Eberlin state that in addition to direct deposition on metals, whereby a variety of applications in finishing, covering, and decorating articles is possible, the process can be used to deposit rubber on non-metallic supports. This may be done by impregnating the non-conductor, when porous or permeable, with electrolyte, and connecting this electrolytically with the anode, or in certain cases by graphitising or metallising the non-conductor.

This procedure can be used in particular for the production of rubber articles by electrode deposition upon collapsible forms, and for the electro-deposition of rubber upon closely woven fabrics, and the impregnation of more open weave fabrics.

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NEWS IN PICTURES

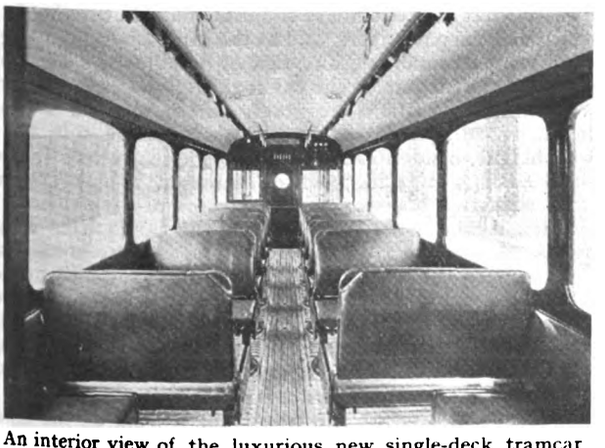
Mr. Alfred E. Terry, a director of Herbert Terry and Sons, Ltd., of Redditch, whose death is announced at the age of 53 years (p. 241). He had travelled extensively.

Mr. David Sarnoff, vice-president of the Radio Corporation of America, who is visiting this country, was caught listening-in at the Savoy Hotel on Monday. Details of Mr. Sarnoff's interesting career are given on p. 241.

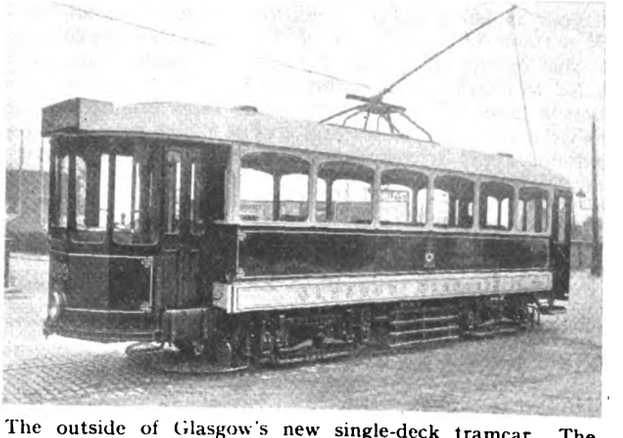
Mr. W. Fennell, general manager and engineer of the Mid-Cheshire Electricity Supply Co., Ltd., was responsible for interesting rural supply developments (p. 233).

This very creditable display was made by the Sussex Electricity Supply Co., Ltd., in the Littlehampton Carnival last week. The slogan has a topical flavour.

The Ashton Co-operative Society's all-electric bungalow, which was viewed by 14 000 people during the fourteen days in which it was open to the public.



An interior view of the luxurious new single-deck tramcar which is being introduced on the Glasgow Corporation Tramways. Particulars of the construction and equipment of the car are given on page 252.



The outside of Glasgow's new single-deck tramcar. The platforms are fitted with double exits, the passengers entering at the front and leaving at the rear, or vice versa whichever way is most desirable.

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WIRELESS NEWS.

Wireless Receiving Sets and Loud Speakers Built into Furniture.

THE latest radio innovation is the wireless receiving set and loud-speaker built into an armchair, which we illustrate below by the courtesy of the "North Mail and Newcastle Daily Chronicle." Invented by Mr. E. O. Walton, of Newcastle, the wireless chair is being demonstrated by Robsons, Ltd., of Northumberland Street, Newcastle. A three valve receiver is concealed inside the back portion of the chair, but is shown open in the picture, and in use the only visible portion of the apparatus is the loud-speaker mounted on top of the chair-back. There are no aerial or earth connections and the set is switched on by the mere act of sitting down in the chair.

This "wireless chair" has just been introduced in Newcastle-on-Tyne.
—("North Mail" photo.)

Anglo-Australian Wireless Rates.

A Melbourne correspondent of the "Daily Telegraph" states that in commercial and other circles in that city it is regarded as important that action be taken immediately to prevent the charge for messages between England and Australia by beam wireless being fixed on too high a scale. It is also stated that negotiations are proceeding between the Australian and British postal authorities, and apparently an endeavour is being made to fix the charges behind closed doors without any discussion in Parliament or consultation with the interested parties. It is understood that it is intended to charge 2s. per word for full-rate messages. The opinion is held in Melbourne that the rates originally fixed, which were based on the capital cost of a high-power station, should not apply to beam stations costing a much smaller amount.

Wireless News in Brief.

According to "Amateur Wireless," the horn-type of loud speaker is gradually disappearing from the American market, and the cone speaker, originally a European invention, is the favourite in America to-day.

The B.B.C. desires to make it clear that the wavelengths under the new allocation scheme, which come into operation in mid-September, are provisional, and that alterations will be made, if necessary, after the proposed scheme has been given a fair trial.

A special feature of the Radio World's Fair to be held in New York in September will be the erection and equipment of a transmitting station, costing less than £8, by New York amateurs. The apparatus will be assembled on September 13th in the presence of visitors, and the power of short waves to carry code messages from continent to continent will be demonstrated.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

TO deal with massed traffic during peak hours, the Metropolitan Electric Tramways are experimenting with coupled tramcars.

The revenue of the Launceston (Tasmania) tramways during the year ended June, 1925, was £50 400, and the surplus was £5 649, against £7 731.

The movement to form a local trade union for Glasgow tramway employees is said to be making progress, over 200 members having been already secured.

In face of very considerable engineering difficulties the new Tooting Broadway station on the "Underground" Morden extension was built on what was virtually a subterranean pool.

A net profit of £22 959 was made by the Birkenhead tramways and omnibuses during the year ended March last, and £21 286 has been contributed to relief of rates, compared with £19 500 last year.

St. Helens Tramways Committee has decided to run trackless trolley vehicles on the route between Prescot and the Asylum Gates, Rainhill, and the tramway rails on that route are to be taken up.

Aberdeen Corporation has repudiated liability for the Aberdeen Suburban Tramways Co.'s claim of over £30 000 for damage alleged to have been caused to the company's track in connection with the construction of a new aqueduct.

During July 345 suggestions were submitted by the staffs of London's "Underground," and of these 32 will be adopted. The successful suggestions included a self-locking clamp for boiler tube caps and an improved method of covering car lighting wires and 'bus lines.

An Anti-Jarring Device.

An anti-jarring device made by the Kilmarnock Engineering Co. is to be introduced shortly on the Monifieth (Dundee) tramway route. One portion of the shock receiver is fitted to the under-frame of the main body of the car, while the other end is supported by heavy iron strips fixed to the motor case. Any tendency of the car to swing is transferred to a special lever in the spring.

The L.N.E. Railway is about to instal colour light signals on its main line from Eryholme Junction to Black Banks North signal box, near Darlington. Three out of five signal boxes on this section of line will be dispensed with, so that the economy in working will help to set off the capital expenditure.

Following the threat by employees to withdraw their services on Bolton tramways and 'buses in consequence of reduced rates of pay which it is proposed to offer to new entrants into the service, Mr. J. Barnard (manager) says the Corporation has learned from experience that the terms offered to new entrants are adequate for this class of work. The danger of a complete stoppage has been averted.

The new Glasgow Corporation Tramways single deck car, which we illustrate on our picture page this week, was built to show what improvements could be made in catering for the comfort of the passengers, and at the same time, increasing the speed without incurring any risk of derailment. The dimensions and particulars of the car are as follows:—Overall length over bumpers, 32 ft. 6 in.; body length, 22 ft. 6 in.; body width, overall, 7 ft. 2 in.; body width, inside, 6 ft. 10½ in.; body height, inside, 6 ft. 10½ in.; bogie centres, 13 ft.; bogie wheel base, 5 ft. 4 in.; wheel diameter, 26 in. The car is fitted with two bogies and four motors of 25 H.P. each. In addition to the usual hand brakes, the car is fitted with air brakes, also an electro-magnetic brake. There are four sand ejectors, two operated by compressed air and two by pedal motion. Seating is provided for 36 passengers, 24 being accommodated in cross bench seats and the remainder in longitudinal seats in corners of the saloon. This arrangement provides a "well" at each end of the saloon for standing passengers. The platforms are fitted with double exits, the passengers entering at the front and leaving at the rear, or vice versa, whichever system is found to be more efficient. Fully upholstered and very comfortable seats are provided, and the ceiling is covered with embossed paper and painted white. The saloon is well lit, being provided with twelve lamps, and the reflected light from the ceiling helps very materially to brighten up the car. Being equipped with four motors, the car accelerates very rapidly, and the air brakes make smooth and efficient stops.

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COMPANY NEWS.

Electrical Share Prices Improve—Another J. and P. Record—Higher Quotations for Henley's and Siemens—Two Supply Advances.

THERE has been some amount of activity during the past week in the market for electrical equipment shares, under the leadership of Johnson and Phillips ordinary, which have jumped up to the extent of a shade over 3s., being now quoted 66s. 3d., the highest point yet reached. Henley's and Siemens have each risen 1s. 3d., but the proportionate advance in the latter case is double that of the former, the respective quotations for the £1 shares being 31s. 3d. and 78s. 9d. General Electrics, at 31s., are 9d. up. Underground Railways £10 shares have put on another half-crown, and Metropolitan and District ordinary stocks are respectively 1 and ½ higher. Newcastle-upon-Tyne Electric Supply ordinary are 7½d. better at 21s. 10½d.; and City of London, at 49s. 4½d., show an improvement of 1s. 3d.

Last Annl. Divd.	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
%	**Electricity Supply.**				
10	Brompton & Kensington Ord.	32/6	32/6	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	90	90	100	67
15	Charing Cross Elec. Ord. (£1)..	44/4½	44/4½	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	49/4½	48/1½	52/6	20/3
6	,, ,, 6% C.P. ..	22/6	22/6	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	59/4½	59/4½	61/3	14/6
6	,, ,, 6% C.P. ..	22/6	22/6	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	13½	13½	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	32/6	32/6	35/-	5/-
12	Metro. Elec. Sup. Ord. ..	36/10½	35/7½	41/6	8/-
4½	,, ,, 4½% C.P...	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/10½	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	22/6	23/9	10/7½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord (£5) ..	16½	16½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	42/6	42/6	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
	,, ,, 6% C.P...	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	134½	134½	123	24
6	,, 6% Pf. Stk.	110	109½	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	70	70	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	78½	78½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	50½	50½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	78½	78½	89	65
4	Lon. Un. Trams. 1st Deb. ..	47	47	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	64½	64½	101½	49
5	,, 5% Deb. ..	68½	68½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	64	63	84½	19
3½	,, 3½ Pf. Stk.	63½	63½	88½	40½
3½	,, 3½% Deb.	69½	69½	93½	51
3½	Met. Dis. Rly. Ord. Stk. ..	52	51½	58	12½
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	112½	112½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb.	65	65	73½	48½
—	Underground Elec. Rlys. Ord.(£10)	3½	3½	5½	21/3
5	Yorks. (W.R.)Trams. Ord. ..	11/6	11/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
†3½	Brit. Elec. Transformer 7% C.P.	18/9	18/9	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	67/6	67/6	62/-	26/6
6	,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	23/-	23/-	23/4	19/7½
7	,, ,, 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	25/7½	25/7½	29/-	10/-
‡15	Callender's Cable Ord... ..	65/-	65/-	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref...	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)..	11/-	11/-	28/9½	1/11
7½	,, 1st Pref...	21/3	21/3	26/-	5/-
10	Elec. Construction Ord. ..	31/3	31/3	30/4	6/7½
7	,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	15/7½	15/7½	29/3	7/3
6	,, 6% C.P... ..	18/-	18/-	21/3	10/6
6	Ericsson Telephones 6% C.P...	21/3	21/3	21/-	12/7½
6	Ferranti 6% Pref.	19/4½	10/4½	18/6	16/9
7	,, 7% 2nd Pref... ..	18/-	18/-	19/-	13/9
5	,, 1st Mort. Deb. Stock..	91½	91½	96½	80½
7½	General Elec. Ord.	31/-	30/3	59/-	13/6
20	W. T. Henley's Ord.	78/9	77/6	86/6	23/3
17	Johnson & Phillips Ord. ..	66/3	63/1½	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	25/7½	25/7½	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	47/6	47/6	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	31/3	30/-	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	28½	28½	56/2/6	19½
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb ..	74½	74½	87½	60
10	Eastern Ord. Stk.	180½	180½	213½	113/2/6
3½	,, 3½% Pref. Stk.	65½	65½	84/17/6	49
4	,, 4% Deb. ..	79½	79½	103½	60
10	Eastern Extension Ord. (£10)..	10½	10½	21½	10/12/6
4	,, ,, 4% Deb. ..	78½*	79½	97½	60
‡2	Gt. Northern Telegraph (£10)..	27½	27½	42/12/6	19
‖10	Indo-European (£25)	46½	46½	59½	25
—	Marconi's Wireless T. Ord. ..	15/-	15/-	9/16/3	20/9
7½	,, Int. Mar.	20/-	20/-	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	18½	18½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	78½	78½	10	60/2/6

* Ex-dividend.
† For half-year to June, 1925.
¶ Plus 3 p.c. in respect of 1921.
‡ Plus share bonus.
‖ Including bonus.

LIVERPOOL OVERHEAD RAILWAY CO.—No interim dividend will be paid on pref. shs.

OXFORD ELECTRIC CO., LTD.—Intm. div. at rate of 5 p.c. per annum, less tax, on ord. shs., payable September 1st.

EDISON ELECTRIC CO.—A rumour that the company has purchased the Milan electricity undertaking for 200 000 000 lire is denied.

MIDLAND ELECTRIC MANUFACTURING CO., LTD.—The issue of preference shares, to which reference was made in THE ELECTRICIAN last week, was over-subscribed.

CONSOLIDATED GAS, ELECTRIC LIGHT AND POWER CO.—Div., $⅝ per sh. on common shs. for qr. endg. Sept. 30th, 1926, payable Oct. 1st, to holders of record Sept. 15th.

RANGOON ELECTRIC TRAMWAY AND SUPPLY CO., LTD.—During the past week, shareholders have been invited to subscribe for a further issue of 100 000 £1 ord. shs.

MONTREAL LIGHT, HEAT AND POWER CONSOLIDATED.—Each of the old common shares has been exchanged for three new common shares of no par value and one pfd. sh. of $50.

ABERDEEN SUBURBAN TRAMWAYS CO.—Accts. for half yr. ended July 31st show loss, £791. Deducting this from amt. brt. in, leaves £2 526 at credit of pft. and loss. After paying directors' fees, £2 426 is carried fwd. Directors have under consideration further negotiations with Aberdeen Corporation for resumption of running powers within the city.

COMPANIA DE ELECTRICIDAD DE LA PROVINCIA DE BUENOS AIRES.—Gross receipts in 1925, £444 962, agst. £406 094, net earnings £168 400, agst. £147 947, after allowing £25 000 for depreciation. Blce. available, after mtg. all charges, £99 190 (including £3 736 brt. in), agst. £69 171. Divs. proposed 8 p.c. on the two non-cumulative pre-pref. and pref. issues, to res. £4 673; fwd. £3 793.

HELLENIC ELECTRIC RAILWAY CO., LTD.—An announcement, issued during this week to comply with Stock Exchange Regulations, contains the information that the share capital authorised and issued is £418 000, that the company has issued £400 000 7 p.c. 20-year bonds, and that the principal object of the company is the exploitation of the Athens Piræus Railway and/or other steam or electric railways and/or tramway lines.

ENFIELD CABLE WORKS., LTD.—Normal expansion of business, due to the general increase in trade in the manufactures of the company was the factor to which the chairman, Lord Verulam, at the annual meeting on August 19th, attributed the increase in the company's profits. He remarked that the improvement was not due to accepting work at less remunerative rates. The turnover for the past year, he said, exceeded that of the preceding year by 8 per cent., while the profit showed an increase of 16½ per cent. Commenting on the liquid position disclosed by the balance-sheet, he remarked that if the company was to keep abreast of the times it was essential to maintain reserves and a liquid cash position. Developments were taking place in the industry which might shortly necessitate the installation of much new plant. Lord Verulam, in conclusion, observed that it was to be feared that there would be an increase in income tax next year.

DIVIDEND DATES.—British Insulated Cables Ltd. is due to announce its interim dividend next month. Last September it paid 1s. per share and followed this up in March with a final dividend of 1s. and bonus of 1s., making 3s. or 15 per cent. for the year. In December last there was a bonus issue of one ordinary share for every three shares held.

Callender's Cable and Construction Co.'s next dividend, the interim for 1926, is due to be declared in October. Last year the company paid 1s. per share, and the final dividend was 2s. per share. In the current year this company has also made a bonus issue of one new ordinary share for every three held.

Johnson and Phillips' interim is due in November. Last year 7½ per cent. was paid, followed by a final dividend of 10 per cent.

Siemens Brothers' interim is also due in November. Last year it was 2½ per cent., and was followed by a 5 per cent. final distribution.

New Companies.

BARKER BROTHERS (DONCASTER), LTD.—Cap., £1 000. Manufacturers of and dealers in electrical apparatus, etc. Solicitors: Brooke and Dyer, 25, High Street, Doncaster.

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W. Muir Goodfellow and Co., Ltd.—Cap., £3 000. Electrical engineers and contractors, suppliers of electricity, etc. Reg. office: 11, Berkeley Terrace, Berkeley Street, Glasgow.

Castellina Co. (1926), Ltd.—Cap., £1 500. Dealers in and manufacturers of alabaster figures and bowls, electrical fittings, wireless apparatus, etc. Reg. office: 58, Great Marlborough Street, London, W.1.

Lighting Components, Ltd.—Cap., £150. Dealers in and manufacturers of electrical fixtures and fittings, electrical and wireless engineers, dealers in all wireless apparatus, etc. Reg. office: 30, Lytham Street, Blackpool.

Mozarts (Birmingham), Ltd.—Cap., £300. Makers, importers and factors of and dealers in wireless apparatus and electrical goods, electrical engineers, etc. Solicitors: Forsyth, Pettinson and Co., 36, Cannon Street, Birmingham.

Inoac Lamp Co., Ltd.—Cap., £300. To acquire business of the Ino Guarantee Lamp Co., Ltd., carried on at 35, Aldermanbury, London, E.C., and to carry on the business of factors, importers, exporters and agents of electric lamps, wireless and electrical accessories, etc.

B. Morris (Electrical Radio), Ltd.—Cap., £500. Electrical engineers, electric lighting contractors, dealers in electrical fittings, and devices and appliances whereby sound is recorded and transmitted, including wireless, etc. Reg. office: 50, Doughty Street, London, W.C.1.

Dick and Nicolle (1926), Ltd.—Cap., £1 500. To acquire from S. C. Harper the assets of the business lately carried on by Dick and Nicolle, Ltd., at 29, Rochester Place, Camden Town, London, N.W., and to carry on the business of manufacturers of and dealers in electrical goods, etc.

Radio, Motors and Cycles, Ltd.—Cap., £6 000. To acquire business carried on as Radio Electric Co., and to carry on the business of manufacturers of and dealers in wireless apparatus and accessories, electrical engineering appliances or accessories, etc. Solicitor: N. F. Steward, Wolverhampton.

Metal and Chemical Prices.

Tuesday, August 24th.

		Price.	Inc.	Dec.
Copper—				
Best Selected ..	per ton	£65 15 0	5s. 0d.	—
Electro Wirebars ..	„	£67 5 0	—	—
H.C. Wire, basis ..	per lb.	9 11/16d.	—	—
Sheet	„	9 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 1 1/16d.	—	—
Brass 60/40—				
Rod, basis	per lb.	7½d.	—	—
Sheet, basis ..	„	9⅞d.	—	—
Wire, basis ..	„	10⅛d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£4 12 6	—	—
Galvanised Steel Wire, basis 8 S.W.G. ..	„	£13 10 0	—	—
Lead Pig—				
English	„	£34 5 0	5s. 0d.	—
Foreign or Colonial	„	£32 15 0	2s. 6d.	—
Tin—				
Ingot	„	£294 0 0	£3 0 0	—
Wire, basis	per lb.	3s. 9d.	—	¼d.
Aluminium Ingots ..	per ton	£120 0 0	—	—
Spelter	„	£34 5 0	5s. 0d.	—
Mercury	per bottle	£15 10 0	—	—

Sulphur (Flowers)—Ton £11 10 0 *Sodium Chlorate*—Per lb. 3d.
„ (Roll-Brimstone)—„ £10 5 0 *Sulphuric Acid* (Pyrites, 168°)
Copper Sulphate— „ £25 to £25 10 0 per ton, £6 15 0
Boric Acid (Crystals) „ £37 *Sodium Bichromate*—Per lb. 3½d.
Rubber—Para fine, 1s. 7⅛d.; plantation 1st latex, 1s. 7⅛d. to 1s. 7⅛d

The metal prices are supplied by British Insulated Cables Ltd.

The Lead Market.

Slight Increase in Speculative Dealing Causes Rise in Price.

In their report on the lead market dated August 21st, James Forster and Co. state that an advance of 6s. 3d. for August and 2s. 6d. for November over last week's closing prices took place on Monday; Tuesday and Wednesday showed practically no change; Thursday, an advance of 2s. 6d. per ton. Anticipation of a speedy settlement of the coal dispute was probably the cause of the slight increase in speculative dealing and the consequent advance in prices. Consumers are little in evidence except for a few prompt parcels, and show no disposition to anticipate forward requirements.

In the meantime arrivals are on a larger scale than for the last two months, and will amount to date to about 14 000 tons, including to-day's arrivals. Germany has not been buying during the week, France has reshipped Mexican and Colonial lead to this market, having apparently more than she needs.

Closing prices were £32 17s. 6d. for August and £32 8s. 9d. for November.

AMERICAN EXPORTS.

Increase in Value of Electrical Goods Shipped Abroad.

Exports of electrical goods from the United States during the first eleven months of 1925 totalled $80 264 527, according to preliminary figures just made available. This is only $1 800 000 less than the amount for the calendar year 1924. Export trade for the full year, accordingly, is estimated at approximately $85 000 000.

Commenting broadly on the export trade of last year as compared with that of 1924, "Lloyds List" says it is apparent that less business has been done in heavy equipment lines and more in smaller lines, and this situation is, to some extent at least, due to the increasing representation abroad that is being arranged for by smaller American manufacturers. Apparatus exports as a whole have declined somewhat; increases are shown in shipments of alternating current generators, steam turbine generating sets, and self-contained lighting sets, but, on the other hand, there were decreases in shipments of direct current generators, transformers and motors.

Exports of electric locomotives formed a considerable item during 1924, but last year there was little railway electrification work carried on by U.S. manufacturers abroad, and the volume of exports of that class of equipment was small. Shipments of locomotives for mining and industrial service were, however, practically the same as during 1924. Reflecting the continued interest in radio throughout the world, shipments of batteries continued heavy in 1925, and during the first eleven months were approximately $2 042 000, as compared with about $1 560 000 for the corresponding period of 1924. Storage-battery exports, however, declined somewhat below those of 1924, though exceeding in value the primary batteries shipped.

Exports of motor-driven household appliances and of domestic heating and cooking appliances both passed the million mark within the first ten months of 1925, showing a substantial increase over the like period of 1924.

The year's business in electric fans, however, will probably be slightly smaller than that for 1924, the decline apparently being in the cheaper lines. During the past year shipments of telephone and telegraph equipment and materials have held to approximately the same level as during 1924; there has been a decline in some items, but an increase in others.

The Biggest Purchasers.

American electrical manufacturers shipped their products to practically every country of the world; countries of North and Central America took the largest volume. Next in importance were the countries of Asia, followed in order by Europe, South America, Australasia and Africa. Canada was the outstanding leader, with Cuba next and Mexico third; however, two Central American markets were relatively high in rank.

In Asia, Japan is of an importance comparable to that of Canada in North America, and took a very high percentage of the total exports to Asiatic markets. India was next in importance, followed by the Philippine Islands, which took more than all of China.

Shipments to Europe appear to be slightly less than what they were in 1924, but the difference is not great. As in the past, the United Kingdom continued to be the largest customer of the United States, and took about 40 per cent. of shipments into the European field. According to the preliminary figures available, Spain was America's second largest European market in 1925, the developments which have taken place in telephony and railway electrification in that country, undoubtedly helping much to that end. France was third in rank, followed by Italy, Belgium, Netherlands, Germany and Sweden in order.

Australia and New Zealand continued as very important customers. Shipments of electrical goods to those two markets were approximately one-third of the total shipped to all of South America, and, to carry the comparison further, the markets of Oceania took approximately 40 per cent. of the total that went to Asia, with a population 70 times as great. Exports of electrical goods to Africa were relatively small, and of the total shipped British South Africa took 80 per cent. Egypt was second among America's African customers, and is steadily growing in importance; Portuguese East Africa was third, and the small remainder was divided among a half-dozen other districts.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

AERIAL ENGINEERING CO., 14-16, Great Garden Street, Aldgate, E., auto and electrical engineers. £24 16s. 6d. June 7th.

ANDERSON AND ANDERSON, 907, Romford Road, Manor Park, electrical engineers. £26 5s. 1d. July 2nd.

JENSON, Oscar, 38, Carnaby Street, W., electrical engineer. £15 18s. July 12th.

RICHARDS, Arnold, Abbey Wood Works, Abbey Wood, wireless supplies merchant. £16 9s. 9d. July 14th.

TEMPLEMAN, Mr. G. A., 8, Johnson Street, Notting Hill Gate, W., electrical engineer. £30 3s. July 12th.

Receivership.

LUMOS RADIO VALVE CO., LTD. A. Hart, of 442, Strand, W.C.2, was appointed receiver on August 9th, under powers contained in mortgage debenture dated July 14th, 1926.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

EDISON SWAN CABLES, LTD., Lydbrook. Registered July 20, £37 500 debentures, to Branch Nominees, Ltd., 15, Bishopsgate, E.C.; charged on property, at Lydbrook: also general charge,

HAMMERSLEY BROTHERS, LTD., London, E., manufacturers of electrical instruments, etc. Registered July 21st, £100 debentures part of £500; general charge.

NELSON ELECTRIC CO., LTD., London, E.C. Registered August 3rd. £3 600 debenture, to Anglo-Oriental and General Investment Trust, Ltd., 31-33, Bishopsgate, E.C.; general charge.

SOUTH AFRICAN LIGHTING ASSOCIATION LTD., London, E.C. Registered July 26th, £5 000 debentures part of amount already registered; general charge. *£20 000. June 23rd, 1926.

Satisfaction.

PROTECTOR LAMP AND LIGHTING CO., LTD., Eccles. Satisfaction registered July 29th, £2 000, part of amount outstanding July 1st, 1908.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*

CASTELLINA CO., LTD., alabaster importers and wireless and electrical dealers, Great Marlborough Street, London, W. Liabilities of £2 300 and of that amount (£946 due to unsecured creditors and the balance and the deficiency as regards debenture holders) were disclosed at the statutory meeting of creditors in the voluntary winding-up of this company. There are debentures amounting to £4 300 and the assets after allowing for preferential claims, total £2 946, so that there will be no dividend available for the unsecured creditors. The liquidator reported that he had been appointed Receiver for the debenture holders and the stock had been sold by him for £1 500. The company was formed in September 1922 with a nominal capital of £3 000. Mr. Smith also stated that the company had never traded at a profit and that the present position had been brought about by the issuing of a writ by an Italian creditor and certain property which the company owned in that country having been seized. Replying to Mr. W. Baker of the Wholesale Traders Association, the liquidator said that the turnover of the company had been in the neighbourhood of £6 000 per annum. The company dealt in alabaster bowls, certain electrical fittings and equipment, and recently in wireless. The creditors decided that the meeting should be adjourned with a view to the debenture holders or the directors submitting an offer of not less than 10s. in the £ to the unsecured creditors.

GROGAN, John, trading as JOHN GROGAN AND CO., electrical engineers, 95, Waterloo Street, Glasgow. Creditors were called together recently when a statement of affairs was submitted which showed liabilities of £3 186 (£217 to trade creditors and £2 969 to the bank) and net assets £453, or a deficiency of £2 733. It was reported that the debtor started business in December 1924, the purchase price being £2 900, which was made up of stock £1 450, and book debts £1 450. The debtor started business without capital, but he obtained an overdraft at the bank. The present position was attributed to depreciation of stock and bad debts. The accounts prepared showed that for the year to June 1925 the debtor made a loss of £857 and for the period to August 5th 1926 a further loss of £725. No offer was made, and it was decided that the estate should be dealt with under a trust deed in favour of Mr. Gemmill, accountant, of Glasgow, with a committee of inspection.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Company Winding Up.

FULLER'S UNITED ELECTRICAL WORKS, LTD. Meeting of creditors, September 9th, 11.30 a.m.; and contributories, September 9th, 12.15 p.m.; Bankruptcy Buildings, Carey Street, Lincoln's Inn, London, W.C.2.

Companies Winding-up Voluntarily.

COGENT ELECTRICAL CO., LTD.—B. M. Hanmer, chartered accountant, 24-26, North John Street, Liverpool, appointed liquidator, August 18th.

SCARBOROUGH ELECTRIC SUPPLY CO., LTD. By special resolution, July 24th, confirmed August 14th, A. A. C. Swinton and W. S. Robinson appointed joint liquidators. Meeting of creditors, 6, York Place, Scarborough, on Monday, August 30th, at 3 p.m. (All creditors have been, or will be, paid in full.)

Bankruptcy Information.

HAWKINS, Albert Bernard, and HAWKINS, Harold, electrical engineers, 101, Station Hill, Kidderminster, trading as HAWKINS BROS. First meeting, August 30th, 2.45 p.m., Lion Hotel, Kidderminster. Public examination, September 27th, 2.45 p.m., Town Hall, Kidderminster.

JAMES, Jessie Amy May (married woman), 11, Mill Street, Middleton, trading as "FUCHSIAPHONES INSTALLATIONS," wireless dealer. First meeting, August 30th, 2.30 p.m., Official Receiver's Offices, Byrom Street, Manchester. Public examination, November 10th, 10.30 a.m., Court House, Church Lane, Oldham.

PADGETT, Harold, and NICHOLSON, Arthur, trading as "PADGETT AND CO.," 218, Spring Bank, and 10, Beverley Road, Kingston-upon-Hull, electrical and radio engineers. Receiving order, August 18th. Debtors' petition.

Bankruptcy Proceedings.

PEGRUM, A. W. (trading as ECONOMIA), electrical contractor and general merchant, 258, High Holborn, W.C. The first meeting of creditors herein was held at Bankruptcy Buildings, Carey Street, W.C., on Monday before Mr. Walter Boyle, Senior Official Receiver. According to the debtor's statements he started the above business in August, 1922, with £700 capital, at 215, Piccadilly, removing twelve months later to 12, Silver Street, and in September, 1925, to the present address. Owing to lack of capital the trading has never paid and a proposal to raise some by converting the business into a limited company came to nothing. The crisis came on August 6th when the landlord distrained for rent due, £275; the whole of the stock and effects were sold a week afterwards and realised only £150, although they were valued at £800 by the debtor. He roughly estimates his liabilities at £2 000 and has no assets. The failure being attributed to lack of capital and loss by forced sale. In the absence of any resolution the case was left in the hands of the Official Receiver who said he should apply in due course for an order of adjudication in bankruptcy. He added that it was extremely foolish of the debtor not to have filed his petition when pressure was first exercised by creditors instead of waiting until all the assets had been seized and sold under the landlord's distraint.

WICKETT, John Henry, electrical engineer, 17, Albion Street, Stratford, Essex. The public examination of this debtor was held on August 24th, at the London Bankruptcy Court, the accounts showing total liabilities £1 217 (unsecured £400) and assets "bad book debts £43." Questioned by the Official Receiver the debtor stated that he was employed for 24 years as an electrical engineer and in October 1921 purchased the above business, then being carried on as Paterson and Co., for £350. The trading was not a success, and in March 1924 finding himself in debt to the extent of about £1 500, and being unable to continue any longer he sold the business for £500 which was used in part liquidation of the liabilities. Witness afterwards acted as manager for the purchasers until May 1925, and was now employed as an engineer at a weekly salary. The debtor attributed his failure to keen competition, heavy overhead charges and high cost of production. Examination concluded.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

234 480 J. Hawadier. Thermionic valves. (26/5/24.)
235 196 International General Electric Co., Inc. Moulded electrically insulating bodies having projecting ribs or screens. (3/6/24.)
236 595 Benjamin Electric, Ltd. Portable electric lamps. (5/7/24.)
242 565 O. Graetzer. Electric hand-irons. (1/12/24.).
255 502 W. Asquith (1920), Ltd., J. W. S. Asquith and G. Feather. Electrically driven drilling machines and like machine tools. (24/2/25.)
255 505 W. Asquith (1920), Ltd., J. W. S. Asquith and G. Feather. Electrically driven radial drills. (24/2/25.)
255 512 A. Edwards. Means and method of wiring-up and executing electrical circuits embodied in wireless sets and the like. (15/4/25.)
255 517 E. A. Willson. Variable electric condensers. (20/4/25.)
255 524 I. B. Blaiberg. Crystal detectors for wireless receivers. (22/4/25.)

A SHOWCARD of somewhat unusual, though striking, design which is now available for retailers. Lithographed in seven colours, and measuring 12½ in. by 9⅞ in., it is an attractive and conveniently-sized production.

255 525 D. W. Carlisle. Electrically operated indicating devices. (22/4/25.) (Addition to 232 340.)
255 528 A. F. Berry. Incandescent electric lamps and heat radiators. (22/4/25.)
238 851 Automatic Telephone Manufacturing Co., Ltd. Telephone systems. (22/8/24.) (Addition to 7256/25.)
255 534 J. R. Quain. Electric arc lamps. (24/4/25.)
255 543 F. Warner. Thermionic valves. (24/4/25.)
255 547 N. H. Clough. Variable tuning and loading devices, suitable for use in wireless telegraphy and telephony. (24/4/25.)
255 559 General Electric Co., Ltd., and A. E. Ide. Electric tumbler switches. (29/4/25.)
255 565 M. J. Railing and C. C. Garrard. Draw-out electric switchgear. (1/5/25.) (Cognate application, 32033/25.)
255 572 J. A. Crabtree. Electric socket or coupling elements, and the manufacture thereof. (6/5/25.)
255 581 W. G. R. Jacob and Eastern Telegraph Co., Ltd. Electric telegraphy. (15/5/25.)
255 585 W. J. Cole and Telegraph Condenser Co., Ltd. Electrical condensers. (21/5/25.) (Cognate application, 14570/25.)
255 587 A. L. Landau. Crystal detectors for radio apparatus. (25/5/25.) (Cognate application, 26802/25.)
255 602 A. W. Gamage, Ltd., and J. S. Parker. Automatic switch mechanism for the control of wireless receiving sets and like purposes. (5/6/25.)
255 603 General Electric Co., Ltd., and M. L. Kahn. Starting arrangements for electric motor converters. (9/6/25.)
235 601 P. M. R. Salles. Electric converters. (14/6/24.)
237 235 British Thomson-Houston Co., Ltd. Gaseous electric conduction devices. (17/7/24.)
237 236 British Thomson-Houston Co., Ltd. Electric discharge devices. (17/7/24.)
255 622 Standard Telephones and Cables, Ltd. Short-wave transmission systems. (3/7/25.) (Patent of addition not granted.)
255 625 R. G. E. Spawforth. Mounting inductance coils. (4/7/25.)
255 628 Radions, Ltd., and A. W. Coates. Thermionic valves. (7/7/25.)
255 635 F. C. Owen. Transformers for electric arc-welding apparatus. (14/7/25.)
237 203 Marconi's Wireless Telegraph Co., Ltd. Pictures and the like and means for reproducing and or telegraphing them. (16/7/24.)
255 644 A. W. Booth and C. D. Cuppleditch. Battery boxes of electric locomotives. (30/7/25.)
237 926 J. P. Burke. Fine adjustment devices for tuning radio-receiving apparatus and the like. (1/8/24.)
255 657 Coventry Automatic Telephones, Ltd., and C. C. Puckette. Step-by-step switching apparatus for telephone systems. (14/8/25.)
255 660 Standard Telephones and Cables, Ltd., and W. E. Mougey. Methods of and apparatus for measuring the inductance of cables and conductors. (19/8/25.)
255 673 Pirelli-General Cable Works, Ltd., and R. E. Horley. Three-phase electric cables. (10/9/25.)
255 688 G. Sokolow Wishnevsky. Transformer for constant secondary voltage with varying network voltage. (12/10/25.)
255 691 Württembergische Metallwarenfabrik and A. Wolf. Electroplating baths for simultaneously obtaining metallic deposits of various thicknesses. (19/10/25.
242 619 W. Gross. Electromagnetic cut-outs. (7/11/24.)
242 283 Siemens-Schuckertwerke Ges. Electric furnaces for bright annealing. (1/11/24.)

Applications for Patents.

August 3rd.

19 230 British Thomson-Houston Co., Ltd. Electric switches. (26/8/25, U.S.)
19 152 V. Candotti. Device to determine distance by wireless telegraphy.
19 233, 19 237 N. W. McLachlan and W. S. Smith. Cable telegraphy.
19 234 N. W. McLachlan and W. S. Smith. Photo-electric cells.
19 235 N. W. McLachlan and W. S. Smith. Duplex telegraphy.
19 236 N. W. McLachlan and W. S. Smith. Telegraphic, etc., communication systems.
19 186 Norske Aktieselskab fur Elektrokemisk Industri. Electrodes for electric furnaces. (9/12/25, Norway.)
19 187 Norske Aktieselskab fur Elektrokemisk Industri. Electrodes for electric furnaces. (19/9/25, Norway.)
19 232 N. M. Rust and F. P. Swann. Frame aerials.
19 190 A. A. Thornton (Radio-Rohren Laboratorium Dr. G. Nickel Ges.) Thermionic valves.
19 144 T. F. Wall. Thermoelectric generators.
19 197 Western Electric Co., Inc. (Bell Telephone Laboratories, Inc.) Electric regulators.

August 4th.

19 265, 19 266 W. G. Allan. Electrolytic apparatus.
19 306 W. J. Ricketts and E. E. Smith. Telephone transmitters.

August 5th.

9 378 British Thomson-Houston Co., Ltd. High frequency signalling systems. (5/8/25, U.S.)
19 407 A. G. Clark and W. O. Heyne. Rheostats for thermionic valves.
19 384 A. H. Curtis and Igranic Electric Co., Ltd. Electrical plug connectors.
19 415 H. L. Kirke. Thermionic rectifiers.
19 416 H. L. Kirke. Electrical controlling means.
19 392 H. H. A. Wolfe. Electrodes for luminous vacuum tubes.

August 6th.

19 436 E. Adamson. Electrically operated reciprocating tools, etc.
19 491 R. D. Ball, R. L. Cleaver and English Electric Co., Ltd. Asynchronous electric motors.
19 503 E. G. Budd Manufacturing Co. Electric welding apparatus. (15/8/25, U.S.)
19 439 F. G. Hasler. Electric switches.
19 464 B. M. Howell and Howell and Co. Adjustable slow-motion device for electrical instruments, etc.
19 478 International General Electric Co., Inc. Electric transformers. (6/8/25, Germany.)
19 507 Maschinenfabrik Oerlikon. Electric motor vehicles. (9/7/25, Switzerland.)
19 432 E. Reed. Electrical ceiling roses, etc.
19 423 F. G. Warbrook. Variable electric condensers, etc.
19 505 Westinghouse Electric and Manufacturing Co. High-frequency electric signalling apparatus. (6/8/25, U.S.)
19 467 E. W. Whiting. Apparatus for indicating functioning of electrical ignition systems.

August 7th.

19 531 L. C. Airey. Continuous operation of electric steel furnaces.
19 561 British Thomson-Houston Co., Ltd. (General Electric Co.) Electric arc welding.
19 546 A. A. L. I. von Mehren. Low-frequency circuits for wireless telegraphy, etc.
19 545 H. Swann. Wireless receiving apparatus.
19 562 Soc. Francaise de Lampes a Incandescence Luxor. Thermionic valves. (2/3/25, France.)
19 571 P. D. Tyers. Utilisation of high voltage electric currents for operating thermionic valves.
19 572 P. D. Tyers. Radio-frequency receiving systems.
19 534 S. Y. White. Transferring electrical energy. (8/8/25, U.S.)

Licences of Right.

Notice is given that the undermentioned patents were endorsed "Licences of Right" on July 7th, 1926:—

118 080 (18 750/17.) J. Courtier and another. Improvements in and relating to electric ignition apparatus for internal combustion engines.

180 690 (14 887/22.) Allgemeine Elektricitats-Gesellschaft. Apparatus for winding up a spring motor by hand and by an electric motor.

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Friday, August 27th-28th.

Iron and Steel Institute.—Autumn meeting at Stockholm.

Tuesday, August 31st.

Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting.

Tuesday, August 31st-September 10th.

World Power Conference.—Basle.

Wednesday, September 1st.

Electrical Contractors' Association (London Branch).—Ordinary meeting.

Wednesday, September 1st-4th.

Institute of Metals.—Autumn meeting, Hall of the Association des Ingenieurs, 16, Quai des Etats-Unis, Liége.

Thursday, September 2nd.

Electrical Contractors' Association (Newcastle Branch).—Ordinary meeting. 11 *a.m.*

Electrical Contractors' Association (Bristol Branch).—Ordinary meeting. 3.15 *p.m.*

Friday, September 2nd-6th.

Women's Engineering Society.—Leeds University. Fourth Annual Conference.

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The Electrician.

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WIRING THE HOMES OF BRITAIN.

IT has already been announced that the E.D.A. and E.L.M.A. are this autumn waging a big campaign with the object of getting more homes wired for electric lighting. We are glad that the *lighting* side will be properly emphasised. In recent wiring schemes there has been a tendency to concentrate mainly on the heating and cooking side. The latter is, of course, of considerable value to electricity supply undertakings, especially in improving the load factor. But it must always be remembered that lighting is the backbone of the business of many supply undertakings, and that from the *revenue* standpoint it may overshadow other domestic applications of electricity. For example, according to statistics recently presented for electric supply undertakings in the United States only about 25 per cent. of the total electrical energy generated in 1925 was consumed for lighting. But the revenue from lighting was as much as 67 per cent. of the total.

That the average home in this country is underlighted can scarcely be doubted. In the United States energetic efforts towards the substitution of lamps of higher wattage have recently led to remarkable increases in revenue. It is of the first importance, therefore, that modern houses should be so wired as to make ample allowance for proper lighting, and also for probable advances in consumption in the future. We mention this because there is some danger that, in the effort to reduce first costs, the wiring may be somewhat "scrimped." The same applies to the provision of ample outlets and switches. We can recall "all-electric" houses in which the lighting formed but a very small fraction of the total load—as might, indeed, be expected. In these circumstances it is ridiculous to find, as one sometimes does, that the limited methods of the past are applied to lighting, and that the priceless advantage of electric lighting, its flexibility, is forgotten.

In the model electric home the effort should be to provide every facility that lighting can offer. In many of the recent demonstrations—for example, those provided by the E.L.M.A. Lighting Service Bureaux, and at the Ideal Home Exhibition—up-to-date lighting was well illustrated. The same methods should be actually applied in practice.

A point that will at once occur to everyone is the desirability of providing sufficient plug sockets. In a house of small dimensions it is commonly assumed that consumers should be satisfied with a single central unit. It may be admitted that a good design of the semi-indirect type furnishes excellent general illumination. But the charm of a room is enhanced if there is provision for portable silk shaded table lamps and standards, and for the numerous luminous knick-knacks that are now becoming popular. There are many people, also, who prefer to work with a local lamp when any lengthy reading and writing is to be done. It is for illuminating engineers to decide whether such local lighting is necessary, and preferable to general lighting. But we fancy that modern opinion is in favour of the view, notwithstanding the ease with which good general lighting is now provided, that a well-designed local lamp supplemented by moderate general lighting is psychologically and physiologically an advantage. In the dining room again, the conventional fitting over the table might well be supplemented by some attempt at general lighting, at any rate in rooms of moderate size.

In the bedroom, too, we should like to see the resources of electric lighting exploited. The single light in the centre of the room is now obsolete, but the dressing table lighted by only one unit is too often usual. There can be no question that twin lights, one on either side of the mirror are necessary, and the positions and shading of such sources require considerable care. There should also be a lamp at the bedside, naturally under control from the bed. Here, as in the case of stairs and corridors, switches enabling lights to be controlled from several points are an advantage, and the introduction of this system is a good advertisement of the elasticity of electric lighting.

For the kitchen and the bathroom there are now admirable types of diffusing overhead units, conveniently mounted direct on the ceiling, which should be in every electric home. We would suggest particularly that the lighting of the kitchen should be as good as that in any other room in the house, and that, generally speaking, the servants' quarters should receive as much care as the residential rooms. (In this age of domestic problems attention to comfort in the maids' rooms has more to do with success in keeping servants than is commonly imagined!)

There are many other small accessories: night lights for the nursery, units for illuminating the porch and the name and number of the house, for example, which ought to be available. It is surely one of the strangest anomalies that electrically-lighted houses are so often provided with no adequate method of revealing the name or number of the house at night—so that the stranger has to grope for infor-

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mation in darkness. All these are features which should be well illustrated in demonstrations, and which should be kept in mind in the equipment of an electric home. In the early days of electricity a great deal of harm was doubtless done by injudicious propaganda, based on comparisons of cost; and in instilling the idea, still prevalent to-day, that however extravagant a person might be in other directions he must at all costs economise to the utmost in his lighting.

Let us not make this mistake again. The consumer should be made to see that electric light is one of the cheapest of commodities, and that he is well repaid for what he spends on it. In the long run he will not suffer by being somewhat more liberal in this respect. For the improvement, both in volume and distribution, of the domestic load will ultimately tend to the cheapening of rates for electricity, on which the cost primarily depends.

In conclusion we would urge that, whilst the coming campaign should help manufacturers and supply undertakings, and contractors, its success will be enhanced if they can secure the co-operation of independent bodies. Efforts to push the sale of electricity and electrical appliances are greatly aided by the element of "service," the giving of useful advice and guidance to the consumer. But the fact remains, and is naturally appreciated by the public, that such campaigns are primarily for the benefit of the electrical industry, and the public ear will be more readily gained if the influence of bodies who have no axe to grind can also be applied. The Illuminating Engineering Society, for example, is concerned solely with the promotion of improvements in lighting, irrespective of the particular devices and illuminants by which such improvements are secured. It would be of great assistance, therefore, if their co-operation, in the form of a general campaign for the better lighting of the home, could be secured in conjunction with the great electrical "push."

Current Topics.

The Big Push.

BEFORE the end of next week the whole of the electrical industry will have received very full and detailed particulars of the great E.D.A.–E.L.M.A. campaign, which has as its immediate object and slogan, "Wiring the Homes of Britain." Having been afforded an early peep behind the scenes we can say without the slightest hesitation that it is the biggest piece of propaganda ever undertaken for electricity, and that the scheme is a thoroughly sound one from all points of view. As we have previously explained, the essence of the campaign is that big scale Press advertising, starting at the beginning of October, will compel millions of people to apply in person at their local centres of electrical activity—contractors' shops, supply undertakings' showrooms, etc.—for a free book, which will entitle them to compete in a simple educational ballot, in which the first prize is a freehold all-electric house, worth £2 000. With all these people coming of their own accord to the electrical retailers of the country it is obvious that there is big business to be done, and large numbers of people who had previously never been aware of the benefits of electricity in their houses will, as someone aptly put it the other day, "put the electrical shop on their shopping list." The possibilities before the industry are immense, and they are equally attractive to electricity suppliers, manufacturers, wholesalers and retailers. The contractor, who has previously been referred to as the "spearhead" of a selling campaign, is definitely "in the centre of the picture." The only thing necessary to make this prodigious effort the greatest co-operative trade push of our times, is personal enthusiasm. Mr. BEAUCHAMP and Mr. BUSH and their staffs of the E.D.A. and E.L.M.A. have planned the big push, and it remains now for every individual in the industry to do his share to make it an unqualified success.

Treasure Trove.

DURING the present month everyone engaged in the electrical industry must decide what share he will take in the Better Home Lighting Campaign, so that when the idea is presented to the general public in October, all electrical men and women will simultaneously begin to play their own pre-determined part in the national effort. Ways in which this can be done are indicated elsewhere in this issue. The prospects are literally golden, for although seven million out of the ten million homes of Britain are situated in electricity supply areas, only 1 400 000 of them are wired. It has been estimated that the 5 600 000 new prospects could consume annually 1 400 000 000 kWh, and if they all bought installations at £20 each, and purchased fittings, lamps, etc., of equal value, the electrical industry would obtain £224 000 000 of new business in the domestic field alone.

Paper Mill Plant Developments.

IN a paper read recently before the Institution of Mechanical Engineers, Messrs. W. WORBY BEAUMONT and LESLIE N. BURT gave an instructive account of the modern development of paper-mill plant. The art of paper-making is old. In Spain there was a trade of this kind in the twelfth century and in France in the thirteenth century, whilst in England good paper was made at Hertford as far back as 1496. From primitive beginnings the industry has expanded vastly, now involving the use of much complex machinery, as is well shown by the authors' numerous illustrations of large paper-making machines, newsprint machines, calendars, etc. In facilitating modern advances electricity has done a great deal. The authors remark that many of the largest and fastest modern machines are electrically driven. In many instances the commercial efficiency outweighs somewhat higher capital outlay; a higher cost per H.P.-hour may result in bigger dividends. One great advantage of electric driving is ease of control; speeds can be varied instantaneously from any point, and motors can be conveniently situated in an annexe, immune from moisture and dust. Reference is made to various special motors and systems for this class of work, the Harland electric drive being described in some detail. As is well-known, there have been notable developments in motors intended for use with paper-making machinery, and requirements can be met with much greater precision than only a few years ago.

Protecting the Public.

IN the course of an Editorial Note on a recent fatal accident where a boy was killed as a result of trespassing on an electric railway, the "Railway Gazette" points out that the risk that undoubtedly exists in such cases is not the responsibility of the railway company, because the victims have no business on the line. It adds that the matter is one of public responsibility. We agree, but we would go further and speculate to what extent this class of accident is due to the custom of providing too much protection. Guarding of all sorts, whether in a factory, on a railway or on overhead transmission lines is good enough up to a point, because there come to all of us moments of carelessness when we should be protected against ourselves. But beyond this it may not be wise to go. For while too little protection punishes momentary absence of mind severely, too much induces to carelessness or reliance on equipment, rather than on oneself. In some branches of industry this state is rapidly being reached, and in the long run the remedy may be worse than the disease.

The Collection of Information.

READERS of THE ELECTRICIAN are probably aware that in view of the enormous amount of scientific and other special information which is now available in periodicals,

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text books and patent specifications it is becoming increasingly difficult to ensure that this data is made known to those who require it for their own purposes. An association—The Association of Special Libraries and Information Bureaux—has therefore been formed, not only to encourage and co-ordinate the activities of special libraries, but to act as a clearing house for the services they offer and to promote the wider dissemination and systematic use of published information. Membership of the Association is open to anyone interested, and with the assistance of the Carnegie United Kingdom Trust the compilation of a dictionary of sources of specialised information in Great Britain and Ireland is being undertaken under the editorship of Mr. G. F. BARWICK, who was for some time Keeper of Printed Books at the British Museum. The importance of such work, especially to electrical engineers, cannot be overestimated. We hope its utility will particularly appeal to Research Associations. These bodies, in the short time they have been in existence, have collected a great deal of useful information, but exceedingly little, even when it is of a non-confidential nature, has been allowed to leak out.

Electricity and Gas for Industrial Heating.

IN an article in "Chemical and Metallurgical Engineering," Mr. R. C. GOSREAU makes an interesting comparison between electricity and gas for industrial heating purposes. The competition between these forms of heating is mostly in the range from 100 to 2 000 deg. F., which covers the largest part of the field of each. Although many operations using gas are conducted at temperatures above 2 000 deg. F., the cost of gas fuel on these installations very nearly equals the cost of electrical energy in most parts of the United States. The choice as to application is properly divided into two considerations—an economic and an engineering consideration. The recent rapid increase in the amount of current used for melting and heating metal shows that electricity can often compete economically where quality is paramount. Inevitably in the choice of direct-resistance heating the shape of the piece to be heated is a governing factor. An intricate piece cannot be made to carry a current satisfactorily and heat uniformly. The direct-resistance method is successfully applied to straight pieces and also to welding, shrinking and surfacing operations. As a consequence the cost of a fuel is not the determining factor; but the degree of utilisation is the prime, important and only factor to consider in its application in any heating process.

An Interesting Patent Case.

AN American contemporary states, and we publish the statement with some reserve, that De Forest Radio Co. is attacking the validity of the well-known drawn tungsten filament patent on the grounds that the inventor was not Dr. COOLIDGE but a Mr. C. G. FINK. Supposing this to be true, it will be interesting to examine the problem that arises from the point of view of British law. In the first place the relationship of employer and employed gives the former no right in the inventions of the latter, and if a patent is taken out by the employer on the invention of his workman such patent would be void. On the other hand, a workman cannot patent inventions which he has made as part of his experimental duties, or if the leading idea of the patent originated with the employer. In the absence of a special contract an invention made by the employee, even when made in the employer's time and with his tools, etc., is the property of the employee. The case, therefore, seems to rest on the exact relationship between the General Electric Co. and Dr. COOLIDGE and Mr. FINK as regards inventions made by them in carrying out their duties in the research department. If the company has a right in the inventions thus made it would not seem to matter whether they were, as a fact, due to Dr. COOLIDGE or Mr. FINK.

Symbols.

A LARGE amount of ground was covered at the meeting of the International Electrotechnical Commission and some important decisions were arrived at. The temperature rise question seems to have been settled, and agreement was reached on the dielectric tests for electrical plant. On other matters there is still a difference of opinion, partly because alterations in practice mean expense, the justification of which is not always apparent. This, however, does not apply to one matter discussed by the Advisory Committee on Symbols and we are glad to learn that considerable progress was made in the standardisation of this useful type of shorthand, both on diagrams and in formulæ. It has now been decided to use the symbol Ω for the ohm and MΩ for the megohm. This will lead to less confusion than the employment of O as originally suggested. To obtain the full advantages from this arrangement, however, it is obvious that all writers should take the trouble to adopt them. It is some time since the International Electrotechnical Commission suggested the use of kW for kilowatt, but our experience, which covers in a year a vast amount of manuscript and printed matter, indicates that the suggestion has only been adopted in a minority of cases. The variations are many and there is not even consistency in the same manuscript or publication. This may seem a small matter, but it is a case where standardisation would lead to an avoidance of confusion.

Car Starting Sets.

EVEN with the high degree of efficiency to which motor-cars have now attained, one of the most remarkable of their qualities is the wonderful way in which the electric starting and lighting sets, which have become standard equipment, stand up, year in and year out, to what is probably the most severe and careless treatment that any electrical apparatus could possibly receive. Thousands and thousands of car starters function satisfactorily under conditions under which no other machinery would be expected to work, and though, like everything else, they are susceptible of still further improvement they are yet a marvel of "foolproof-ness." But one of our popular Sunday papers thinks differently, and, in regard to batteries, learnedly observes that "The truth is that the usual form of battery is somewhat faulty in several respects," and, for the benefit of the appropriate manufacturers, no doubt, states that "the need of the future is not merely for more powerful sets, it is for batteries that are more foolproof, more easily repaired by unskilled hands, and better able to stand misuse than the present type." Statements of this kind are very misleading, and grossly unfair to British makers of this equipment.

Domestic Apparatus Design.

REFERRING to last week's note emphasising the need for better looking domestic electrical apparatus, a Burnley manufacturer furnishes confirmatory evidence of the good financial results which have followed the production of electrical appliances that are good to look upon. Some time ago he introduced a de-luxe electric wash boiler, superbly finished, with the top and legs of pressed and highly polished heavy gauge aluminium, the exterior of the boiler proper being finished in attractive colours to harmonise with any scheme of decoration. Warnings that there was no market for such refinements were happily disregarded, and when the model was finally put on the market the far-seeing makers were inundated with orders. One of these boilers was sent in the first place to each of seven municipal showrooms, and the whole seven were sold within twenty-four hours of their being placed in the window. This experience furnishes ample proof of the truth of our original contention, and we hope that it will encourage other manufacturers of domestic apparatus to further efforts to make their goods as satisfactory in appearance as they undoubtedly are in performance.

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CURRENT TRANSFORMER CHARACTERISTICS.

Requirements for Satisfactory Operation—The Ideal Transformer—Interesting Tests at Ontario—Variation and Reactance Values.

By G. L. E. METZ.

THE intricacies of the current transformer and its operation under load conditions are directly traceable to the fact that a variation in load causes a corresponding variation in e.m.f., and the current remains constant.

The e.m.f. is connected with the flux by the equation :

$$E = 4{\cdot}44 \sim \varphi 10^{-8}$$

any variation in the voltage E will produce a similar variation in the flux density, assuming a constant cross section of iron, and in this way will also effect the no-load current of the transformer.

It can be seen that a variation in load brings a corresponding change in e.m.f., flux, and no load current which maintains the flux, and it is upon the latter and its variation in magnitude

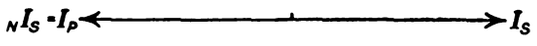


Fig. 1.

and phase displacement that the satisfactory operation of a current transformer depends.

The B.E.S.A. Specification clearly states the permissible limits of ratio and phase angle error, and as these errors are dependent upon the no-load current it actually restricts the value the latter may have.

Now these permissible limits are very small indeed, and a transformer which complies with the specification is very little removed from the ideal, where there are no losses at all, and the current in the primary and secondary windings would have a ratio equal to the inverse ratio of turns, and would also be in direct phase opposition.

This condition is shown in vector diagram 1 where I_P and I_S are the primary and secondary currents respectively, and N the ratio of turns.

It is, of course, impossible to attain the ideal in practice, as there must always be a definite if small amount of energy to excite the core.

A consideration of vector diagram 2 will show the effect of this no-load current (a 1/1 ratio being taken for convenience). Starting with the flux vector φ, the primary and secondary pressures E_P and E_S will each be at right angles to φ and in mutual opposition ; the secondary current I_S will lag behind Es by an angle A determined by the joint impedance of the current transformer and load ; this secondary current being balanced by a component in the primary I_{S_1}.

In order to drive the flux round the magnetic circuit against its reluctance a small current I_M will be required in phase with the flux φ, and a further current I_E in phase with the pressure will supply the energy losses in the iron. The two currents I_E and I_M adding up vectorially to form I_O the no-load current of the transformer.

It is the variation of I_O with load and the internal characteristics (more especially reactance) of the transformer that this article is intended to deal, as this factor has so far received very scant attention.

A comparison of the ideal and practical cases given in diagrams Nos. 1 and 2 illustrate :

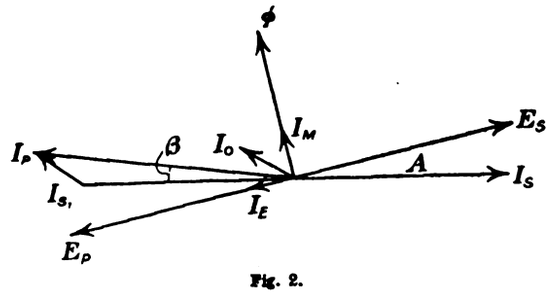


Fig. 2.

(1) That in practice, the primary and secondary currents no longer have a ratio equal to the inverse ratio of turns ; (2) These currents are no longer in direct phase opposition, the vectorial addition of I , the no-load current, having introduced a small angle β upsetting this condition.

The errors produced in the transformer are referred to as ratio and phase angle errors respectively, and their dependence upon the magnitude and phase displacement of the no-load current is apparent in Fig. 2.

Considering the components of the no-load current I_E and I_M, it can be seen by reference to Fig. 2 that an increase in the former is conducive to ratio error, while an increase in the latter affects the phase angle error.

This statement, while being true for the transformer corresponding to Fig. 2, does not hold in every case—in fact, in the majority of 50 cycle current transformers over certain ranges the reverse occurs.

In the particular case taken, it can be seen that the angle of lag A of the secondary current due to resistance, and reactance of load and windings is comparatively small in magnitude ; in the vast majority of current transformers, however, the angle A is large.

This is due to the fact that a comparatively large proportion of the flux lines do not link with the turns of both windings, giving the transformer a high reactance.

The effect of this leakage flux is most marked at the higher frequencies and varies as the square of the turns ; it is just as important at light loads as at conditions of heavy load, and quite often produces such a large angle of lag of the secondary current as to even make the power factor of the load of quite secondary importance.

A number of very interesting tests have been carried out at the University of Ontario by Prof. H. W. Price, in which the resistances and reactances which may be expected from the usual commercial design of switchboard current transformer have been ascertained under given conditions of load.

A table (Fig. 3) is printed below giving these figures as far as they apply to the usual designs met with in this country.

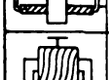
Type.	Ratio.	Volts.	Load.	Sec. Int. Resistn^{ce}	Sec. React. at 60$^{\sim}$	Prim. React. at 60$^{\sim}$ in Terms of Sec.
	5/5	3,300	1·0^{W}	0·35	0·54	0·75
	75/5	15,000	1·6^{W}	0·46	2·0	9·0
	5/5	3,300	1·0^{W}	0·33	0·87	1·1

Fig. 3.

These values of reactance vary with different types of windings and cores, but the most general types have been dealt with.

The importance of the reactance of a current transformer is apparent from these figures which show that in many cases this factor dominates the power factor of the secondary load, and in that way greatly affects the operation of the transformer.

The approximate vector diagram for a tube type transformer (type 2) is given in Fig. 4, in which it will be noted that the angle A has very greatly increased. It will be seen that the flux and e.m.f. vectors have all turned through a large angle taking the no-load vector I_O with them, and while the latter may not have altered in magnitude, it has considerably changed in effect. As remote from the condition shown in Fig. 2, it should be noted that an increase in I_M is now conducive to ratio error, and an increase of I_E similarly effects phase angle error ; this is quite the reverse obtained by a consideration of diagram 2.

The magnetising current is invariably greater than the energy current, with the result that in the last case where the transformer has a high reactance, large ratio and small phase angle, errors are to be expected.

The importance of leakage reactance is also manifest in other ways : it prevents comparison between unsimilar types of current transformer of identical ratio unless the internal angle of lag of each is known, and complicates the mathematical predetermination of errors to a great extent.

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Current transformers of different types of construction, but having a common ratio and identical errors at a given load, may behave quite differently at other conditions of load, power factor or frequency.

Where attempts are made to predetermine the errors of current transformers by mathematical means, the formulæ used invariably depend upon the addition of the various current vectors by means of a trigonometrical analysis, in which case the phase displacement of the no-load current I_0 must be known.

This makes it necessary to obtain by some means or other the reactance of the transformer.

Now it has already been stated that the errors of a modern transformer are confined to very small limits, and as it is not possible to calculate the leakage reactance with any degree of accuracy, it but remains to fall back upon actual test.

It is by no means simple to obtain the reactance of a current transformer, and a well-equipped laboratory, and highly skilled

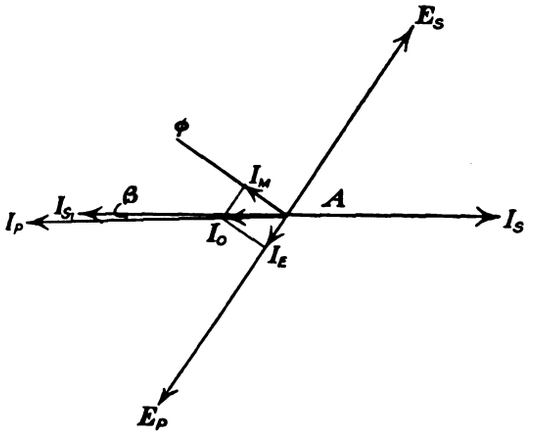

Fig. 4.

engineers, are required to perform the experiment, which, it must be remembered, must be carried out over the whole range of transformers, as the effect of leakage reactance of a current transformer varies as the square of the turns.

The effect of leakage reactance generally prevents the predetermination of the errors of a current transformer by mathematical means; and possibly accounts for the difficulties met with in making and comparing tests on these errors, more especially where transformers are used having a 1/1 ratio. The behaviour of a 1/1 ratio transformer may be quite different when other ratios are employed.

In conclusion, it will be seen that tests for these errors can never be brought down to a usual routine affair if any reliance is to be placed in the results obtained; while mathematical predeterminations cannot be relied upon to give accurate results.

THE CADMIUM CELL.

Its Use for Measuring Ultra-Violet Radiation Intensity.

THE cadmium cell which has been designed by Messrs. H. D. Griffith and J. S. Taylor for measuring ultra-violet radiation intensity depends for its efficiency as a measure of ultra-violet radiation on the so-called photo-electric effect. This photo-electric effect is a specific property of certain materials, by which they emit electrons under the influence of radiation, the rate of emission being proportional to the intensity of the source to which they are exposed. If such materials are charged with negative electricity and exposed to light, they lose their charge at a rate depending on the intensity of illumination; if they are charged with positive electricity they keep their charge. All materials show this photo-electric effect if the wavelength of the radiation to which they are exposed is sufficiently short, but not all if the wavelength is limited to the visible and near ultra-violet region.

In order to measure ultra-violet light for therapeutic purposes, it is essential to choose a material sensitive mainly to light of the wavelength which is responsible for the therapeutic action. Cadmium exposed behind a quartz window fulfils this condition well, as this metal is completely insensitive to visible light, of a wavelength greater than 350 uu while the quartz window cuts off all radiation of a wavelength less than 200 uu. The maximum sensitivity within these limits is situated approximately at 300 uu, which is the region of greatest biological interest.

Construction of the Cell.

The construction of the cell is indicated in the figure, in which part of the glass wall has been covered with a layer of cadmium metal distilled from the globule *C*, which may be seen in the cell. During the distillation, the quartz window *Q* is shielded by a microscopical cover glass *M* (which may also be seen loose in the cell) so that it is not obscured by the cadmium deposit. After the preparation of the cell (which is highly evacuated), the cadmium globule and the cover glass fall down into the side tube *B*, and play no further part, the cell being subsequently filled with an inert gas at low pressure. The plate *A* serves as the photo-electric electrode, the gauze *G* is merely the recipient of the electrons which it loses. The rate of loss of charge is measured by an electroscope in the usual manner.

The time between charge and discharge is proportional to the intensity of the ultra-violet radiation falling on the cell. This intensity depends, of course, on the character of the lamp, on its distance from the cell and also on the area of the quartz window, which latter can be varied by means of a series of diaphragms.

An electroscope which consists of a leaf electroscope mounted on suitable brass base plate has also been designed for use with this cell.

In this instrument the single aluminium leaf is attached to a central brass stem which is effectively insulated from the metal case by being mounted in a sulphur plug set in a double ebonite bushing.

The whole is mounted in a cylindrical brass chamber 3¼ in. diameter the ends of which are closed by discs of glass held in position by brass caps. The lower half of one of these discs is silvered, so that by observing the leaf through an adjustable eye piece, a position of no parallax is obtained, the leaf being seen immediately above the reflected image of two lines, etched on conveniently mounted brass plates.

A small drying chamber is provided to hold calcium carbide or other suitable de-hydrator. The base also carries a vertical

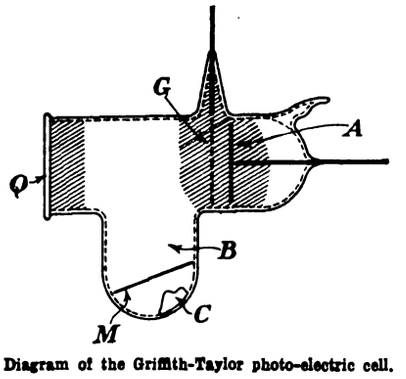

Diagram of the Griffith-Taylor photo-electric cell.

steel rod on which is clamped the cell holder, and also a fitting carrying an adjustable wheel of diaphragms having three apertures, the respective diameters of which are 4 mm., 8 mm. and 16 mm. An ebonite rod is provided for charging the instrument by friction. Both these instruments are manufactured by Watson and Sons (Electro-medical), Ltd.

I.E.E. Regulations.

Publication of the New Edition of Rules for Equipment of Ships.

WE are informed that the Council of the Institution of Electrical Engineers has revised the I.E.E. Regulations for the Electrical Equipment of Ships, and has authorised the publication of a second edition.

Copies may be obtained from the secretary of the Institution, Savoy Place, London, W.C.2, or from E. and F. N. Spon, Ltd., 57, Haymarket, S.W.1, at the following prices: Bound in blue cloth, 3s. 6d. net (or 3s. 8d. post free) each; bound in black American cloth, 2s. 6d. net (or 2s. 8d. post free) each.

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NEW ELECTRIC LOCOMOTIVE FOR BRAZIL.

British Manufacturer's Design Adopted—Most Powerful Equipment yet Constructed in this Country—Brazilian Electrification Progress.

THE accompanying photograph shows a 100-ton electric locomotive which has just been completed by the Metropolitan-Vickers Electrical Co. for passenger service on the Paulista Railway of Brazil.

Electrification of the main line of the Paulista Railway has been proceeding since 1921. The track gauge is 5 ft. 3 in.

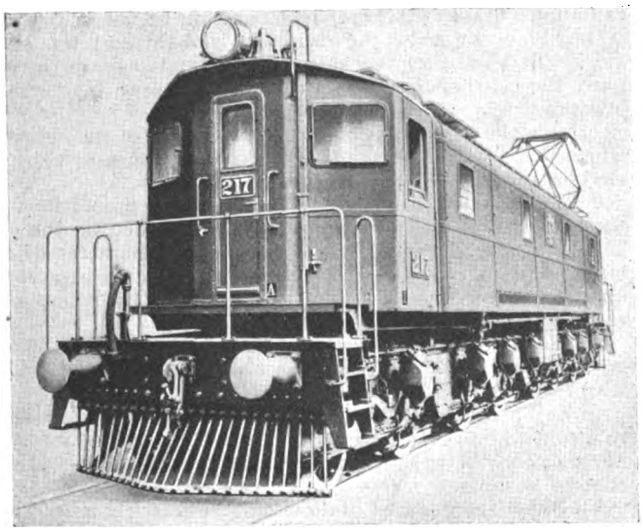

Fig. 1.—3000 V Metrovick passenger locomotive for the Paulista Railway; 2-6-0, 0-6-2 type, 100 tons, 2 340 h.p.

and the system of operation is 3 000 V d.c. with overhead trolley and rail return. By the end of the present year it is expected that 83 miles of line between Jundiahy and Rio Claro will be electrically operated, and extensions are planned to S. Carlos, a further distance of 45 miles. The present equipment of the railway includes ten freight locomotives, six passenger locomotives, and five shunting locomotives, all of American construction.

The new Metrovick electric locomotive is the most powerful yet constructed in Great Britain. It has six motors totalling 2 340 H.P., and weighs 100 tons. It will haul a 400-ton train at 50 miles an hour on the level, at 48 miles per hour up a gradient of 1 per cent., and at 39 miles up a gradient of 2 per cent., which, it may be mentioned, is considerably steeper than the grades ordinarily encountered on British main line systems.

Constructional Details.

The general construction and principal dimensions of the new locomotive are shown in Fig. 3. The body structure is carried on two trucks, each of which has three motor-driven axles and a single guiding axle. The trucks are coupled together by an articulated joint of the ball type. The body is supported on two pivots which engage in centres so disposed on the trucks as to give equal loading on all driving axles. One of the pivot centres is allowed a longitudinal sliding movement, so that while the distance apart of the body centres remains unchanged, the trucks are free to take up the varying positions required when negotiating curves. The arrangement of pivots and the design of the articulated coupling are such that all draw and buffing shocks are transmitted through the bogie units without stressing the body structure. A side equalisation system gives equal distribution of weight on all the driving axles.

Current is taken from the overhead line by means of one of two pantograph-type collectors mounted on the roof of the locomotive. The collectors are raised and lowered by means of compressed air cylinders, the valves of which can be operated either electrically or manually. Spring control is provided so that the pantographs will follow variations in height of the overhead trolley from 15 to 22 ft. above rail level.

The main motors are of 390 H.P. each, and are mounted one on each of the six driving axles of the two trucks. Power is transmitted to the driving wheels by means of flexible spur gearing. The motors are wound for 1 500 V but insulated for 3 000 V, control being so arranged that at least two of the main motors are always connected in series. In starting up, the control sequence is first to connect all six motors in series, then two parallel groups of three motors in series, and lastly three groups of two motors in series. The controller has twelve accelerating notches, the full range of which is used with each motor combination in turn, so that very smooth control of acceleration is obtained. There is also provided a weak field notch which can be used with any combination of the motors.

On down grades power is returned to the line by means of regenerating braking, the motors being driven as generators. Field excitation for the regenerating motors is provided by a special motor generator set installed behind the driver's cab at one end of the locomotive.

Main Control Gear.

The main control gear is of the electro-pneumatic type, the master contactors being operated by compressed air cylinders with electrically controlled valves. The high tension apparatus is housed in a separate compartment in the middle of the locomotive, the doors of this compartment being interlocked with the collector system, so that they cannot be opened until the pantographs are lowered. Accidental contact with live high tension apparatus is thus impossible. The control circuits of the motors and accessories are operated at low voltage on a supply given by another motor generator set installed similarly to the field excitation set but at the other end of the locomotive. The control gear is of the non-automatic drum type and is fitted with mechanical interlocks to ensure correct operation.

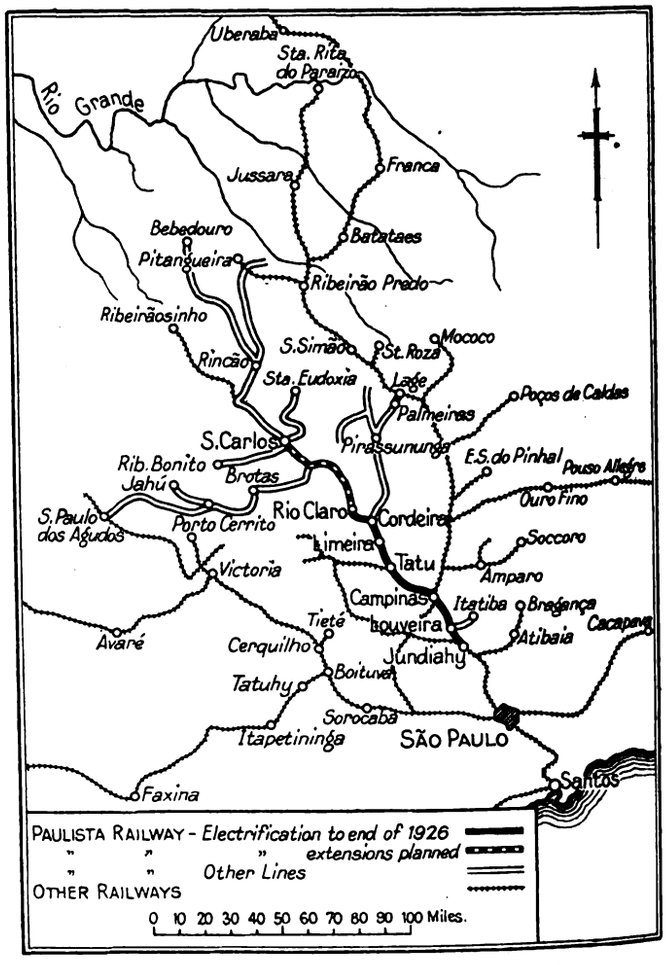

Fig. 2.—Map of Paulista Railway, Brazil, showing electrified lines.

The brake system is automatic, provision being made for applying vacuum brakes on the trains and compressed air

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brakes on the locomotive. Ordinarily, the locomotive brakes are applied automatically with the train brakes, and with a proportional force, but provision is made for partial application of the train brakes alone when regenerating.

The equipment of the locomotive is similar in many respects to that of the ninety-five 3 000 V locomotives supplied by the Metropolitan-Vickers Electrical Co. for service on the metre gauge South African Railways, but while the South African locomotives are of 1 200 H.P. each and arranged for multiple unit control, the much broader gauge of the Paulista Railway makes possible the use of a much more powerful unit for single operation.

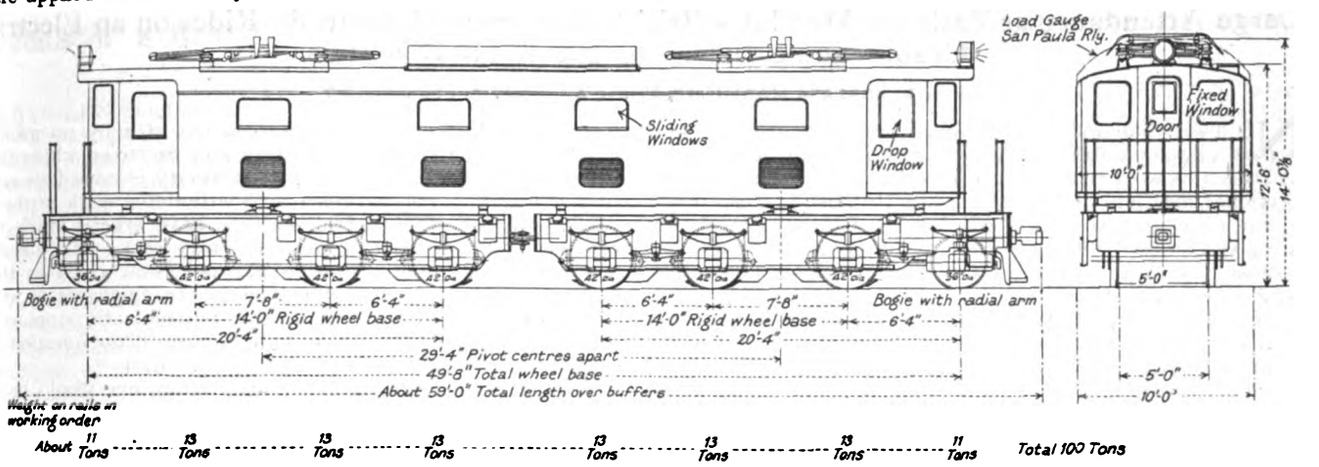

Fig. 3.—Outline and principal dimensions of locomotive. Note: The side buffers at present fitted on the locomotive will eventually be replaced by the central automatic buffer here shown.

CORRESPONDENCE.

Rectifiers for Measuring Alternating Currents—The Use of Esperanto for Technical Articles—Domestic Apparatus Design.

"MEASURING SMALL ALTERNATING CURRENTS."

[To the Editor.]

Sir,—Since writing the article on "Measuring Small Alternating Currents," published in your issue of August 20th, I find that a new small rectifier has been marketed by the M.O.V. Co. This is the "U" type, and is a thermionic diode. It should serve admirably in the circuits detailed in my Paper. For higher currents two or more valves may be paralleled.

I have not made it clear in my article that when using triodes the anode and grid should be connected together.

Further, when measuring very small currents of the order of a few microamperes it is advisable to make the grid negative, and not to connect it to the anode, so that contact potential difference will be eliminated. Otherwise small circulating currents may be set up which would give a small deflection on a microammeter.

This is not marked with dull-emitters, however, which may still be connected as shown.—I am, etc.,

E. H. W. Banner.

London.

LANGUAGE AND THE METRIC SYSTEM.

[To the Editor.]

Sir,—I have followed with interest the correspondence on the subject of International Language, commencing with your Editorial of July 9th. It appears to me that both your original Editorial and also the letter from Mr. Rettie in your issue of August 13th fall into the same error, in connection with Esperanto.

You assumed in your Editorial that Esperanto was not a "vehicle of thought," whereas I am quite prepared to prove that it is so by producing an individual who not only successfully courted his wife in that language but uses it as a regular thing in his home, and undoubtedly thinks in it.

Mr. Rettie's second paragraph, which is intended to lay emphasis on the unsatisfactoriness of a "made up language," in actual fact serves to call attention to its strongest point. I myself frequently have to translate technical articles in French, and occasionally in German, and I have also done a fair amount of translation of technical material prepared in a national language and then translated into Esperanto. I have not the slightest doubt, after considerable experience, that it is easier to get an exact translation of, say, French into English, *via* Esperanto than direct. To achieve the latter necessitates that one person shall have complete command of technical French, technical English, and the subject of the article. To perform the translation *via* Esperanto necessitates that one Frenchman and one Englishman shall have each a complete knowledge of his own language and of the subject in question, and a *working* knowledge of Esperanto.

It is a particularly strong point of such a language that the technical terms are either international, or so logically built up that there is no difficulty in translating if one knows the subject being dealt with.

I would ask both the writer of your Editorial and Mr. Rettie whether they have had any actual experience of either reading or writing Esperanto: if they have not, it seems to me that they are not qualified to speak on its difficulties, or, as I maintain, its lack of difficulties.—I am, etc.,

Blackheath. P. K. Turner.

BETTER-LOOKING APPARATUS.

[To the Editor.]

Sir,—Your plea in The Electrician last week that the electrical industry should devote more attention to the appearance of apparatus for domestic use should cause some of our appliance designers—sometimes one wonders whether there really are any—to pause and consider whether they could not produce electrical apparatus that will fittingly take its place in a well furnished home. I particularly refer to the appalling appearance of many of the electric fires that are foisted upon the public; fires with cases made in a sham "Jacobean" patterning; fires with curly bits of iron protruding from every available corner; fires with knobs all over them; and so on *ad nauseam*. There are, of course, several very distinguished exceptions, but, on the whole, whatever their efficiency, most electric fires are not pleasant things to contemplate in slippered ease.

Much of the unnecessary ornamentation complained of only adds to the manufacturing costs, and I maintain that the omission of much of the so-called "decoration" would result in the production of a cheaper and more handsome piece of apparatus.

The numerous services to which electricity can be put in the home are performed efficiently and unobtrusively. Why, then, should the apparatus through which that service is given so blatantly proclaim its presence?

I enclose my card and hope that you will continue your efforts to raise the standard of design in this direction.—I am, etc.,

Oxford. "Antifus."

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THE WORLD POWER CONFERENCE.

Large Attendance at Basle on Monday—British Delegates Honoured—Rides on an Electric Crane—Some Ingenious Electrical Diagrams.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.I.C.E., M.I.E.E., F.R.A.S.

NO fewer than 468 representatives of 32 countries, as well as a large number of Swiss engineers, have forgathered at Basle this week to attend the 1926 World Power Conference Sectional meeting. Of these, 34 are British (or 7 per cent. of the total visitors from abroad). The names of the latter are given below. Of these, the British official delegates are indicated with the name of the Association or Institution which has nominated them :—

D. A. Bremner (B.E.A.) ; C. A. R. Bradley ; R. A. Chattock (I.E.E.) ; D. N. Dunlop (chairman, International Executive Council World Power Conference) ; E. J. Fottrill (Commonwealth of Australia) ; Dr. J. W. Evans ; J. A. Hookham ; K. E. Hughes (THE ELECTRICIAN) ; C. W. Kay ; P. D. Low ; H. C. Lott ; C. F. Mackness ; R. Borlase Matthews ; Col. R. K. Morcom (B.E.A.M.A.) ; Col. O'Brien ; Dr. B. J. Owen (Ministry of Agriculture) ; W. H. Patchell ; M. Perrin ; T. Petersen ; E. Parry ; B. Pochebradsky ; W. Prescott ; J. C. B. N. Radcliffe ; Dr. A. H. Railing ; T. Rich ; J. F. Schippers ; J. M. Scott-Maxwell ; Roger T. Smith (I.E.E.) ; Sir John F. Snell (Electricity Commissioner) ; P. Stivender ; A. J. T. Taylor ; H. A. Slack ; D. W. Thorpe.

British Papers.

Eighty-two different papers have been presented, dealing with the five subjects of the present conference—viz., (*a*) utilisation of world power and inland navigation ; (*b*) exchange of electrical energy between countries ; (*c*) the economic relation between hydro and thermal electrical energy ; (*d*) electricity in agriculture ; (*e*) railway electrification. As only three of these subjects, viz., (*a*), (*d*) and (*e*), were of direct interest to Great Britain, and since only one paper dealing with each subject was permitted from each country, the maximum number of British papers was limited to this number—viz., " The Use of v d/y as a Parameter in the practice of Hydraulics," by E. Parry ; " Electric Ploughing," by R. Borlase Matthews ; " The Economic Aspects of Railway Electrification with special consideration of those which cannot be expressed numerically," by Col. E. O'Brien.

The honour of presiding at the second Railway Electrification Session was accorded to Great Britain, as represented by Mr. Roger T. Smith ; while the British readers of papers were privileged to open their respective sections by reading the first papers each day. These marks of courtesy to the British nation are much to be appreciated in these days of tendencies to international jealousies.

Monday, the opening day, was devoted to meetings of the International Executive Council. In the evening, however, all those in attendance at the Conference met at the official dinner, which was held in the large hall of the Exhibition. A very full programme, both of Papers and visits, has been arranged, of which it is hoped to give some details in a forthcoming issue of THE ELECTRICIAN.

Valuable Temporary Loac s.

This sectional meeting of the World Power Conference is being held in conjunction with the somewhat unwieldily titled Swiss International Exhibition of Inland Navigation and Utilisation of Hydraulic Power. New ferro-concrete buildings have been specially erected for the purpose of this Exhibition. These buildings are very representative of the modern neo-art style of Continental architecture. The final result is very pleasing and effective, yet the cost of construction must have been very reasonable. The general interior decoration and finish are very much more pleasing and permanent than was adopted for the Wembley Exhibition, for example. The buildings are comparatively small for an exhibition, as is usually understood in these days of big things ; on the other hand, their size permits them to be situated within the city itself.

Naturally, there is an Amusement Park, which is, however, separated from the main exhibition. Combining utility with thrills, one of the amusements consists of a modern builder's electric crane, which hoists and swings around a caged bucket of venturesome passengers. Beautifully light and compact in construction, this crane is illustrative of the manner in which Continental contractors expedite the construction of buildings. Further, it is an illustration of a by no means negligible load to the central station of the town where the buildings are being erected ; for electricity is nowadays employed for all power purposes in new building work in these parts. In fact, the central stations have special staffs to canvass for and connect up this temporary work. It is almost a wonder that more attention has not been given to the matter in England, since the load in the aggregate is well worth having, and the services are subsequently employed for the supply to the finished buildings. [This question is dealt with by a contributor on page 277.—ED.]

Judging from the title of the exhibition, one would have expected to have found considerable machinery on view ; however, except in the French Section, where some lighthouse lights and lenses are shown, as well as some conveyors, it is really an exhibition of models and diagrams. Nevertheless, it is a highly instructive and interesting exposition.

Many of the wall diagrams utilise numbers of small lamps, which operate by automatic electrically driven switching gear, clearly bringing out the points to which attention is directed. The method is familiar in its simplest form to patrons of London's " tubes," where it is employed on route indicator boards. At this exhibition, however, it is carried to a much greater degree of refinement and detail.

One chart showed all Swiss stations of 1 000 H.P. and over, in stages of 5 000 H.P., and in vears of construction, with and without water storage capacity ; any of these details being immediately ascertainable on pressing the appropriate button.

Italy had a bas-relief map of her central station and also of her interconnecting electrical distribution system. These diagrams certainly gave a very graphic idea of the rapid rate of development of power stations and distribution lines. Italy modestly claimed that she was far behind other European countries. Obviously her representative cannot have visited England. It would do a number of our legislators and financiers a world of good to see these diagrams, so that they would realise the importance of doing something to put Britain in the vanguard of electrical progress.

(*To be continued.*)

Electric Clothes Washers.

A Simple and Portable Appliance of Novel Design.

UNLIKE the usual type of electric clothes washing machine, which is necessarily a rather elaborate and heavy piece of apparatus, the latest appliance of this kind is extremely simple and portable. Known as the " Turbax " electric clothes washer, and weighing only 21 lb., the appliance consists of a cylindrical casing of non-corrosive metal, to the top of which the motor casing is attached. The motor is of the universal type, and is supplied for a.c. up to 60 cycles or a d.c. supply of 100 to 250 V ; consumption is 300 W.

Coupled to the motor shaft is a high speed turbo-pump working at about 5 000 revs. per min., and arranged in the lower part of the machine. The pump shaft is insulated from the motor shaft by means of a fibre coupling, and the lower cylindrical casing is also well insulated from the motor casing. In operation the appliance is simply placed in an ordinary wash boiler or bath tub and clamped to the side by the special fitting provided. On starting the motor the hot soapy water is drawn in through a series of small holes in the lower part of the cylinder and ejected from another orifice in a powerful jet which surges through the clothes. From three to fifteen minutes are said to be required to wash a tub full of clothes thoroughly.

It is claimed for this new washing machine that as there is no wear and tear on the clothes the finest fabrics can be washed very speedily without harm. When not required for use the " Turbax " machine can be stored away in a cupboard or hung up in the washhouse. The overall height is 26 in. and the diameter 4 in. There are few wearing parts and the bearings only require a few drops of oil about once a month. The selling price is £12 12s., and the sole concessionaires are Burdette and Co., Ltd., Fitzalan House, Arundel Street, London, W.C.2.

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RAILWAY AUTOMATIC SUB-STATIONS.

Details of a British Firm's Supervisory Control Gear Recently Installed on an Indian Railway's Suburban System.

MODERN practice in the operation and control of hydro-electric generating stations and static and converter sub-stations situated at varying distances from the central main generating station calls for means whereby the various switching operations at the remote stations can be directly controlled from the main station or other control point. Moreover, the correct accomplishment of these various operations must accurately record back at the control centre.

Following the success of the A.T.M. remote control and supervisory apparatus, which was designed and manufactured by the Automatic Telephone Manufacturing Co., to the order of the Metropolitan-Vickers Electrical Co., for the city of Wellington tramways, the Metropolitan-Vickers Co. suggested the use of A.T.M. equipment for the supervisory controlled rotary converter equipments which they are supplying to the order and specification of the Bombay Baroda and Central India Railway Co. in connection with the electrification of suburban lines of that company in the neighbourhood of Bombay. This specification is fairly elaborate, and calls for :—

(*a*) A control board showing diagrammatically all the main electrical connections of the apparatus controlled by supervisory apparatus.

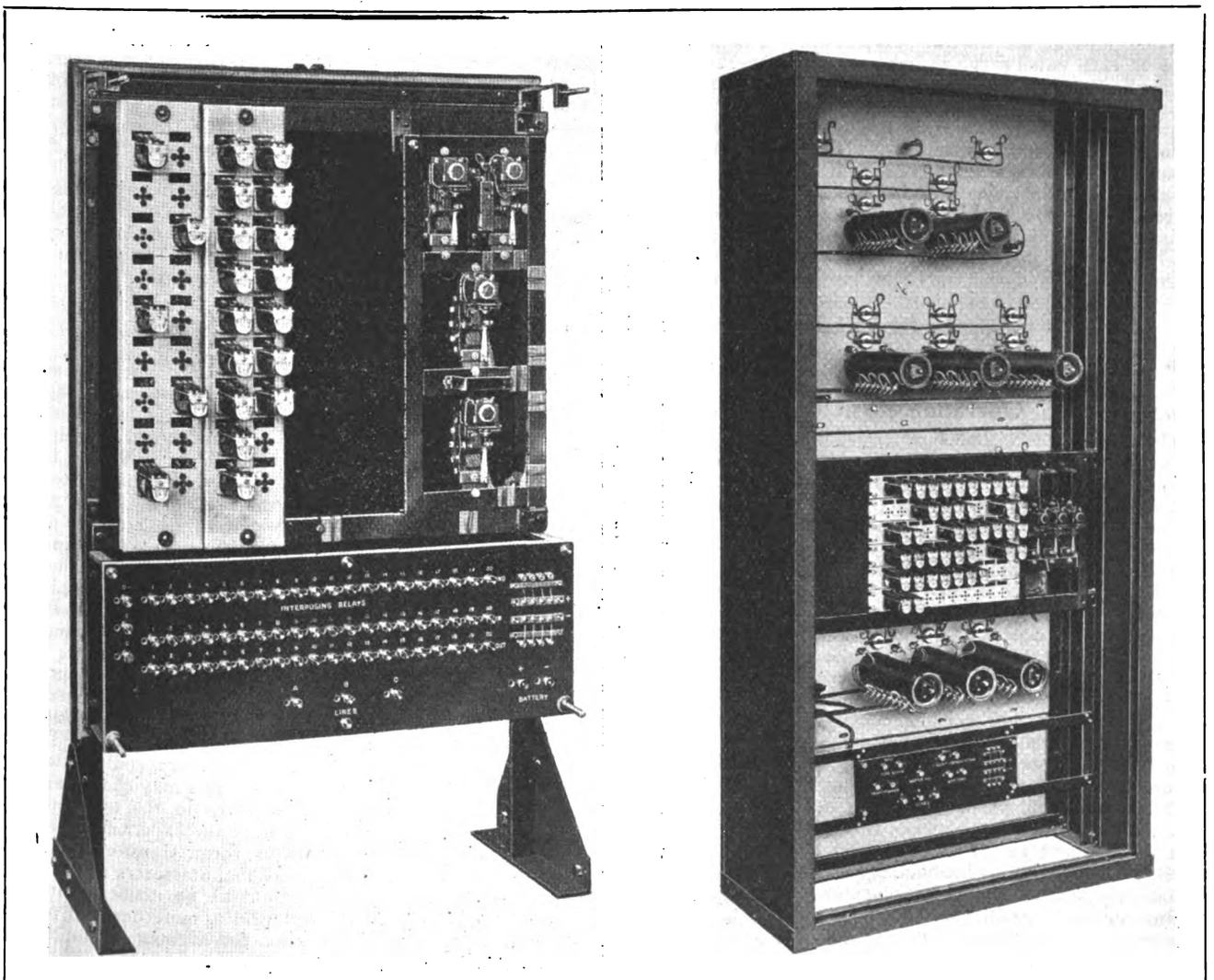
(*b*) The installation of temperature alarms to indicate on the supervisory control board when a machine is approaching an unsafe operating temperature.

The plant to be controlled on the B.B. and C.I. electrification comprises 20 000 kW of rotary converter plant, in three automatic substations ; 22 000 V h.t. feeders, 1 500 V d.c. traction feeders, and railway station lighting transformers and circuit breakers in two track sectioning cabins.

The supervisory equipment comprises five supervisory control panels, which will be installed in a central control room, and corresponding apparatus in cabinets which will be located at each of the distant sub-stations and section cabins. On the panels are mounted the selector switches and indicating lamps for the control and supervision of the circuit breakers at the sub-station.

The selector switch handles on the face of the panels are each associated with the indicating diagram of the power circuit they control, the whole forming a complete diagram of the system.

Each selector switch has its own indicating lamps mounted behind red and green opals, to indicate the condition of the corresponding distant at any moment, i.e., whether "open" or "closed." The function of these selector switches is to prepare the circuit in advance for the actual switching operation, which is finally effected by pressing the control push button. To ensure the correct condition of the circuit following the manipulation of the selector switch, subsidiary pilot lamps are provided, and the operator awaits confirmation of the circuit by these lamp signals before finally pressing the control button. This is a noteworthy and very important feature, inasmuch as it is claimed that it ensures absolute certainty of correct selection and relieves the operator of anxiety regarding possible errors in switching. Other indicating lamps on the panels



Details are given in the accompanying article of an interesting remote control and supervisory system installed on an Indian railway. The illustration on the left shows a sub-station apparatus cabinet, the other being a back view of a control panel.

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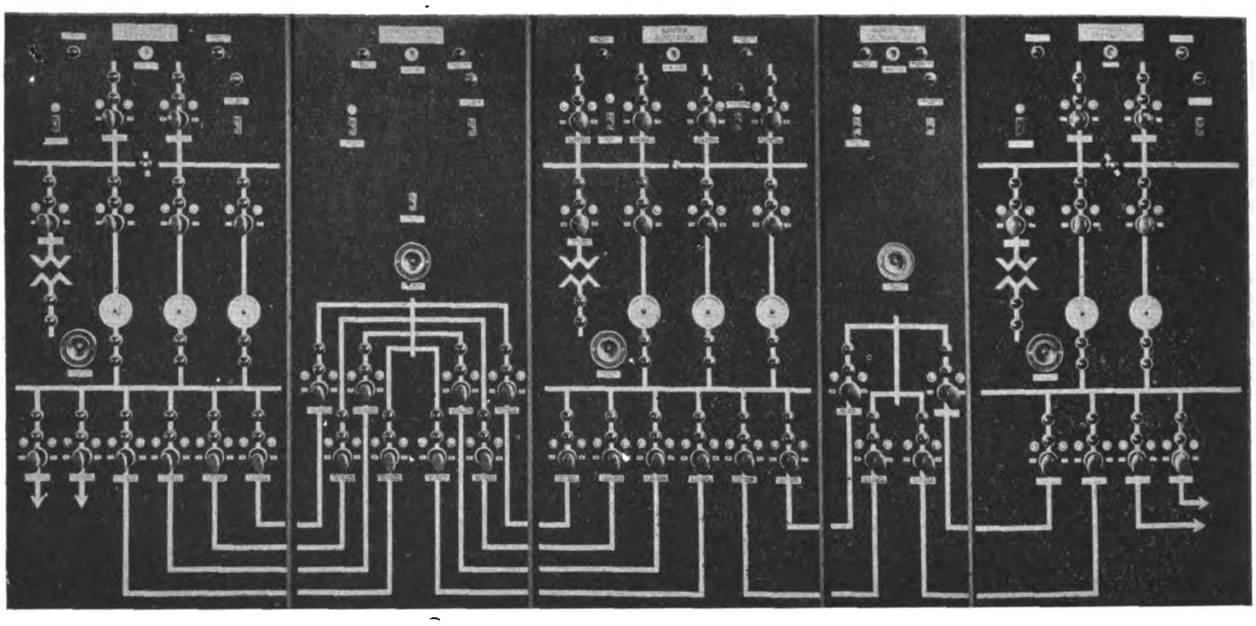
furnish immediate warning of undue temperature rise in the windings of the running plant at the sub-station.

Facilities are provided which enable the operator to check the condition of the distant switches at any time by operating a special checking key. In addition to the indicating lamps, audible alarms are provided to call attention to any change in the conditions at the distant sub-station. Two main pilot lamps on each panel serve to indicate to the operator, whilst switching, that the signalling impulses are actually being transmitted over the line wires and in due course back to the central control room. There is also provision on each panel for carrying out daily routine tests on the line equipment.

The panels form the fronts of independent cubicles containing the selector switches, relays and switching apparatus. There are removable doors at the back of these cubicles. The apparatus cabinets at each sub-station are dustproof and metal cased. In them are mounted the relays and switching apparatus associated with the circuit breakers and thermostats.

Each panel of the central control board is connected with its corresponding sub-station apparatus cabinet by a pair of pilot line wires, whilst a common return from all sub-stations also leads back to the central control board. Over these pilot line wires, the equivalent of telephone wires connecting the central control board with the distant sub-stations, the whole of the actual switching operations are effected and their due accomplishment recorded back to the attendant in charge.



Five panel supervisory control board provided for the suburban electrification of the Bombay, Baroda, and Central India Railway Co.

It will be seen that, irrespective of the number of circuit breakers to be controlled and supervised at any sub-station, only one pair of pilot line wires and a common return are necessary links between the central and each distant point.

The A.T.M. remote control and supervisory system is based on step-by-step mechanism analogous to that constituting the well-known A.T.M. (Strowger) automatic telephone system, which has now been standardised by the British Post Office for the public telephone service of this country.

REVIEW.

Power Station Operation. Vol. I. (London: "The Electrical Times.") Pp. 100. 3s. 6d. net.

A valuable feature in recent issues of the "Electrical Times" is the section in which under the heading of "Power Station Operation," questions relating to the maintenance and operation of power plants are discussed. Members of power station technical staffs and other specialists here contribute the solutions to difficulties and problems raised by correspondents engaged in this branch of electrical engineering. The book is a selection of some 260 of the more important queries dealt with during a period of fifteen months, and has been the means of bringing together no inconsiderable amount of sound advice based upon accumulated experience. The questions asked and answered cover nearly all departments of generating station and sub-station working, and most of them are of an essentially practical nature. Although every engineer in charge of plant acts upon knowledge gained from experience, he would not fail to be interested in another's view as regards say, how often a big water-tube boiler should be taken off the line for blowing out soot between tubes; notes on the fusing point of ash, and the troubles caused by such fusing; the relative advantages and disadvantages of water and compressed air tools for scaling tubes; or hints on the installation and starting up of centrifugal pumps. Not all the examples however, are of this general description, for many examples of calculation relative to boiler and turbine losses and efficiency are included. In the sections dealing with transformers, rotary converters, switch-gear, parallel running, etc., the majority of the questions raised refer to the fundamental principles and characteristics of the apparatus. Practically all the information demanded and supplied here is the subject matter of any modern text book of electrical engineering. Satisfactory explanations with clear vector and connection diagrams are furnished, however, and should be helpful in clearing up the points raised. All these subjects are treated in an elementary way, which occasionally lapses into looseness of expression, as, for example, the use of the term "reverse current" instead of "reverse power" in connection with alternator protective relays; again, on page 34, we read, "it would not be permissible to raise the pressure at the busbars of one power station in order to provide for an interchange of power between stations, on account of raising to an inordinate degree the pressure at the terminals of near-by consumers." The station referred to being alternating current, it would not only be not permissible but impossible to effect an interchange of power by this means. However, the contributor does not fail immediately afterwards to state the conditions correctly.

It is noticeable that comparatively few contributors are responsible for the replies—perhaps this may change as more station engineers interest themselves in the questions. It would indeed be invaluable to have the experience of station engineers on breakdowns—stator, rotor, transformer, switch, turbine, etc., etc. Unwilling as manufacturers might be to write such accounts, there would be no doubt about their willingness to read them—and who is more qualified to give a better informed or more impartial account of an accident of this kind than the station engineer himself?

The elementary scope of the work, its general accuracy, clearness of statement and practical outlook should find this unpretentious little book many friends among central station men.

S. PARKER SMITH.

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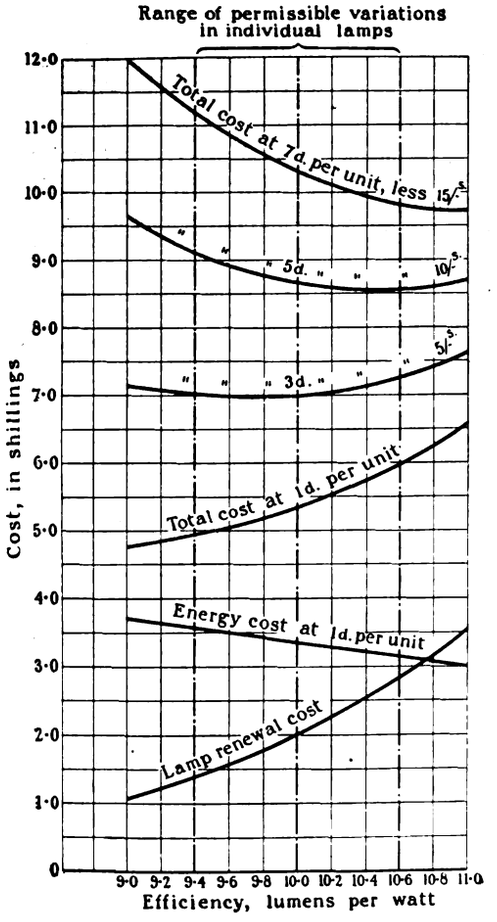
THE ECONOMICS OF LAMP CHOICE.*

Two Problems for the Consumer—Manufacturers and the Proposed Grading of Lamps—An Important Matter.

By D. J. BOLTON, B.Sc.(Eng.).

THE performance of electric lamps can be varied in any degree by suitable over-running or under-running, and the rating is therefore chosen on purely economic grounds. The economic calculations in connection with illumination are thus made on a basis of a service unit, e.g., lumen-hours, whereas most other economic comparisons are based only on a time-unit. The consumer is offered two problems, (1) choice of type of lamp, and (2) choice of rating. The best choice depends on the local conditions, primarily on the cost of lamps and the price per unit paid for electricity. Some of the author's general results are shown in diagrammatic



form in the chart above which relates efficiency in lumens per watt to cost in shillings.

In the algebraical treatment a distinction is drawn between two cases. In Case I, when the same lamps are used, the pressure being varied, the relation is given by the following formula :—

$$R^{12\cdot5} = 0\cdot202\,\frac{PW}{C}$$

In Case II, assuming a fixed size of illumination unit giving a certain number of lumens, the formula becomes :—

$$R^{16\cdot1} = 0\cdot15\,\frac{PW}{C}$$

In these formulæ R = Ratio of most economic voltage to actual rated voltage,
P = price of energy per kWh
C = first cost of lamps
W = watts consumed.
} in the same units.

A number of examples of the application of the formula are discussed, and some interesting conclusions are drawn. It is pointed out that the 40 W lamp, costing 2s. is economical on its present day rating with energy at 4d. a unit. With a 60 W lamp, on the other hand, the economical life would be 882 hr., whilst with a 20 W lamp it would be 2 230 hr. Generally speaking the larger or the less expensive the lamp, the higher should be the efficiency and the shorter the life aimed at. Prof. Bohle has found that a 60 W tungsten lamp costing 2s. 6d. is most economical on its normal rating, giving say 1 000 hr. and taking 1·2 W per c.p. But when energy costs 6d. a kWh it is more economical to over-run the lamp until it takes 1·03 W per c.p. ; whilst with current at 2d. it may be run at 1·35 W per c.p.

No Guidance.

The most economical efficiency or rating is thus dependent on the cost of lamps and the price per kWh. Consumers receive little or no guidance on this point. Thus until recently the author was paying 7d. a kWh for lighting, whilst a neighbouring block of flats received energy at a uniform rate of 1d. per kWh. Lamps which were economical for one circuit would clearly be unsuitable for the other. Yet lamps for both were bought from the same shop, and there was nothing on the lamps or wrappers to show that they were not suitable for the same voltage under all circumstances.

Manufacturers could help by grading their lamps for dear, medium, and cheap energy, somewhat on the lines of the "three voltage rating" recently advocated. The energy price is admittedly the most difficult item in the problem. But, however difficult, there can be no denying the importance of the problem in view of the fact that the energy cost may frequently represent 90 per cent. or more of the total cost of the illumination, and that the energy price may vary as much as 1d. to 8d. per kWh. In the absence of more positive action or assistance to the consumer it would appear that the least that could be done would be to stamp on the lamp or wrapper the particular energy price, as well as the voltage for which the rating was determined.

* Abstract of a Paper presented to the Institution of Electrical Engineers.

Forty Years Ago.

Some Interesting Items from "The Electrician" of September 3rd, 1886.

LOOKING back exactly forty years we find in THE ELECTRICIAN of September 3rd, 1886, that :—

A new Anglo-Irish telegraphic cable was being laid.

* * *

An electric battery-driven tricycle was placed on the market.

* * *

The first number of "L'Ingenieur Electricien" was published.

* * *

An electric travelling crane was installed in a French warehouse.

* * *

An electrical device for recording votes was to be installed in the French Senate.

* * *

Arrangements were completed for electrically lighting the rotunda at the Birmingham Art Gallery.

* * *

Several readers criticised claims made in a prospectus by the Regent Portable Lamp and Lighting Co., Ltd.

* * *

A party of engineers visiting the works of the Anglo-American Brush Corporation was "much interested in a Wimshurst machine giving a constant succession of vivid sparks."

* * *

Pending the hearing of the appeal in the Edison-Swan *v.* Woodhouse and Rawson lamp case, the latter firm agreed to pay a royalty on all lamps sold, the royalty to be returned in the case of the appeal being successful.

* * *

Tests were being made of an electrical device to make restless and vicious horses stand quietly while being shod. The apparatus comprised "an induction coil, a dry battery, and an arrangement for giving a shock of graduated intensity."

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MOTOR CONTROL GEAR.

A New "Small Power" Range for A.C. and D.C. Motors up to 10 H.P.—Interesting Technical Features—"Safety-First" Provisions.

FOR an electrical control gear manufacturer with a range so extensive as that which is provided by Brookhirst Switchgear, Ltd., to prepare a comparable range of small motors up to about 10 H.P. is no small undertaking. It also represents in the case of this firm an important and progressive development, for although the quality of the new productions is in keeping with the Brookhirst reputation, the manufacturing methods adopted allow them to be presented at comparatively competitive prices. Naturally the development of the small power range of gear, which includes hand operated and automatic control gears for both a.c. and d.c. motors up to about 10 H.P., 220 V, has called for several years of careful preparation, and now the entire range is to be placed upon the market very shortly.

To distinguish them from the higher power ranges made by the firm, the Brookhirst small power d.c. hand-operated control gears for "non-inching" duty have been styled "Midget," this type of panel comprising a face plate starter with no-volt and overload releases, two fuses, and a combined d.p. switch and isolator. The variable speed form includes in addition a radial-type shunt speed regulator.

Besides their compactness and reasonable price these gears are remarkable for the fact that they embody all the protective features generally regarded as desirable for motors of small size, and it is a real achievement to have included in such gear a "safety-first" feature. To this end the d.p. switch fulfils the double duty of main switch and isolator, being enclosed in a separate inner chamber and interlocked with the main door, so that the latter cannot be opened unless the switch is "off" and the exposed portion of the gear "dead." Standard faceplate starters are also included in this range, but these do not embody "mistake-proof" protection.

For inching duty it is necessary to embody an electrically operated contactor in the control equipment, and following the considerations which influenced the introduction of the "Midget" range, a line of control panels termed "Junior Drum" has been developed. This range covers the capacities coming within the scope of the "Midget" panels, but as the design is applicable to higher powers, the range has accordingly been extended. The "Junior Drum" type panels bridge the gap between the "Midget" and the firm's well-known speciality—the "Safety-First" drum-type panels. Having exactly the same protective features as the latter, they are nevertheless considerably less expensive, and form an attractive alternative in the smaller sizes.

It may be recalled that the adaptation of the drum-type starter design for starting, as distinct from controlling duty, was made practicable by the Brookhirst patent handle box. In any but the "full on" position, the release of the handle opens the main contactor, which cannot again be closed unless the handle is returned to "off." In addition, the handle box ensures true step-by-step operation, and if the ratcheting is done too quickly the pawl fails to engage at all. Finally, there is a single *forward* movement from "on" to "off."

The no-volt feature is provided by the operating coil of the contactor, and protection against excess current is furnished by two overload trips. The isolating switch is similar to that employed in the "Midget" gears, but serves in this case as an isolator only. The shunt speed regulator, where included, is of the radial type, interlocked against starting with a weak field.

Next in the d.c. hand operated series is the "Junior" (Fig. 1) drum panel for wall mounting. Its drum type starter is actuated by a ratchet-operating handle, giving definite step-by-step movement and "slow motion" starting. The starter is so connected and interlocked with the contactor that the armature circuit is always made and broken by the latter, and not upon the starter contacts, which are only utilised to cut out resistance. The d.p. contactor has magnetic blowouts, provides no-volt release, and in combination with the two solenoid type overload trips may be said to represent a true "free-handle" circuit breaker. The d.p. isolator is fitted in a locked compartment and interlocked with the contactor so that the armature current is made and broken by the latter; while the handle is so interlocked with the doors of the case that they cannot be opened until the isolating switch is off.

Automatic Gear.

The considerations which influenced the introduction of the hand-operated gears were also responsible for the development of the "Brookhirst" small power automatic control gears for d.c. motors. For motors up to 3 H.P. there is the "Midget" solenoid type (non-inching) starter and starting panel, and for motors up to 12 H.P. the "Junior" solenoid type (inching) starter and starting panel has been produced.

In all these control gears the starter employed is of the same general type, and is in fact very similar to that embodied in the larger "Brookhirst" solenoid type panels, with which many of our readers are familiar. The movement of the starter is such that the wedge-shaped contact bar gives, instead of a sliding movement from contact to contact, a complete and instantaneous contact on each of the several steps in turn. At the same time after making contact there is a sliding and self-cleaning movement across the fixed contacts, which consist of carbon blocks. The latter are controlled by spiral springs, which secure efficient contact during starting, and serve to ensure a positive return to "off" when the operating solenoid circuit is interrupted.

On the "Midget" solenoid starter and starting panel (Fig. 2), the action of the starter is controlled by an oil dashpot. It has been part of the Brookhirst policy to avoid the use of dashpots for this purpose as far as possible, but as for the very smallest powers, the use of automatic control depends upon the standardisation of an equipment of reasonable price, considerable effort has been devoted to the production of a dashpot which shall ensure a very large measure of relia-

MOTOR CONTROL GEAR

THREE examples of the new "small power" range of d.c. hand operated and automatic control gear described on this page.

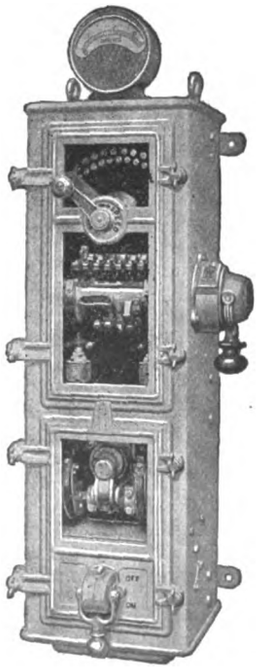

Fig. 1.

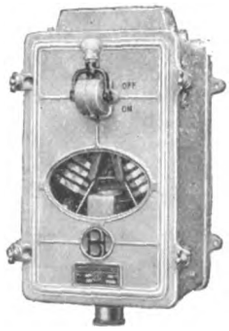

Fig. 2.

Fig. 3.

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bility. In the design standardised, dust is practically excluded, and it is almost impossible for the oil to "creep." Adjustment is by means of a large internal cone giving a wide range of variation, and minimising any trouble due to dust, should such find a way into the dashpot.

In the "Junior" solenoid starter and starting panel (Fig. 3), the movement of the starter is controlled by means of an eddy current retarder, which provides for a starting time which is definitely adjustable to suit the starting conditions; it is also self-adjusting to suit any fluctuations in the starting load.

The "Midget" solenoid starting panel includes protective features in the form of two fuses and a combined main switch and isolator, so enclosed and interlocked that the main door cannot be opened unless the switch is "off" and the exposed portions of the gear "dead."

The protective features in the "Junior" solenoid panel comprise a d.p. contactor, which with two overload trips, forms an effective double pole free-handle circuit breaker. There is also an isolating switch, enclosed in an inner chamber and interlocked with the main door in the same way as in other models. The "Junior" panel is supplied in a constant speed arrangement, and in two variable speed forms, both of the latter embodying a hand-operated radial type shunt speed regulator interlocked against starting with a weak field. In the one case the set value of regulating resistance is inserted in a single step, but in the other an automatic accelerator is furnished, and the speed accordingly increased gradually.

We hope to refer to the a.c. series of small power gears in a forthcoming issue.

THE RADIO SHOW.

Novel Devices to Look for at the Olympia Exhibition.

IN order to give readers who are about to visit the National Radio Exhibition—which opens to-morrow (Saturday) at Olympia, London—a concise idea of the novelties that are to be seen, we present below the results of a lightning "tour." This will be followed next week by a more detailed account of the exhibits.

Things to look for at Olympia include :—

Three new valves (Stand 127).

* * *

Roll-front valve-receiving sets (Stand 114).

* * *

New mounting methods for coils (Stand 215).

* * *

Apparatus for aerial insulation de luxe (Stand 148).

* * *

A complete new line of 2 V accumulators (Stand 100).

* * *

Detector crystals and piezo-electric quartz (Stand 203).

* * *

Low tension batteries in glass containers (Stand 158).

* * *

Facilities for testing visitors' own condensers (Stand 109).

* * *

Five-valve supersonic units for portable sets (Stand 142).

* * *

Cabinet receivers with oxidised silver fittings (Stand 61).

* * *

A British-made condenser with die-cast plates (Stand 102).

* * *

A loud speaker plated all over and highly polished (Stand 223).

* * *

Sir Oliver Lodge's N Circuit incorporated in a new receiver (Stand 102).

* * *

Condensers incorporating the new ortho-cyclic principle (Stand 107).

* * *

Cream and oxidised silver finished disc loud speakers (Stand 128).

* * *

A lateral action variable condenser occupying a very small space (Stand 92).

* * *

Combined lightning arrestors and lead-in tubes of novel design (Stand 54).

Cartridge-form fixed condensers, requiring no fixing or drilling (Stand 32).

* * *

Guaranteed "outdoor aerial" results from an indoor aerial (Stand 208, Gallery).

* * *

A complete new range of valves with interesting characteristics (Stand 105).

* * *

Receivers incorporating the Retrosonic circuit, on show for the first time (Stand 62).

* * *

A new pattern unitune aperiodic fixed coupler at a greatly reduced price (Stand 72).

* * *

Eight-valve super-heterodyne portable sets in leather carrying cases (Stand 55).

* * *

A drawing-room cabinet self-contained four-valve receiver and loud speaker (Stand 228).

* * *

Receivers in which the ordinary wooden cabinet is entirely replaced by crystal glass (Stand 257).

* * *

A complete self-contained unit for adding an extra low-frequency stage to any set (Stand 5).

* * *

New l.t. batteries incorporating a novel arrangement of the zinc and carbon electrodes (Stand 218).

* * *

Spiral plate condensers, consisting of two flat helical plates rotating one within the other (Stand 223).

* * *

Cabinet receivers in which the cabinet reproduces the characteristic shape of a spinet (Stand 118).

* * *

Incorporating a card scale and pointer, a new dial with reduction gear which greatly simplifies tuning (Stand 53).

* * *

An entirely new aerial switch which automatically switches off the valves and aerial at the same time (Stand 53).

* * *

Compensated square law condensers with pig-tail connection to moving vanes, and ball bearings (Stand 149).

* * *

Batteries which can be charged from the house supply without being disconnected from the set (Stand 104).

* * *

A valve without a filament, which operates in a similar manner to the American Ratheon tube (Stand 140, Gallery).

* * *

Variable condensers in which rotation of the control knob moves only one vane of the condenser at a time (Stand 154).

* * *

A universal tuner suitable for one, two or three valve circuits, needing only two holes for fixing to the main panel (Stand 17).

* * *

Accumulators in which lead and acid are replaced by steel plates immersed in a steel-preserving alkaline solution (Stand 249).

* * *

A valve receiving set with which listeners can hear two B.B.C. stations by merely plugging in the telephones or loud speaker (Stand 24).

* * *

Ebonite sheets, the two sides of which have different finishes, such as one side mahogany and the other side black, mahogany and oak, etc (Stand 217).

* * *

"Tricoil" units, which dispense with the old type of moving coils, but give constant reaction whatever the aerial, being on two circuits (Stand 79).

* * *

Diaphragmless cone loud speakers with a small armature which, actuated on the "push-pull" principle, react to the faintest impulse (Stand 157).

* * *

A new range of radio batteries designed to enable users of multi-valve sets to obtain economical and long service from a h.t. dry battery (Stand 155).

* * *

Powerful double-wound and centre-tapped transformers, specially insulated for use on electric lighting mains for double wave rectification (Stand 148.)

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NEWS IN BRIEF.

Electrical Playing Card Dealers—Our Big Share in South African Lamp Trade—No Special Survey to be Made of Telegraph Services.

AN electrically-operated device for dealing playing cards has been registered at the Berlin Patent Bureau.

It is expected that the c.s. "Dominia" will have completed the laying of the duplicate cable between Fanning Island and Vancouver by October.

The Indo-European Telegraph Co.'s employees on Soviet territory have declared a strike following the refusal of a demand for higher wages and alterations in the terms of their service.

Dundee Electricity Committee will accept a British cable tender, the difference between the lowest foreign and British offers being £137 10s. The convener said that foreign cables had gone up and British prices had been reduced.

Brighton Electricity Department staff sports were held last Saturday.

Sheffield Electric Supply Department has invited tenders for the erection of a transformer sub-station in Fitzwilliam Street.

There were 434 594 telephone instruments—about 72 instruments per 1 000 inhabitants—in use in Sweden at the end of 1925.

An underground telephone cable is to be laid between Alexandria and Cairo. The cost (£E. 250 000) is to be spread over several years.

An automatic telephone exchange was opened at Cheltenham last Saturday. The time occupied in switching over from the magneto system was four minutes.

A fire at the electricity sub-station of the Gwauncaegurwen Colliery, Glamorganshire, last Saturday, burnt the building to the ground. The damage amounts to between £4 000 and £5 000.

South African imports of electric lamps and globes rose from £111 612 in 1924 to £161 544 in 1925. Of this total Great Britain's share was £89 794. Holland was the next biggest supplier with £33 933.

The "Chamber of Commerce Journal" points out that where a consumer is required by an electricity supply company to give a deposit for the payment of his bills the company is bound to pay interest at the rate of four per cent. on the deposit.

Ross and Marshall, Ltd., of Greenock, are engaged on the task of raising a 5-ton electric crane which fell into the Clyde at the Custom House Quay recently. Three punts support the raising tackle, and will be placed under the crane when it is raised sufficiently.

An official of the Post Office has denied a statement that a special survey is being made of the telegraph services, and he does not admit that such a survey is necessary. The annual loss of over £1 000 000 per annum on the telegraph service is due to industrial depression, increased staff and labour costs, and the diversion of much of the short distance traffic to the telephone.

At the Drapers' Chambers of Trade Summer School, at Cambridge last week, Mr. W. J. Jones, of the London E.L.M.A. Lighting Service Bureau, demonstrated window lighting effects, and in support of the slogan: "People buy where the light is bright," related the sad case of a lady who went into a shop to buy crêpe-de-Chine but found the place so gloomy and miserable that she actually purchased crape.

Cuckfield R.D.C. has agreed to the project of the Electric Supply Corporation for the supply of electricity in Hassocks and Hurstpierpoint.

It is announced that a further reduction in cable rates will be made by the Pacific Cable Board when the duplication of the cable is completed.

Waldron (Sussex) Council has assented to the proposal of the Weald Electricity Co. to supply electricity in the district. Current is to be taken by the company from Tunbridge Wells.

An underground telephone cable has been completed between Paris and Strasbourg, a distance of 312 miles. There are sufficient conductors in the cable to enable 498 simultaneous conversations to be carried on.

THE E.D.A.-E.L.M.A. CAMPAIGN.

THE E.D.A.-E.L.M.A. Better Home-Lighting Campaign with the slogan "Wiring the Homes of Britain" has as its objects :—

1. *Getting electric lighting installed in as many houses as possible, and exploiting all practical means for the rapid extension of home electrification.*

2. *Raising the standard of domestic lighting by instructing the public in the principles of good lighting.*

3. *Encouraging more extensive wiring work, i.e., more complete installations designed with a view to easy extension for cooking, heating and other purposes.*

4. *Giving the public a really practical message about the uses of electricity for domestic purposes.*

5. *With the whole-hearted support of every individual firm and undertaking in the electrical industry, to make the whole country re-echo with the same ordered and disciplined electrical message, day in and day out, for 26 weeks from October 1st, 1926, onwards.*

At the end of 1925 Sweden had 3 604 telegraph stations, compared with 3 566 in 1924.

Inland trunk telephone statistics just issued for the two past financial years show on comparison an increase for 1925–26 of 8 712 809 calls, or 11 per cent. The total was 77 288 439.

The recently electrified railway between Lisbon and Cascaes has been interfering with the reception of messages at Carcavellos submarine cable station, and steps are being taken to remove the trouble.

All the telephone exchanges within 5 miles of the centre of Sheffield are about to be converted to automatic working. These include Sheffield (now called Central), Attercliffe, Beauchief, Broomhill, Ecclesfield, Oughtibridge, Owlerton, Sharrow and Woodhouse.

At the Engineering Exhibition, under the auspices of the South Wales Institute of Engineers, at Cardiff, from November 24th to December 4th, there is to be an electrical section. Inquiries should be sent, before September 30th, to the Secretary of the Institute, Park Place, Cardiff.

A fire occurred on the premises of the Aberdeen Electrical Engineering Co., Ltd., on August 25th. A workshop was destroyed, and some plant was damaged. The danger of the spread of the fire to the British Broadcasting Co.'s adjacent studios was averted.

The British Columbia Electric Railway Co., Ltd., has commenced work on the development of a hydro-electric power plant at Bridge River (British Columbia), to cost £6 000 000. This is the biggest enterprise of its kind in the history of the Province.

Under the will of Mr. H. M. Grant, of King's Norton, the chair used by James Watt, a collection of letters from members of the Watt family, and a painting of Heathfield Hall, by Jonothan Pratt, showing the garret used by Watt after his retirement from business, are to be handed over to the city of Birmingham for the Boulton and Watt collection.

Mr. Geo. D. Haskell, the head of a machine tool company, is bringing an action claiming £3 000 000 from the Aluminium Co. of America and others for conspiracy to prevent him from obtaining water powers needed to develop the manufacture of aluminium. It is alleged that the late Mr. J. B. Duke was dissuaded from selling power from a Canadian river, and that the Aluminium Co. has since acquired all the bauxite deposits in the United States and Europe, thus giving it a monopoly of crude and semi-finished aluminium.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

MR. C. A. Vandervell gave prizes for a village fair organised by the sports committee of the Pangbourne, Berks, Working Men's Club last week.

Mr. G. Marconi left this country on Tuesday, and is proceeding in his yacht "Electra" to Rome, prior to resuming, in the Mediterranean, his experiments in beam transmission.

It is understood that Sir Herbert Blain, the present Chief Conservative agent, and who is well known to many of our readers for his work with the London Underground Railways, is to be offered an important Government position.

Mr. Alan Williams has been appointed by the Vickers Boiler Co., Ltd., as their sales representative for the South of England in connection with industrial boiler installations and export business. Mr. Williams is an Old Cromptonian.

Mr. A. C. Taylor, secretary of the Peterborough Infirmary, has been presented with a cheque for £670 and a silver tea tray in recognition of his self-sacrifice, resulting in the loss of several of his fingers in the course of his X-ray work at the Infirmary, which he has carried on almost from the time of the discovery of X-rays.

The late Dr. John Bell Simpson, formerly chairman of the Newcastle and District Electric Lighting Co. and the Waste Heat and Gas Electrical Generating Stations, Ltd., and a director of the Parsons Steam Turbine Co., Ltd., and other companies, left unsettled property valued at £812 170, with net personalty valued at £761 825.

Mr. C. Garfield Abbey has been appointed president and general manager of the Lancashire Dynamo and Motor Co. of Canada, Ltd. Mr. Abbey has been connected with this company for 15 years, being first at the parent company's works at Trafford Park, and latterly on the staff of their Glasgow agents, Messrs. Kelsall and Parsons.

Mr. John A. MacArthur, assistant draughtsman and designer to the Macfarlane Engineering Co., and previously with the North British Locomotive Co., Glasgow, has been appointed by the Plymouth Education Committee as assistant lecturer in the Electrical Engineering Department of the Plymouth and Devonport Technical College.

On his retirement after 20 years' service Mr. P. S. Stewart, senior station engineer, was last Saturday at a gathering of the officers and staff of the generating station at Devonport Dockyard, presented with a lever watch. In asking Mr. Stewart's acceptance of the gift, Mr. Benham, electrical engineer, referred to the good work the recipient had done in bringing the station up to its present state of efficiency. In his reply Mr. Stewart tendered thanks to everyone who had helped him so loyally throughout his period of service.

BUSINESS ITEMS.

Changes of Address, Representatives, and Other Developments.

THE Cressall Manufacturing Co., has removed to 31-32 Tower Street, Birmingham. The telephone number, Central 3463, is unchanged.

A Belgrade firm wishes to represent British manufacturers of wireless apparatus. Particulars (Reference No. 231) are available at the Department of Overseas Trade.

Mr. Reginald Wood, late of Reginald Wood and Co., Westgate, Huddersfield, has commenced business on his own account as an electrical contractor at 6 and 8, Half Moon Street, Huddersfield.

The Normand Electrical Co., Ltd., has removed to 3, North Side, Clapham Common, London, S.W.4, where the telegraphic address is "Necondite, Clapcom, London," and the telephone number, Battersea 1634-5.

The Lancashire Dynamo and Motor Co. of Canada, Ltd., has moved to larger offices at 4, Hospital Street, Montreal, in which centre a well-equipped service station is also being established. The present works and service station in Toronto will continue to serve the company's customers in Western Ontario.

It is reported from Canada that the manufacturers of the "Frigidaire" refrigerator will spend $20 000 000 during the next six months in increasing their manufacturing capacity, and within a year the company will be turning out 600 000 electrical refrigerators per annum. The 1926 production is estimated at 300 000 refrigerators.

Importers and Distributors, Ltd, 173-175, Great Portland Street, London, W.1, will consider applications from electrical traders desirous of acting as their agents in Ireland. Other firms desiring Irish representation include the Midland Accumulator Co., 47, Newhall Street, Birmingham, and Brittain's Electric Motor Co., 110, Cannon Street, London, E.C.4.

New central offices have been opened by the Mullard Wireless Service Co., Ltd., at Mullard House, 21, Denmark Street, London, W.C.2. The telegraphic address is "Radiovalve, Westcent, London," and the 'phone number, Gerrard 5633 (3 lines). For the convenience of traders in the provinces Mullard depots have been opened at 6, White Horse Street, Leeds, 66½, Corporation Street, Birmingham, and 140c, Victoria Street, Bristol.

Over forty "Express" electric passenger lifts have been installed in various cities in China, including Shanghai, Hong Kong, Hankow and Tientsin. One for which an order has been received for a hotel in Mukden will be the first to be installed in Manchuria. The installation of this lift, as with others, will be carried out by the General Electric Co. (of China), Ltd., who, referring to the hotel order, state that this is the place "where the No. 5 wife of Marshal Chang Tso-lin frequently stays."

The Siemens and English Electric Lamp Co., Ltd., 38-39, Upper Thames Street, London, E.C.4, announces that they have reduced the list prices (as from September 1st) of their Silvalux opal gasfilled lamps. The prices of the new Siemens Purlite internally frosted gas filled and vacuum lamps have also been reduced, and are now the same as those of the standard type clear lamps.

Legal Intelligence.

Alleged Misrepresentation in the Sale of Electric Lamps.

AT Westminster Police Court last Saturday, John Franci Singleton, alias Paul Hermann, traveller, was charged with misrepresentation in the sale of electric lamps.

For the prosecution, Mr. Horace Fenton stated that Singleton had carried on a novel fraud, and there would be many charges against him. The defendant, he said, called on West End firms to introduce a new lamp, guaranteed to last two years, to shine with remarkable brilliancy, and to use only half the usual quantity of energy. The sample lamp, which usually resulted in orders for cash, burnt out after a brief period.

A witness said one of the lamps went "pop" after a few minutes, and none of those which he tested lasted longer than two hours.

A remand on bail was ordered.

Bogus Inspector of Electrical Installations.

William Walsh, aged 19, described as an "unemployed" miner, was charged last week, at Wigan, with thefts of electric lamps from an auctioneer's room, the Wigan Wesleyan Queen's Hall Mission, and from tradesmen's entrances, and with damage to Corporation fittings.

It was stated that accused, representing that he was a Corporation electricity inspector sent to examine fuses and meters after thunder and lightning, obtained admission to tradesmen's premises, and after looking round would say that either a fuse or a lamp was defective, and would replace these with wire or lamp at a charge. Charges of damage, stealing, and obtaining money on false pretences were sustained and Walsh was sent to gaol for two months' hard labour.

The presiding justice (Mr. E. Marsden) said Corporation officials should be armed with a signed authority and ratepayers should not admit anyone who could not produce such authority.

Infringement of Patent.

In the Vacation Court on August 25th, Mr. Justice Fraser had before him a motion in the action of the British Thomson-Houston Co., Ltd., against the National Trading and Lighting Co.

Mr. Tookey, for the plaintiffs, stated that the motion was for an interim injunction restraining the defendants from infringing plaintiffs' patent for gasfilled lamps. The defendants had consented to treat the motion as the trial of the action, submit to a perpetual injunction, with an inquiry as to damages, delivery up of the infringing articles, and to pay solicitor and client costs.

His lordship entered judgment accordingly by consent.

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IN LIGHTER VEIN.

Some Useful Lamp Campaign Hints for Progressive Advertisers.

DO electrical firms make the most of their advertising, or are their minds so full of technical details that they assume that the man-in-the-street is familiar with them all ?

Let us consider for a moment the advertising of one of our leading manufacturers of easy chairs ; the poetic description makes you lay aside a copper each week towards one, until you find your income tax is overdue, and it goes to swell the loot. Think of the lyrical lines you read about a well-known car ; so compelling, so convincing, that if you weren't an engineer and had therefore (*a*) seen under the bonnet, and (*b*) no spare cash to buy one, you would at once dash in the show-room and purchase one.

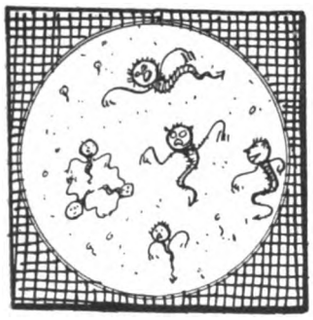
There is room for this compelling advertising in the electrical industry ; for the telling of technical points that make a man buy. Take, for example, the electric lamp. We all know the importance of a good vacuum, and how essential it is that the gas in a gasfilled lamps is truly inert. Technical points it is true, but does the layman appreciate their importance ?

The matter has been handed over to our tame copywriter, and armed with these two points, he has drafted the following advertisement, which is offered free of charge (blocks extra, authors' corrections *ad lib.*) to any enterprising manufacturer who is willing to adopt it :—

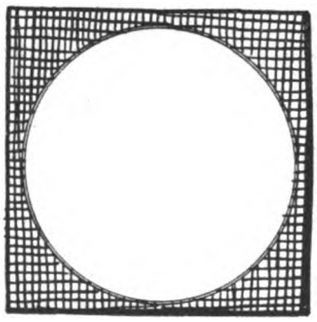
Bulldog Bulbs ——British and Best.

IT'S THE VACUUM THAT COUNTS !

When you buy Bulldog Bulbs you are buying more than a bulb ; you are buying a vacuum. It's a real 100 per cent. full-blooded vacuum, too ; a vacuum chock full of nothing. Examine the vacuum in a Bulldog Bulb closely with the naked eye and you will see nothing. Use a microscope or a telescope, and you will still see nothing, for there is nothing to see !



A bad vacuum.

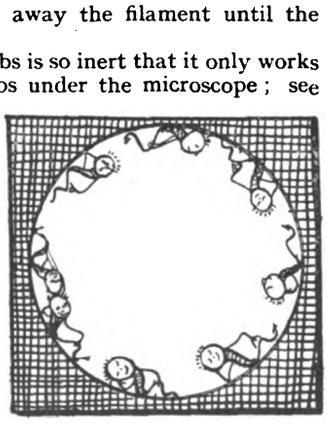


OUR vacuum.

In a cheap imitation bulb the vacuum is often as full and as live as a Gorganzola cheese. You may see oxygen and nitrogen arm in arm, and possibly a couple of hydrogens waltzing with an oxygen. This all means a short life for the bulb, for these parasites gnaw away the filament until the bulb is black in the face.

The Argon in our gasfilled bulbs is so inert that it only works on Fridays. Examine the bulbs under the microscope ; see

A bad molecule in a bad vacuum about to eat the filament.



Argons in a gasfilled lamp as seen daily except Fridays.

the Argons peacefully sleeping. Did you ever see one of our Argons chewings lumps off the filament and plastering them on the glass ? Decidedly—NO !

The moral is—buy Bulldog Bulbs with tame Argon, and *not* the filament-eating substitute.

TRADE PUBLICATIONS.

Details of Catalogues and Dealer-Helps Issued by Manufacturers.

MOVABLE, focussing, self-sustaining lighting fittings are priced and illustrated on a folding card issued by Dugdill's Patents, Hazel Grove, Stockport.

The Parsons Motor Co., Ltd., Town Quay Works, Southampton, have issued publication No. 83, dealing with the gas oil type of engine, which has been evolved to meet the demand for a new type of Parsons engine to use cheaper fuel than paraffin.

The Ray Manufacturing Co., 9, Devon Road, Fishponds, Bristol, is distributing a little folder calling attention to the merits of the "Andy" fuse wire carriers—small leather "vest-pocket" cases, which are supplied in quantities at low prices.

Siemens Brothers and Co., Ltd., Woolwich, are sending out price sheet 646, describing the company's new super-radio h.t. dry battery, which consists of 36 extra large capacity unit cells. It gives 50 V nominal, its maximum economical discharge rate is 20 mA, and its price is £1 5s.

Hans Renold, Ltd., Burbage Works, Didsbury, Manchester, have issued their 1926–7 price list of driving chains. Substantial price revisions have been made, and particulars are given of a new series of duplex chains introduced to meet the demand of space limitations and compactness of drive.

The Allied accumulator is the subject of a leaflet emanating from Allied Electric Manufacturers, Paradise Square, Sheffield. Advantages claimed from this accumulator are the shortness of the time of charging and the low internal resistance of the cell.

New publications received from the Igranic Electric Co., Ltd., Elstow Controller Works, Bedford, include publications No. 6229, dealing with Igranic patent jacks, No. 6230, on Igranic 6-valve supersonic heterodyne receivers, No. 6232, a comprehensive illustrated catalogue of radio accessories, and No. 6241, a leaflet on short wave reception.

"Silveray" one-piece glassware fittings are illustrated in price list No. 99 sent out by the Siemens and English Electric Lamp Co., Ltd., 38 and 39, Upper Thames Street, London, E.C. This, and the company's monthly price sheet, which gives reference numbers and illustrations of a comprehensive range of lamps, fires and other domestic appliances, wires, cables, batteries, etc., can be obtained on application.

Useful Wireless Accessories.

The Lisenin Wireless Co., Connaught House, 1A, Edgware Road, London, W.C.2, have issued a leaflet describing their latest positive grip terminal, which is known as the Lisenin positive grip socket and plug. It is the reverse of the firm's well-known plugs and sockets, the patent positive grip being in the socket portion, which fits on to a pin on the panel.

Pamphlet No. 155a, sent out by A. H. Hunt, Ltd., H.A.H. Works, Tunstall Road, Croydon, contains prices and other details and illustrations of Hellesen high and low tension wireless batteries, dry batteries for torch and pocket lamps, and for telephones, telegraphs, clock signalling and other purposes, valveholders, crystal detectors, etc. Leaflet No. 170, from the same company, is an illustrated description of the factory.

The Mercedes electric typewriter is said to be the only machine on which the keys, shift keys, space bar, carriage return and line space mechanism are entirely electrically operated, and it is claimed that a 30 per cent. increase in efficiency compared with ordinary typewriters, can be obtained by its use. A booklet on "The Electric Typewriter" will be sent by the Mercedes Typewriter Co., Ltd., 89, Queen Victoria Street, London, E.C.4, on application.

The Tungstone Accumulator Co., Ltd., St. Bride's House, Salisbury Square, London, E.C.4, send us their "Unique Parts Booklet," which describes their Tungstone pure lead grid accumulator, and also contains a price list of interchangeable and standardised plates and parts for Tungstone batteries. It is claimed that the official certificate issued by the N.P.L. proves that Tungstone batteries have created a world's record for high percentages of ampere and watt-hour efficiency. Advantages claimed for these batteries are that (1) plates and wood separators are separate, (2) that the cells are not cemented together, (3) that the plate grids and paste are made of pure lead, and (4) that the pasting is done by automactic machinery. Many useful hints are given regarding the filling and charging of batteries.

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"WIRING THE HOMES OF BRITAIN."

Preliminary Details of the Forthcoming E.D.A.-E.L.M.A. Combined Campaign for Better Home Lighting.

OCTOBER 1st, 1926, is a date which is destined to become a landmark in the history of the British electrical industry, for—it is hardly necessary to remind readers—it is on that day that the ambitious scheme jointly prepared by the E.D.A. and the E.L.M.A. for "Wiring the Homes of Britain" will be launched upon the public. Brief details of certain aspects of this remarkable campaign, which is to be waged unceasingly throughout the country from October to March next, have been given in earlier issues, and it is now possible to give a fuller outline of its ramifications.

It may be repeated that the basic idea is to get 5 600 000 British homes wired for lighting purposes, in the belief that once having secured entry into these homes, electricity will more readily be employed for other purposes.

Valuable Prizes.

To adapt a famous advertisement, "The E.D.A.-E.L.M.A. Way is simply this":—To advertise in newspapers reaching over 40 000 000 people telling them to go to their local electrical shop and ask for a free booklet containing an entry form enabling them to compete in a simple ballot on the lines of the Hospital Ballots, for valuable prizes, the first of which is a freehold electrically-equipped house worth £2 000, to be built on any reasonable site indicated by the prize winner. Alternatively a cheque for £2 000 can be given in place of the house. The second prize comprises domestic electrical appliances and/or complete wiring installation worth £200, and the third prize will be given of similar goods to the value of £100. In addition there will be twenty-five other electrical prizes, including suction cleaners, kettles, toasters, etc., of a total combined value of £200. Members of the electrical trade whose names appear on the first, second and third prize winners' ballot forms will be awarded cash prizes of £25, £10 and £5 respectively.

The competition is open to any person of sixteen years of age or over, and is in two parts. Firstly, competitors are required to indicate in spaces provided, their choice of fittings for lighting certain rooms, making their selection from illustrations contained in the free book. This qualifies for entrance in the main competition and ensures that they will read the interesting and expert advice on lighting which is contained in the book.

Secondly, in the main competition, competitors have to show, by votes on a ballot paper, in order of their personal preference or what they consider will be the most popular public preference, the following advantages of electricity for home lighting:—Reliable; simple to control; saves work; preserves the sight; cheerful; adaptable; fumeless; economical; safe; artistic; convenient; clean. The name and address of the electrical contractor or supply undertaking from whom the book was obtained must be filled in at the foot of each ballot paper.

The object of the ballot is to brand the above-enumerated advantages upon the minds of competitors by means of the concentrated thought which will have to be given before arriving at final decisions. In addition to promoting immediate business development, the competition and the book are educational in effect.

The Retailers' Job.

So much for the public end of the campaign, which will bring into electrical shops many thousands of people who have never before entered one. What share is the electrical retailer expected to play in making the scheme an unqualified success? Briefly, it is this:—

(1) Apply at once to the E.D.A., 15, Savoy Street, Strand, London, W.C.2, for as many copies as can conveniently be made use of, of the competition book for which the public will ask. It is a very attractive production (E.D.A. No. 1 092) and is supplied (to the trade only) at £4 10s. per 1 000 copies.

(2) Obtain from the E.D.A. free coloured window bills (E.D.A. No. 1 001) bearing the words, "Apply within for Better Home Lighting Competition Book."

(3) Organise, or assist in the organisation of local demonstration electric homes, so that there shall be all over the country a chain of electric houses under the control of skilled demonstrators competent to give complete information about operation and cost. (A free booklet, "How to Organise Demonstration Electric Homes," to be circulated to the trade, gives detailed information on every phase of this activity.)

(4) Use the special posters, poster stamps, special window trims and other similar campaign helps, particulars of which will be announced in a few days.

(5) Supplement the national campaign advertising (starting in October) by advertising in local papers not covered by the E.D.A. schedule. Blocks of various sizes for this purpose will be supplied at cost.

(6) Adapt the Boy Scout motto and do at least *one* good deed for the campaign every day.

Only a very sketchy account has, even now, been given of the campaign arrangements, but sufficient has been said to show that no member of the electrical industry can afford to withhold his active and enthusiastic participation in a scheme of such outstanding promise. We have the month of September in which to make every possible preparation for extracting the maximum amount of business from the people who come to ask for their Competition Books.

At Campaign Headquarters, at 15, Savoy Street, London, the books and other items are already being packed and despatched in large quantities, and it will greatly assist the smooth running of the whole enterprise if electrical traders will apply as soon as possible for their supplies of "ammunition."

Work in Prospect.

Trade Possibilities for Electrical Installation Contractors.

HAMILTON.—Housing scheme, Chantinghall Road, for Town Council. Particulars, the Borough Surveyor.

BEDWORTH.—Extensions to Leicester Road School (160 places), for Warwickshire Education Committee. Particulars, the Director of Education, Warwick.

CAERPHILLY.—Houses, for Urban Council. Particulars, the contractors, Reynolds and Harris (34), and Davies and Lloyd, 14 bungalows.

THORNABY-ON-TEES.—Additional 110 houses, for Town Council. Particulars, the borough engineer, Mr. G. H. Connor.

WORSBOROUGH.—Housing scheme (40), for Urban Council. Particulars, the surveyor, Mr. T. Shield, Saville House, Worsborough Bridge.

ROYSTON (YORKS).—Housing scheme (14), for Urban Council. Particulars, the architects, Dyson, Cawthorne and Coles-10, Regent Street, Barnsley.

KEYNSHAM.—Housing scheme (20), for Rural Council. Particulars, the surveyor, Mr. H. W. Argile, 16, High Street.

HEMSWORTH (YORKS).—Houses (260), Upton. Particulars, the contractors, Housing Corporation of Great Britain, Ltd.

BARNES (SURREY).—Factory, Lower Richmond Road, for, H. C. Ryland and Sons.

Points of View.

Interesting Pronouncements on a Variety of Topical Electrical Subjects.

THE cheaper we can produce power, the lower will be the cost of production—the very fundamental of property and trade.—*Sir Alfred Mond, M.P.*

* * *

Economic and not engineering considerations will determine the rate at which these electric storage battery locomotives are introduced into mines.—*Mr. D. Jeffrey Williams.*

* * *

In twenty years from now there will not be a house or shop with a rental of £20 or over which will not be lit by electricity.—*Mr. H. E. Andrews.*

* * *

The big men whom one hears of as captains of industry are always accessible.—*Mr. W. Scott-Browne.*

* * *

I can see the nerve doctor of the future saying to the man with a nagging wife, "Give them a radio set."—*Sir Eric Geddes.*

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LAMP PUBLICITY.

Novel Features of Advertising Campaigns for the Coming Lighting Season—What Some of the Manufacturers are Doing.

ON page 272 an irresponsible contributor suggests how the advertising of electric lamps should be conducted. Intriguing as his conceptions undoubtedly are, our readers will still wish to know how lamps are going to be advertised this season, and the following outline of the plans of two of our well-known lamp firms furnishes this information.

Virtually superimposing their lamp campaign on the great E.D.A.-E.L.M.A. Campaign, the British Thomson-Houston Co., Ltd., will conduct vigorous Press advertising for its Mazda lamps, and on a bigger scale than ever.

One of the most striking items in the scheme is an illuminated cut-out designed to occupy the minimum of shop window space. The cut-out "features" the well-known "Mazda Girl" holding aloft, and in front of a clock face, a Mazda lamp to "lighten the dark hours." The cut-out is of reasonable dimensions (40 in. by 30 in.), and when erected the display is only 5 in. deep.

Two lamps are required to illuminate the device, one lamp providing the flashing illumination of the clock face, while the second provides continuous illumination to the word "Mazda," behind which the girlish figure appears to stand. With the cut-out there is provided a thermal flasher, two lampholders and an adaptor ready wired to a length of flex for instant use in the trader's window.

Another feature is the new showcard (20 in. by 15 in.) showing three children inspecting a lamp, and bearing the title "Daddy says it's Bottled Sunshine." In addition, there is provided a very extensive range of leaflets, window stickers, etc., incorporating the "Mazda Girl," and a new 36-page lamp catalogue admirably produced by the litho offset process, and a good selection of leaflets in colours for over-printing.

Besides the usual extensive Press advertising of "Siemens" lamps the Siemens and English Electric Lamp Co., Ltd., have prepared attractive 16 and 8-sheet posters, entitled "Our Choice," for display in all the principal towns. Then there is an interesting publicity film entitled "Once upon a Time," which is to be shown in music halls and cinemas during October and November.

A novelty folder, to be mailed to a large number of electricity consumers, contains a mileometer which gives the approximate mileage from one town to another.

"Light is Life" is the title of the Siemens showcard, and its design will appear in various forms and sizes in "Tube" advertising.

Two designs of electric flashing signs for window display purposes are also available, and will be sent on loan during the lighting season to electrical retailers who apply for them. One of these signs (illustrated on this page) presents a view of Mecca, with its domes and minarets. At night, when the sign is illuminated, the architectural features are all transformed into a variety of lamps, which stand out in bold relief.

SOME examples of the lamp publicity which has been prepared for the lighting season by two of our leading manufacturers.

NEWS ITEMS.

Electricity is being installed at Haddon Hall.

Padiham U.D.C. has invited tenders for the erection of a transformer station at the Market Place, Padiham.

The Commissioners of His Majesty's Works, etc., have been inviting tenders for the erection of a telephone repeater station for Tavistock.

It is proposed to commemorate the centenary of the death of Alessandro Volta by an international electrical exhibition and congress at Como from May to October, 1927.

A station superintendent is wanted for Edinburgh Corporation's Portobello power station. Forms of application from Mr. E. Seddon, engineer and manager, Electricity Department, Dewar Place, Edinburgh.

An inaugural luncheon in connection with the E.D.A.-E.L.M.A. "Wiring the Homes of Britain" campaign will be held at the Hotel Cecil on Friday, September 17th. It is anticipated that a gathering very representative of the electrical industry and of the Press will take place, and the campaign with its important bearings on the future electrification of this country and the housing and smoke abatement problems will be fully explained, and a suitable send-off given to this important enterprise.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given.

WIGTOWNSHIRE EDUCATION AUTHORITY.—Electrical installation work in connection with the proposed reconstruction of the Douglas-Ewart High School Newton-Stewart. Schedules from Mr. Alex. Young, architect, 75, Victoria Street, Newton-Stewart; deposit £1 1s.

COVENTRY CORPORATION, September 3rd.—Buildings, foundations and subways; eight 15 000 kW turbo-alternators condensing plant and economisers; eight water-tube boilers, complete with induced draught plant, and chimneys; coal and ash handling plant; switchgear; steam and water pipework; crane; and cooling towers. Specifications, etc., from Mr. Geo. Tough, engineer and manager, Electricity Department, Council House, Coventry; deposit £5 5s.

NORTHFLEET URBAN DISTRICT COUNCIL, September 3rd.—Electric light installation in 88 houses on the Northfleet housing estate. Particulars from the surveyor, Mr. E. Talbot Fox; deposit £1 1s.

SOUTHEND-ON-SEA, September 3rd.—Twelve months' supply (from 5 000 to 8 000 tons) of fuel oil. Particulars from Mr. A. C. Johnson, deputy borough electrical engineer, Electricity Works, London Road, Southend-on-Sea.

GRIMSBY CORPORATION, September 4th.—Supply of 10 000 yd. single way (or equivalent) cable ducts, alternatively of fibre or stoneware. (Specification No. 218). Supply of about 1 800 yd. paper insulated, lead-covered low tension concentric feeder cable. Specifications from Lt.-Col. W. A. Vignoles, borough electrical engineer, Corporation Electricity Works, Grimsby. (Note.—Tenders only from firms on the King's National Roll.)

MANCHESTER GUARDIANS, September 4th.—Supply of an electrically driven power mixer, with meat mincer, bone crusher, etc., for the Booth Hall Infirmary, Blackley, Manchester. Further particulars from the Steward.

CASTLETON (LANCS) LIBERAL ASSOCIATION, September 6th.—Electric light installation. Specification from Mr. J. Grindrod, secretary, 14, Pleasant Street, Castleton.

CROYDON CORPORATION, September 6th.—Supply of two 50 000 lb. per hour water tube boilers, etc. Specifications from the Engineer and Manager, Electric House, 38, High Street, Croydon.

EVESHAM GUARDIANS, September 6th.—Wireless installation at the Institution. Particulars from Mr. J. H. Damen, at the Institution.

GRAYS THURROCK URBAN DISTRICT COUNCIL, September 6th.—One 250 kW rotary converter with transformer and high and low tension switchgear; one 500 kW motor converter with high and low tension switchgear. Specifications from the Electrical Engineer, Maidstone Road, Grays, Essex, deposit £1 1s.

LONDON COUNTY COUNCIL, September 6th.—Electrical installation at Hackney Institute, Dalston Lane, Hackney (about 410 lighting and 40 power points, fire alarm bells, domestic telephones, etc.). Specifications, forms of tender, etc., from the Chief Engineer, Old County Hall, Spring Gardens, S.W.1, deposit £1 1s.

OLDHAM GUARDIANS, September 6th.—Electric lamps and fittings. Particulars from the clerk, Mr. F. W. Fletcher.

STOKE-ON-TRENT CORPORATION, September 6th.—Electric light wiring of Fenton Town Hall. Specifications and forms of tender from the City Surveyor.

WARRINGTON CORPORATION, September 6th.—Supply of earthenware conduits to the Electricity and Tramways Department for 12 months. Specification and form of tender from Mr. F. V. L. Mathias, borough electrical and tramways engineer, deposit £1 1s.

WEST RIDING EDUCATION COMMITTEE, September 6th.—Improvement of artificial lighting and ventilation at the Sowerby, Bolton Brow, Domestic Subjects Centre. Specifications from Mr. A. Beilby, Education Offices, Sowerby Bridge.

INDIA STORE DEPARTMENT, September 7th.—Two 40 kW d.c. oil engine generating sets, complete with cooling plant, switchgear, cables, etc., for Bhatinda power station. Specifications from the Director-General, India Store Department, Branch No. 14, Belvedere Road, Lambeth, London, S.E.1.

SEDGEFIELD PARISH COUNCIL, September 7th.—Electric lighting of the Parish Hall. Particulars from Mr. F. J. Davison, clerk to the Sedgefield Parish Council.

STOKE-ON-TRENT CORPORATION, September 7th.—Supply and erection of one 10 000 kW turbo-alternator and condensing plant (contract 2 614); one natural draught cooling tower (contract 2 615); and ironclad l.t. three-phase switchgear (contract 2 616). Specification, etc., from the City Electrical Engineer, St. George's Chambers, Wolfe Street, Stoke-on-Trent; deposit £2 in respect of each contract.

THE BIGGEST BUSINESS OPENING!

ELECTRICAL people who are wondering what the coming E.D.A.-E.L.M.A. Better Home Lighting Campaign is worth to them in their own businesses should study these figures :—

Number of houses in Britain, 10 000 000.

Number of houses in electricity supply areas, 7 000 000.

Number of houses wired, 1 400 000.

Which means that—

5 600 000 *new prospects could use annually* 1 400 000 000 *kWh.*

5 600 000 *new installations at* £20 *would provide* £112 000 000 *new business.*

5 600 000 *new purchasers of fittings, lamps, cables, etc., at an average expenditure of* £20, *would spend* £112 000 000.

Specifications and full particulars (no deposit) are obtainable from the British Electrical Development Association, 15, Savoy Street, London, W.C.2. All offers will be accepted.

BERMONDSEY (LONDON) GUARDIANS, September 8th.—Six months' supply of electric lamps. Form of tender (No. 68) from Mr. Hy. H. Reeve, clerk to the Guardians, 283, Tooley Street, S.E.1. Stamped envelope to be sent.

HOLBORN (LONDON) GUARDIANS, September 8th.—Electrical fittings during six months from October 1st, 1926, to March 31st, 1927. Tender forms from Mr. C. J. Cross, 53, Clerkenwell Road, London, E.C.1, after August 23rd.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., September 10th.—Electric wiring in steel conduit at Edinburgh Castle. Specification, etc., from the Architect, H.M. Office of Works, 122, George Street, Edinburgh; deposit £1 1s.

INDIA STORE DEPARTMENT, September 10th.—Supply of power station switchgear and auxiliary plant, in connection with Great Indian Peninsular Railway electrification. Specification (£1) from the Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1.

INDIA STORE DEPARTMENT, September 10th.—One 300 kW d.c. steam driven electric generating set, with boiler, condenser, cooling tower, auxiliaries, switchboard, etc., for Peshawar Cantonment power station. Specifications (5s.) from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1.

KEIGHLEY GUARDIANS, September 10th.—Supply of electrical goods for the Institutions. Particulars from Mr. Sam Green, Clerk to the Guardians, Keighley, before September 10th.

STAINES GUARDIANS, September 11th.—Electric light installation in part of the Infirmary, London Road, Ashford, Middlesex. Specification from the Master of the Institution.

STANDING JOINT COMMITTEE OF GLAMORGAN QUARTER SESSIONS AND COUNTY COUNCIL, September 11th.—Electric light installations at Port Talbot Police Station, Court and Weights and Measures Premises. Specifications from the Port Talbot Police Station or the County Hall, Cardiff.

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TUNBRIDGE WELLS TOWN COUNCIL, September 11th.—Two watertube boilers, superheaters, economisers, mechanical stokers, forced and induced draught plant, steel stack, overhead coal bunkers, coal elevator and conveyors, and truck tippler. Specifications from Mr. R. N. Torpy, borough electrical engineer.

WEST RIDING COUNTY COUNCIL, September 11th.—Electric light installation at Marsden Council Mixed and Infant Schools. Specification from Mr. W. Heeley, divisional clerk, 4, Macaulay Street, Huddersfield.

BRISTOL DOCKS COMMITTEE, September 13th.—Electric light installation at Shed V, Canons' Marsh. Particulars from the engineer, Mr. Thomas A. Peace, Avonmouth Dock, Bristol.

BURNLEY GUARDIANS, September 13th.—Electrician's work. Forms of tender from the clerk, Mr. H. E. Purton, Union Offices, Burnley.

CHESTER CASTLE, September 13th.—Electric wiring. Specification, etc., from Cramp and Frith, 33, Brazennose Street, Manchester ; deposit £2 2s.

ECCLES CORPORATION, September 13th.—Electric light wiring and fitting and electric bell alarm system in the new extension of the Public Baths, Cromwell Road, Patricroft. Specification, etc., from the Borough Electrical Engineer, Electricity Works, Cawdor Street, Patricroft ; deposit £1 1s.

LONDON COUNTY COUNCIL, September 13th.—Three watertube boilers with auxiliaries. Specifications from General Manager, L.C.C. Tramways, Victoria Embankment, London, W.C.2 ; deposit £3.

ST. MARYLEBONE (LONDON) BOROUGH COUNCIL, September 13th.—Supply and fixing of electric overhead runway for removing house refuse from storage pit to screening plant. Particulars from the Borough Engineer, Town Hall, Marylebone Road, London, N.W.1.

INDIA STORE DEPARTMENT, September 17th. One 5-ton travelling electric jib crane. Specification and form of tender (5s.) from the Director-General, Branch No. 14, Belvedere Road, Lambeth, London, S.E.1.

INDIA STORE DEPARTMENT, September 17th.—(1) Two-colour and (2) single-colour litho printing machines with motors, and (3) vertical cross-tube boilers (100 lb. pressure). Specifications (5s. each) from the Director-General, Belvedere Road, Lambeth, London, S.E.1.

HALIFAX CORPORATION, September 18th.—Wiring 58 houses in Nursery Lane. Particulars from the Borough Engineer; deposit £2 2s.

BIRMINGHAM CORPORATION, September 21st.—Supply, delivery and erection of plant for refuse disposal and salvage works. Specifications from the Superintendent, Salvage Department, 161, Corporation Street, Birmingham ; deposit £1 1s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

INDIAN STORES DEPARTMENT, SIMLA, September 6th.—Two 40 kW 240/480 V d.c. three-wire oil engine generating sets. (Reference B.X. 2 782.)

NEW SOUTH WALES PUBLIC WORKS DEPARTMENT, September 6th.—Supply of 66 000 V oil circuit breakers for Barren Jack hydro-electric scheme. (Reference B.X. 2 749.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 7th.—Synchronous condenser for Arapuni power scheme (section 165). (Reference B.X. 2 665.)

DUNEDIN (N.Z.) CORPORATION, September 8th.—(i) Reaction water wheel for direct connection to a.c. generator ; (ii) one 3 000 kW, 6 000 V, 50 cycle generator ; (iii) four 1 000 kW 6 600/20 000 V 50 cycle transformers ; (iv) switchboards, oil-break switches, disconnecting switches, voltmeters, ammeters and wattmeters, current and potential transformers, etc. (Reference B.X. 2 654.)

INDIAN STORES DEPARTMENT, SIMLA, September 14th.—Steam raising plant, feed pumps, oil separator, cooling tower, 300 kW, 440/520 V, steam engine driven d.c. generating set, complete with condensing plant ; switchboard and connecting cables and accessories for Peshawar (Cantonment) Power Station. (Reference 20 816/1926.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, September 14th.—Telephonists' telephones and handsets. (Reference B.X. 2 696.)

CAPE TOWN ELECTRICITY DEPARTMENT, September 15th.—Supply of cables. (Reference B.X. 2 802.)

CONSTANTZA (ROUMANIA) PORT ADMINISTRATION, September 15th.—Supply and erection of eight electric portal cranes. (Reference A.X. 3 399.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 15th.—Supply and installation of electricity distribution system for the town of Luxor, including 6 830 metres of h.t. and 1 210 metres of l.c. armoured cable, 6 transformer cabins, 12 transformers (from 10 to 50 kVA), copper cable, poles, cable boxes, cut-outs, insulators, lamps, etc. (Reference B.X. 2 737.*)

JOHANNESBURG COUNCIL, September 18th.—Underwriters' wire. (Reference B.X. 2 766). Supply of 6 600 V truck-type ironclad switchgear panels. (Reference B.X. 2 767.)

SYDNEY CITY COUNCIL, September 20th.—One h.t. d.c. Kenetron valve testing set for underground cables. (Reference B.X. 2 748.)

POSTS AND TELEGRAPH DEPARTMENT, MELBOURNE, September 21st.—Switchboard keys, and parts. (Schedule 26/720). (Reference B.X. 2 699.)

JOHANNESBURG COUNCIL, September 23rd.—Switchboard-type overload relays. (Reference B.X. 2 809.)

AUCKLAND ELECTRIC POWER BOARD, September 27th.—One 14-ton electrically-operated crane. (Reference A.X. 3 415.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 28th.—Three motor-driven low lift pumps with control apparatus, for Taieri drainage scheme. (Reference A.X. 3 274.)

NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMWAYS (CHIEF ELECTRICAL ENGINEER'S BRANCH), September 29th.—One drag link ash conveyor. (Reference A.X. 3 432.)

VICTORIAN GOVERNMENT RAILWAYS, September 29th.—Two motor-driven disc grinding machines and necessary equipment. (Reference A.X. 3 433.)

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, October 4th.—Pole oil switches. (Reference B.X. 2 795.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 5th.—Supply of one four-motor overhead travelling crane and tramway for the Waikaremoana Electric Power Development, Section 30. (Reference A.X. 3 517.)

POSTS AND TELEGRAPH DEPARTMENT, MELBOURNE, October 5th.—Switchboard cords. (Schedule No. 115). (Reference B.X. 2 747.)

NEW PLYMOUTH (N.Z.) HARBOUR BOARD, October 16th.—Supply, delivery and erection of 30-cwt. portal electric horizontal luffing jib crane, fittings and accessories. (Reference A.X. 3 458.)

SYDNEY COUNCIL, October 18th.—Two 100 ton electrically-operated overhead travelling cranes. (Contract 1 033.) (Reference A.X. 3 467.)

CHRISTCHURCH (N.Z.) DRAINAGE BOARD, October 19th.—Supply and erection of three sets of electric centrifugal pumping plants. (Contract 26 329). (Reference A.X. 3 215.*)

VICTORIAN GOVERNMENT RAILWAYS, October 20th.—Supply and delivery of rail motor equipment. (Contract No. 39 614.) (Reference A.X. 3 449.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Telephone plugs and sleeves. (Schedule C.120.) (Reference B.X. 2 799.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Lamps, lamp caps, and lamp sockets. (Schedule C.124.) (Reference B.X. 2 800.)

SYDNEY ELECTRICITY DEPARTMENT, November 1st.—Supply, delivery, erection, setting to work, testing and maintenance at Bunnerong power station of boiler feed pumps. (Reference A.X. 3 470.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Supply of 110 000 V transformers for Waikaremoana power scheme (section 17). (Reference B.X. 2 744.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Indoor control gear and switchgear for Waikaremoana electric power development (section 14). (Reference B.X. 2 675.)

VICTORIAN RAILWAY COMMISSIONERS, November 3rd.—Supply of 77 miles of seven-strand h.d. copper cable.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone transformers. (Reference B.X. 2 797.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9 th.—Telephone protective apparatus. (Reference B.X. 849).

(*Continued at foot of page* 277.)

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ELECTRIC POWER IN HOUSE-BUILDING.

How Electricity Can Cheapen Building Costs—A Good Load—Numerous Applications for Electrical Appliances.

By J. O. KNOWLES, M.A., F.N A.A.

AS one who is technically interested in electrical manufactures and also in the building of small houses, the writer would like manufacturers of small electrically-driven machines to investigate a new market in the building trade.

The great majority of small houses costing, say, under £1 000 are now built on sites where electricity mains are already run. In the writer's home town the possible sites for house-building within two or three miles of the city are already supplied by an overhead ring main, which is a direct encouragement to building operations, since electric light is now a necessity to the majority of those who are able to afford a new house.

At present no use is made of this electricity supply until the house is completed, but it would be worth while to encourage its use during the processes of building. Brickworks, mortar mills, timber and woodworking factories, glass works and small casting works are all electrically driven in up-to-date plants, with a resultant increase in profit; but in the actual assembly of the house materials on site there is practically no relief from physical hand labour except in large building construction.

In what details, then, could the labour cost of house-building be reduced by electrical means. Taking the outer shell of the house first, and assuming that bricks or small concrete blocks are used, the labour of lifting about 25 tons of bricks to a height averaging about 10 ft. now costs from £25 to £30 for the bricklayer's labour. Would it not be worth while for a firm specialising in small electric hoists to consider the marketing of a simple electric hoist or inclined conveyor which would be the equivalent of the elevators now used for loading waggons from sand pits? If of the hoist type, this elevator should automatically eject its load (in the form of a stack of bricks on a platform) on the stage on which the bricklayer is working. If of the conveyor type, the head of the conveyor should automatically rise a foot or two during the period of lift so as to pile up a small rough stack of bricks on the stage. There are, of course, difficulties to overcome in details of design to make such a hoist sufficiently handy and portable, but only one size is required for the usual type of two-storey house, and in every town there are two or three contractors who build groups of houses in which a hoist could be economically employed.

Electrically-driven Mixers.

For mixing concrete, mortar and plaster, a small electrically-driven mixer of revolving barrel type could be used throughout the progress of the job, if built of a size which would justify its use where four or five adjacent houses were being built at the same time. In some cases it would be more useful to mount this machine in the builder's own yard and to transfer the mixed material by light lorry to the site; but to secure a fresh mix it would be useful to be able to use a mixer on site, even if the mixer were moved during the day from one house to another.

For cutting floor joists, roof timbers, etc., a circular saw, electrically driven, could be usefully employed on site, since most of the cutting to length must be done on the job. This circular saw should be portable but supported on its own low framework or base so that it can be used on a bench or on a platform. The joiner could then use it for constructional work and also for lighter details, such as "second fixings" in each room.

For plastering, a machine on the lines of a cement gun might be developed, so that plaster could be thrown on in a forced stream instead of being trowelled on by hand. The result would be equally strong and tenacious if the force of impact were sufficient, and electric power would enable a greater area to be covered in the same time. It is probable that some skill would be required to produce a surface even enough to make possible a smooth hand-trowelled final coat, but it should be quite practicable to check the accuracy of the work in the usual way while it is in progress.

For painting, distempering and whitewashing, a spray painting machine could be run from the same small electrically-driven air compressor that would probably be used for the "plaster gun." In spraying, simple precautions would be necessary to prevent over-running along divisions such as skirtings, etc., and the final coat might be applied by hand; but here again the saving by the use of electric power is worth a good deal of experimental work.

The above outline is necessarily brief, because the subject is novel. The electrical industry, however, has so far done little to bring down the cost of building operations on small and medium houses, the labour cost on which is wholly out of proportion to the labour cost of operations on which electrical energy is already used. It would not be difficult to secure the co-operation of electricity supply undertakings. A meter could be temporarily fitted in the builder's shed on site, and a supply taken by cab-tyre cable with waterproof plug and socket fittings of the Niphan type. The builder already pays the water company for the temporary supply of water during building, and a rate for a temporary supply of electricity could be agreed.

A Wide Potential Market.

The onus of initiative in this matter does not lie with the builder but with the electrical manufacturer. The potential market is a wide and permanent one, especially in view of the many years' leeway that must be made up in house-building. In view of the shortage of houses, it is unlikely that competition will make builders so close-fisted as to refuse to pay a remunerative price for apparatus that will save its cost. It is true that builders are conservative, necessarily so because of the length of time that must elapse before their buildings can be judged for wear and tear, but this conservation applies more to materials than to labour. From building operatives there may be some opposition similar to that which has dogged the steps of all mechanical progress, but this opposition has been overcome in all other trades and can be overcome in the building trade in a similar way by a readiness to give the operatives the just benefit of higher wages for higher output.

Business Openings.

(*Concluded from page 276.*)

NEW SOUTH WALES GOVERNMENT RAILWAYS, November 10th.—Supply and erection of steam turbine-driven centrifugal boiler-feed pump. (Contract No. 770.) (Reference A.X. 3 534.) November 10th.—Supply and erection of motor-driven centrifugal boiler-feed pump. (Contract No. 771.) (Reference A.X. 3 536.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 16th.—Supply of timing clocks for indicating the duration of telephone trunk line calls. (Reference B.X. 2 827.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 23rd.—Lightning arresters and transformers. (Reference B.X. 2 792.)

SOUTHLAND ELECTRIC POWER BOARD, INVERCARGILL, N.Z., December 1st.—Supply of a 3 000 H.P. horizontal Francis turbine and 2 350 kW generator. (Reference B.X. 2 822.)

VICTORIAN RAILWAY COMMISSIONERS, December 1st.—Rotary converter or rectifier set, with switching equipment for its automatic operation.

Tenders Accepted.

GENERAL POST OFFICE.—Siemens and English Electric Lamp Co., Ltd., twelve months' supply of gasfilled lamps.

SOUTHERN RAILWAY.—Siemens and English Electric Lamp Co., Ltd., six months supply of gasfilled and vacuum standard types, and train lighting lamps.

WAKEFIELD CORPORATION.—H. Smith, electric wiring of houses at Snapethorpe, 450 at £2 635. and 50 at £483; White and Co., wiring 146 houses in Batley Road, £785.

SITTINGBOURNE AND MELTON JOINT HOSPITAL BOARD.—Complete electric lighting installation at the hospital buildings, Keycol Hill, near Sittingbourne; Campbell Gas Engine Co., oil engine and equipment, £1 101 10s.; J. H. Holmes and Co., dynamo and booster, switchboard, etc., £445 5s.; Brunswick Engineering Co., Ltd., wiring, fittings, lamps, etc., £821 7s. 6d.; Alton Battery Co., Ltd., accumulators, £544 13s. 0d. (all recommended).

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ELECTRICITY SUPPLY.

Foreign Coal Puts up Many Supply Tariffs—Aberdeen Extensions—Developing the Textile Load—Electricity on Woolwich Housing Estate.

THE Electric Supply Corporation has purchased a site for a power station for supplying electricity to the Alton urban district.

Fleetwood Council has applied to the Electricity Commissioners for sanction to borrow £18 662 for further development of the electricity undertaking.

Harrogate Corporation decided on Monday to apply to the Electricity Commissioners for authority to supply to a number of places in the rural district of Knaresborough.

Engineering workshops at Kingston, on the River Medina, East Cowes, formerly used by cadets at Osborne, have been sold to the Isle of Wight Electric Light and Power Co.

Notwithstanding a record output from Peterborough Corporation electricity works during July, there was a net deficit of £2 251, wholly due to the increased cost of imported coal.

Millom Scheme to Proceed.

Millom U.D.C. has rejected a proposal to defer for six months the carrying out of its electricity scheme at a cost of £11 500, and has decided to proceed with the scheme without further delay.

In the year ended June, 1925, the revenue of the Launceston (Tasmania) Electricity Department was £58 585, and the net profit was £3 286, compared with a deficit of £2 252 for the previous year.

Ballycastle U.D.C. has informed the local electric light and power company that unless the company applies for statutory powers the Council cannot enter into an agreement with it for street lighting.

Owing to the increased cost of coal, the price of electricity in Bolton is being advanced. The ordinary rate of 4¾d. per kWh for lighting will be increased by ¼d., and the rates for power and other purposes by ½d.

It has been decided to invite tenders for an electric light installation for Hockcliffe Street, Leighton Buzzard, Baptist Church. The cable to transmit the current from Luton is expected to be ready by the middle of September.

The House of Commons has approved the Special Order in respect of parts of the parishes of Penrhyn and Llangwstenin in the rural district of Conway, Carnarvon, and the parish of Llansantffraid in the rural district of Glan Conway, Denbigh.

Electrical Distribution of Yorkshire, Ltd., and Harrogate Corporation have asked Knaresborough R.D.C. to support their respective applications for Orders to supply in the district. The R.D.C. has decided to see what happens at the inquiry.

Pershore R.D.C. has passed plans submitted by the Worcestershire, Shropshire and Staffordshire Electric Light Co. of the proposed mains through the town and district. In the town the cables will be laid underground, and villages will be supplied by means of an overhead line.

Price Reductions Cancelled.

Worksop U.D.C. confirmed last week the Electricity Committee's recommendation to cancel on October 1st the reductions in the price of electricity which came into force on April 1st, with the exception of the business tariff which will remain at 1d. per kWh all the year round.

Leeds Electricity Committee has decided to recommend the Corporation to increase the price of electricity by ¼d. per kWh for the quarter ending December 31st to all classes of consumers, to meet the increased charges already incurred by the purchase of coal at rates much higher than the normal.

The Electricity Commissioners have informed Maidenhead R.D.C. that permission has been given to the Cookham and District Electricity Supply Co. to erect overhead cables, and have asked the Council to withdraw its objections. The Council has decided, by the casting vote of the chairman, to comply.

Huddersfield T.C. has decided to supply electricity to the local theatres for stage lighting and outside illumination at 2½d. per kWh and for all other lighting purposes at 4d. A 5 000 kW set is to be installed at the electricity works to replace the Parsons set and other sets which have been scrapped.

Foreign coal is costing Liverpool Electricity Department 25s. or 26s. a ton over normal, and the coal is of a lower quality than that generally used. The department uses more than 200 000 tons a year, and, having now nearly exhausted stocks, it has had to purchase 40 000 tons abroad at £50 000 extra cost.

Manchester General Purposes Committee proposes to apply for permission to supply electricity for public and private purposes in the parishes of Northenden, Northern Etchells, Styal, and Ringway, and so much of the parish of Baguley as does not lie within the area of supply of the Altrincham Electric Supply, Ltd.

Liverpool Corporation is recommended to apply to the Electricity Commissioners for permission to borrow £95 600 for new electricity mains, services, sub-stations, etc., for the Norris Green housing estate. The Commissioners have sanctioned a loan of £60 000 for mains and services on the Walton-Clubmoor housing estates.

Good progress is being made with various electricity extensions at Preston, despite the coal dispute. The Blackburn inter-communicating cable will be finished shortly, but it will be a few months before it is ready for service. Great headway is being made with the service to Longton, Hutton and Howick, and Hoole, the total area to be supplied being over 40 sq. miles.

The Mid-Cheshire Electricity Supply Co. has applied to Runcorn R.D.C. for approval of an application to the Electricity Commissioners for a fringe Order to give a supply of electricity to Norley and Great Budworth. A Committee has recommended the Council to consent, and to inform the company that the Council would be glad if a supply of electricity were given to the parish of Kingsley.

Alterations and extensions are being carried out at the Aberdeen Electricity Works, at a cost of about £200 000. Foundations are being laid for six converters, and steelwork is being erected to form switchboard galleries. It is hoped that the converting plant will be running next winter. An electric locomotive hauls coal to the works over a new line of rails which has been laid from the railway goods yard.

Dublin's £500 000 Project.

Dublin City Commissioners propose to apply to the Government for sanction to the borrowing of nearly £500 000 for additions to the machinery and plant at the Pigeon House power station, the connection of the city system with the Shannon Supply, the extension and improvement of the distribution network, the laying of mains to Kilmainham, Inchicore, Chapelizod and Cabra, and the improvement and extension of the supply in the Clontarf district.

Correspondence with the Electricity Commission and the Mid-Lancashire Electricity Advisory Board respecting the application of Stalmine P.C. for a supply of electricity for their township was submitted to Garstang R.D.C. last week. The Commission stated that they could only authorise a supply of electricity by granting a Special Order, and that the most suitable source of supply for Stalmine was that of the United Alkali Co. Consideration of the matter is adjourned until a meeting of the ratepayers has been held to consider the matter.

In a report concerning the new Ribble electricity station at Preston, Mr. J. F. Simpson, borough electrical engineer, states that the long continued trade depression has deferred expected expansion of the textile load, but supplies to mills already connected, amounting to about 4 000 H.P. have given satisfaction, and a resumption of activity will certainly lead to an increase in textile consumers. The manufacturer is beginning to realise that the time spent in attending to purchase of fuel, disposal of ashes and repair of engines and boilers can be better devoted to the output of his particular product, leaving the production of power to the power station engineer.

Mr. G. W. Keats, borough electrical engineer, of Woolwich, states, in a letter to a daily paper, the circumstances in connection with the electrical equipment of 750 houses on the Borough Council's housing estate, and the exclusion of gas. The Housing Committee, he says, decided, on account of restrictions placed upon the cost of construction and with a view to saving in cost of decorations, that electricity should be the only illuminant. The gas company refused to instal gas cookers unless they were allowed to canvass for lighting. Instructions have been given to equip 500 more houses electrically, and if it is found that some adjustment in cost of energy is advisable action will be taken.

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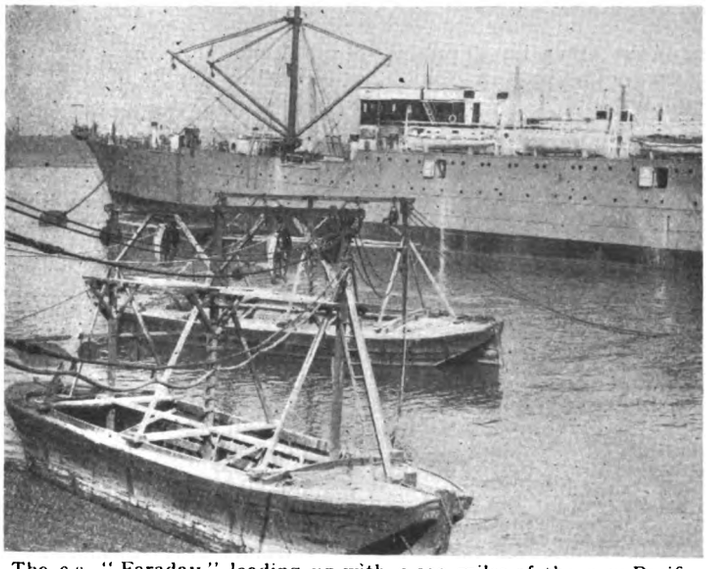
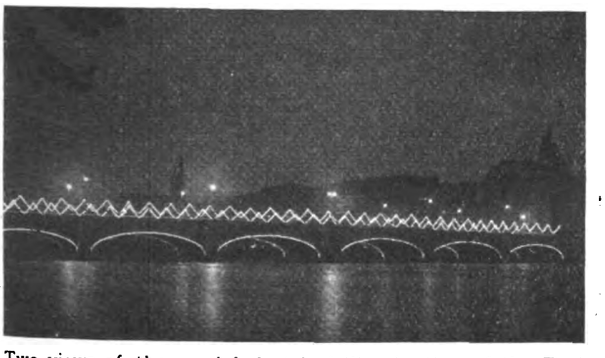
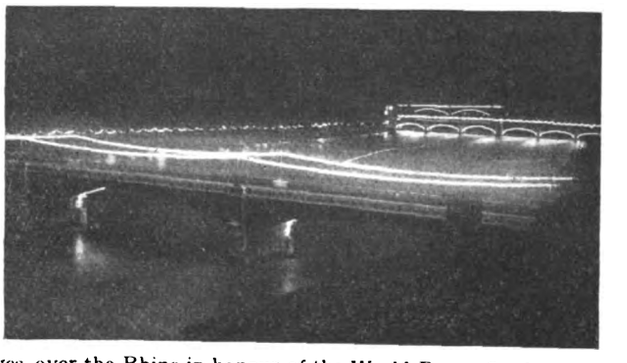
ELECTRICAL NEWS IN PICTURES

Another electrical publicity "stunt." In Seattle, a popular actress fixes the first of the 7 000 lamps to be used in this theatre illuminated sign, the letters of which are 15 ft. high.

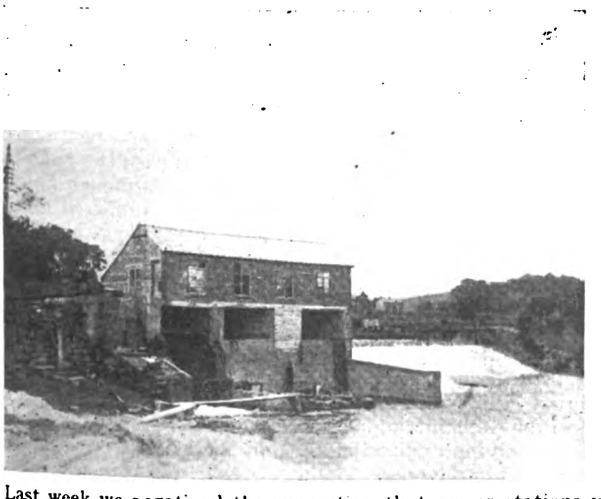


The c.s. "Faraday" loading up with 2 500 miles of the new Pacific cable connecting Canada with Australia, New Zealand and the Fiji Islands. Loading operations will take three weeks.





Two views of the special electrical illumination of the Basle bridges over the Rhine in honour of the World Power Conference, which opened there on Monday. A special account of the opening proceedings is given on page 264.



Last week we negatived the suggestion that power stations were inherently ugly. Here is pictorial evidence supporting our contention, obtained in Yorkshire by an ELECTRICIAN photographer. Both pictures are of hydro-electric stations, the one on the left showing the turbine house of the Linton Mills Co., while the other picturesque plant seen to the right supplies the village of Kettlewell.

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ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

ON single tracks on the Manchester tramways the "staff" system is to be adopted in foggy weather.

Profit on the South Shields tramways during the past year was £5 000. On the motor 'buses there was a loss of £2 000.

Work on the Abbey Lane extension of the Sheffield Corporation tramways has been suspended until a further supply of rails is obtained.

One of the driving ends of the new single-deck Glasgow tramcar, interior and exterior views of which were published in "The Electrician" last week.

Burnley Corporation has approved a tramway extension from Belvedere Road to the junction of Brunshaw Road and Stroyan Street, a distance of 660 yd., at an estimated cost of £9 625.

The Aberdeen District Committee has called the attention of the Road Board to the Road Surveyor's report that the track of the Suburban Tramway Co. is in a very unsatisfactory condition, and that nothing short of reconstruction of the permanent way would be of any value.

Two more tramcars, fitted with upholstered transverse seats, have been placed in service on the section of the London United Tramways between Shepherd's Bush and Uxbridge. Nearly the whole of the rolling stock on this route now consists of the new-type cars.

A novel feature connected with the Underground Railways' extension to Morden will be the garage which is to be provided at the Morden station. Facilities for washing and repairing motor cars are to be provided, and supplies of petrol will be obtainable at the garage.

Salford Corporation has approved an arrangement already agreed to by Manchester Corporation, for the running of certain through services of tramcars in and through the two towns. The basis of the arrangement is that each authority shall run an equal mileage in the area of the other.

Mr. James Dalrymple, manager of the Glasgow tramways, reports that since the reductions of fares and the introduction of a 2d. maximum fare on July 1st, revenue has increased by £2 029, whereas in June, before the revision of fares, the decrease, compared with June last year, was £11 000.

There has been considerable delay in opening the trackless trolley vehicle service between Bradford and Clayton. The overhead equipment has been erected, and the delay in commencing the service is said to be entirely due to the inability of the car builders to deliver cars, because of the coal stoppage.

Additional regulations issued by the Ministry of Transport limit the speed of the L.C.C. tramcars in King Street, Hammersmith, between the Broadway and Studland Street and other sections of line at Hammersmith to 12 miles an hour, while in Beadon Road the speed is not to exceed 8 miles, and four miles an hour is to be the limit on curves between streets.

A statement just issued regarding passenger traffic in Greater London shows that in 1913 the tramways carried 812 million people (36 p.c. of the total), omnibuses 736 million (32 p.c.), and railways 725 million (32 p.c.). By 1925 the total traffic had increased by 63 p.c., the figures being omnibuses 1 671 million (45 p.c. of the total), railways 1 049 million (28 p.c.), and tramways 979 million (27 p.c.).

WIRELESS NEWS.

Licence Fees as Source of Revenue—Retailers' Protest.

SHOULD the Post Office retain a part of the income from wireless licences as revenue or should the whole of the fees go for the development of the wireless service? This question is raised by the Wireless Retailers' Association of Great Britain, whose Council have passed the following resolution:

"That, having regard to the high educational and recreative value of broadcasting and the urgent need of funds for more fully developing the service, the Council of this Association is of the opinion that licence fees should not be subject to any deduction other than the actual cost of collection, and that the amounts already retained by the Post Office in excess of such cost should be paid to the British Broadcasting Co., Ltd."

The honorary secretaries of the Association state that for the three years ended March 31st, 1926, the Post Office collected £2 227 000, of which only £1 166 000 had been paid to the B.B.C. The withholding of large amounts, they urge, has hindered improvements in the service.

Wireless News in Brief.

The Woodstock Poor Law Institution, Oxon, and the King Edward VII Hospital, Slough, are to be fitted with wireless.

The newly-formed Irish Association of Radio Manufacturers and Wholesalers will hold an exhibition very shortly.

Nationalisation of South African broadcasting, or, alternatively, a Government subsidy is to be considered.

Irish Free State licence fees are now reduced to 10s., and listeners who paid £1 for this year's licence are entitled to a refund.

The Commissioners of His Majesty's Works have invited tenders for the erection of a wireless station at Portishead, Bristol.

Speeches at the dinner of the National Association of Radio Manufacturers and Traders will be relayed on September 7th from the Piccadilly Hotel, London.

Interesting novelties to look for at the National Radio Exhibition which opens at Olympia, London, to-morrow (Saturday) are indicated on page 269.

Lancashire and Cheshire radio wholesalers have formed a local wholesalers' association called the Lancashire and Cheshire Radio Wholesalers' Association, "for the purpose of mutual protection and support."

A radio lighthouse has been put into operation at Cape Spencer, at the northern entrance into the channels of South-eastern Alaska. Ships will now be able to obtain bearings regardless of weather conditions.

The Washington Weather Bureau has carried out successful experiments in the wireless transmission of complete weather maps. At present the apparatus has a sending radius of 1 500 miles, and the time taken to send a complete map is 45 minutes.

It is reported from Berlin that a valve has been constructed which greatly increases the volume of sound received without any increase of the current required. The intensification of the sound is said to result from the use of a resistance intensifier devised by Herr von Ardenna, one of the inventors of the valve.

Mr. J. L. Baird is now experimenting with the radio transmission of coloured moving pictures, but although promising results have been obtained he is not yet prepared to give a demonstration. Meanwhile, he is continuing his work on ordinary television, and is said to have achieved results which are comparable with the earliest cinematograph films.

As this year witnesses the twenty-fifth anniversary of the first wireless signal sent across the Atlantic, the Marconiphone Co. are setting up at the National Radio Exhibition a striking tableau of the scene in the low room of the old barracks on Signal Hill, Newfoundland. Much of the original apparatus used for transmitting and receiving the signal will be on view. The receiving apparatus used on the historic occasion was of peculiar sensitiveness, and a telephone receiver, which was no part of the ordinary instrument, had been supplied so that the slightest clicking might be conveyed to the ear. It was through this receiver that Mr. Kemp, who had accompanied Marconi to Newfoundland for the event, heard the three dots of the Morse telegraphic "S," transmitted from Poldu, Cornwall, which announced that wireless had conquered the Atlantic. Mr. Kemp himself will be present at Olympia.

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COMPANY NEWS.

Electrical Shares in Demand—Edison Swan Ordinary Improve on Offer to Shareholders—Further Cable Appreciations—J. and P. Gain Consolidated.

ELECTRICAL manufacturing shares continue to be bought. This week the leading feature has been the advance in the price of Edison Swan 4s. ordinary shares, on the offer to shareholders for their holdings of 13s. per share. The company has had a chequered career and several reconstructions, by the last of which, in 1923, the sum of 16s. per share was written off the 957 117 ordinary £1 shares. Things have since improved, and dividends of 7½ per cent., 7½ per cent. and 10 per cent. have been paid in respect of the three years to June 30th, 1925. Henley's shares are 3s. 9d. up, at 82s. 6d., and Johnson and Phillips have retained their last week's improvement. Callender's have risen 1s. 3d., and English Electric and Siemens 7½d. each. General Electrics are 3d. better.

Last Annl. Divd.	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
%	**Electricity Supply.**				
10	Brompton & Kensington Ord.	31/3*	32/6	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	90	90	100	67
15	Charing Cross Elec. Ord. (£1)..	44/4½	44/4½	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/9	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	49/4½*	49/4½	52/6	20/3
6	,, ,, 6% C.P. ..	22/6*	22/6	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	50/4½	50/4½	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	22/6	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	13½	13½	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	32/-*	32/6	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	36/10½	36/10½	41/6	8/-
4½	,, ,, 4½% C.P. ..	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21 10½	21/10½	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	22/6	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord (£5) ..	16½	16½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	42/6	42/6	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
	,, ,, 6% C.P...	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	139½	134½	123	24
6	,, 6% Pf. Stk.	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69*	70	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	78½	78½	102‡	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	50½	50½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98‡	52
5	Lon. & Sub. Trac. A. Deb. ..	78½	78½	89	65
4	Lon. Un. Trams. 1st Deb. ..	47	47	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	64½	64½	101½	49
5	,, ,, 5% Deb. ..	68½	68½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	64	64	84½	19
3½	,, 3½ Pf. Stk.	63½	63½	88½	40½
3½	,, 3½% Deb.	69½	69½	92‡	31
3½	Met. Dis. Rly. Ord. Stk. ..	52	52	58	12‡
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	112½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb.	65	65	73½	48½
—	Underground Elec. Rlys. Ord.(£10)	3‡	3‡	5½	21/3
5	Yorks. (W.R.)Trams. Ord. ..	11/6	11/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½*	18/9	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	67/9	67/6	62/-	26/6
6	,, ,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	23/-	23/-	23/4	19/7½
7	,, ,, ,, 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	25/7½	25/7½	29/-	10/-
‡15	Callender's Cable Ord.	66/3	65/-	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref...	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)..	12/9	11/-	28/9½	1/11
7½	,, ,, 1st Pref...	21/3	21/3	26/-	5/-
10	Elec. Construction Ord. ..	31/3	31/3	30/4	6/7½
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	16/3	15/7½	29/3	7/3
6	,, ,, 6% C.P... ..	18/-	18/-	21/3	10/6
6	Ericsson Telephones 6% C.P...	21/3	21/3	21/-	12/7½
6	Ferranti 6% Pref.	19/4½	19/4½	18/6	16/9
7	,, 7% 2nd Pref... ..	18/-	18/-	19/-	13/9
5	,, 1st Mort. Deb. Stock..	91½	91½	96½	80½
7½	General Elec. Ord.	31/3	31/-	59/-	13/6
10	W. T. Henley's Ord.	82/6	78/9	86/6	23/3
17½	Johnson & Phillips Ord. ..	66/3	66/3	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	25/7½	25/7½	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	47/6	47/6	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	31/10½	31/3	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	28‡	28¼	56/2/6	19½
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb ..	74½	74½	87½	60
10	Eastern Ord. Stk.	189½	189½	213‡	113/2/6
3½	,, 3½% Pref. Stk.	65½	65½	84/17/6	49
4	,, 4% Deb. ..	79½	79½	103½	60
10	Eastern Extension Ord. (£10)..	10½	10½	21½	10/12/6
4	,, ,, 4% Deb. ..	78½	78½	97½	60
22	Gt. Northern Telegraph (£10)..	27½	27½	42/12/6	19
‖10	Indo-European (£25)	46½	46½	59‡	25
—	Marconi's Wireless T. Ord. ..	15/-	15/-	9/16/3	20/9
7½	,, Int. Mar.	20/-	20/-	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	18½	18½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	78½	78½	10	60/2/6

* Ex-dividend.
¶ Plus 3 p.c. in respect of 1921.
‡ Plus share bonus.
‖ Including bonus.

DAVIS AND TIMMINS, LTD.—Intm. div. on ord. shs. at rate of 6 p.c. p.a., tax free.

PENNSYLVANIA WATER AND POWER CO.—Div. of $2 on common shs. for quarter ending September 30th.

SHAWINIGAN WATER AND POWER CO.—Div. $2 p. sh. on common shs. for quarter ending September 30th, payable October 11th.

CANADIAN GENERAL ELECTRIC CO.—Quarterly div. of 1¾ p.c. for three months ending September 30th on pref. stk., payable October 1st.

GENERAL ELECTRIC CO. OF NEW YORK.—Quarterly div. 75c. and special stock div. 15c., agst. 75c. and $1 respectively for preceding quarter.

PINCHIN, JOHNSON AND CO., LTD.—Intm. div. 10 p.c. actual, less tax, payable September 1st. Sales and pfts. for first half of 1926 have been very satisfactory.

BRAZILIAN TRACTION, LIGHT AND POWER CO.—It is reported from Canada that the net earnings are expected to show an increase of about $6 000 000 over last year's.

HURST, NELSON AND CO., LTD.—Div. of 2s. p. sh., with bonus 6d. p. sh., on ord. shs. recommended. With intm. div. of 7½ p.c. paid in May, total distribution for year is 20 p.c., including bonus.

VERA CRUZ ELECTRIC LIGHT, POWER AND TRACTION, LTD.—Estimated net earnings for July, $14 700 (Mex.), a decrease of $5 400, and total from January 1st to July 31st was $139 400, increase $10 600.

WESTINGHOUSE ELECTRIC AND MANUFACTURING CO.—It is announced that a group of New York bankers offered in New York last week $30 000 000 5 p.c. debentures of this company, at the price of 99. The proceeds are for the redemption of the company's outstanding 7 p.c. gold bonds.

PALESTINE ELECTRIC CORPORATION, LTD.—It is reported that Mr. Bernard Barron has just subscribed for £100 000 worth of shares in this corporation, which was formed to acquire a concession granted to Mr. Pinhas Rutenberg, and to carry out a scheme for the utilisation of the waters of the rivers Jordan and Yarmuk in the generation of electricity.

EDISON SWAN ELECTRIC CO., LTD.—An offer has been made by Lescher, Stevens and Co., acting on behalf of clients, to purchase the ordinary capital at 13s. per share. The offer has been considered by the board of directors, who advise shareholders to accept. The ordinary capital amounts to £191 435 8s. in 4s. shares, which were reduced from £1 each in 1923. The company has been improving its position for some years, and ordinary dividends of 10 p.c. per annum have been paid for the last two years.

ROSS-SHIRE ELECTRIC SUPPLY CO., LTD.—Applications are invited (until to-morrow, September 4th) for an issue of 18 000 7½ p.c. £1 cum. pref. shs. at par, and 12 000 £1 A ord. shs. at par. The company has been formed to take over the undertaking at present carried on by the Strathpeffer and Dingwall Electric Co., Ltd., which has, during the last twenty years, supplied electrical energy to Strathpeffer and Dingwall. Concessions for the development of the water resources at Lochluichart and the Falls of Conon have been obtained from the riparian proprietors, and a Special Order made by the Electricity Commissioners, and now awaiting confirmation by the Minister of Transport, will allow the new company to extend the present distribution mains from Strathpeffer and Dingwall to Invergordon and Tain.

New Companies.

CRAIG AND MILLS, LTD.—Cap., £3 000. Electricians, etc. Reg. office: 22, Cooper Street, Manchester.

SAFETY FIRST SIGNALS, LTD.—Cap., £500. To erect all kinds of signals and signs, etc. Reg. office: 147, Bath Street, Glasgow.

EXPRESS CABLE ENGINEERING CO., LTD.—Cap., £300. Manufacturers of wireless apparatus and accessories, etc. A subscriber: G. H. Walpole, 37, Montpellier Street, Brighton.

ROADSIDE SERVICE GARAGES, LTD.—Cap., £500. Garage proprietors, letters and hirers of electric vehicles, electrical engineers, etc. Reg. office: 64A, Bridge Street, Manchester.

VAMPIRES, LTD.—Cap., £500. Manufacturers and importers of and dealers in vacuum cleaners, electrical and mechanical engineers, etc. Reg. office: 435/437, Oxford Street, London, W.

EUREKA ELECTRIC AND WIRELESS MAINTENANCE GUARANTEE CO., LTD.—Cap., £500. To acquire business of electrical and wireless manufacturers, etc., carried on by Wardell and Co., at Raleigh Road, Richmond.

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REGENT PIANO CO., LTD.—Cap., £31 500. Manufacturers of pianos, wireless transmitting and receiving apparatus, etc. Solicitors: Ashurst, Morris, Crisp and Co., 17, Throgmorton Avenue, London, E.C.2.

FIBROK PRODUCTS (1926), LTD.—Cap., £8 100. Manufacturers, importers, exporters and dealers in ebonite, stabilite compounds for electrical and other requirements, etc. Reg. office: 10, Fenchurch Avenue, London, E.C.

WHOLESALE ELECTRIC SUPPLY STORES, LTD.—Cap., £2 000. To acquire business of manufacturer of and dealer in electrical sundries carried on by W. H. Osborn at 38, Gloucester Road, Brighton, as the "Brighton Electric Supply Stores."

DORSET AND DEVON ELECTRICITY SUPPLY, LTD.—Cap., £10 000. To establish and develop electric light and gas undertakings, and to carry on the business of electrical contractors, engineers, etc. Secretary (*pro tem.*): L. J. Waring, 3, Prideaux Road, Stockwell, London, S.W.9.

MAXEE SYNDICATE, LTD.—Cap., £1 000. To acquire from W. H. McCandlish the benefit of his patent invention and rights for improvements in or relating to fire alarm devices, and to carry on the business of electrical engineers, etc. Reg. office: 25–27, Bishopsgate, London, E.C.2.

S. P. TIME LOCK CO., LTD.—Cap., £2 000. To adopt an agreement with E. Sumner for the acquisition of an invention and patent relating to time indicating locking devices and to carry on the business of mechanical and electrical engineers, etc. Reg. office: 21, Central Buildings, Islington, Liverpool.

Metal and Chemical Prices.

TUESDAY, August 31st.

		Price.	Inc.	Dec.
Copper—				
Best Selected ..	per ton	£65 10 0	—	5s. 0d.
Electro Wirebars ..	,,	£67 10 0	5s. 0d.	—
H.C. Wire, basis ..	per lb.	9 11/16d.	—	—
Sheet	,,	9 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 1 11/16d.	—	—
Brass 60/40—				
Rod, basis	per lb.	7½d.	—	—
Sheet, basis ..	,,	9⅜d.	—	—
Wire, basis ..	,,	10⅛d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£4 12 6	—	—
Galvanised Steel Wire, basis 8 S.W.G. ..	,,	£13 10 0	—	—
Lead Pig—				
English	,,	£34 5 0	—	—
Foreign or Colonial	,,	£33 0 0	5s. 0d.	—
Tin—				
Ingot	,,	£294 15 0	15s. 0d.	—
Wire, basis	per lb.	3s. 9d.	—	—
Aluminium Ingots ..	per ton	£120 0 0	—	—
Spelter	,,	£34 7 6	2s. 0d.	—
Mercury	per bottle	£15 10 0	—	—

Sulphur (Flowers)—Ton £11 10 0 *Sodium Chlorate*—Per lb. 3d.
,, (Roll-Brimstone)—,, £10 5 0 *Sulphuric Acid* (Pyrites, 168°)
Copper Sulphate— ,, £25 to £25 10 0 per ton, £6 15 0
Boric Acid (Crystals) ,, £37 *Sodium Bichromate*—Per lb. 3½d.
Rubber—Para fine, 1s. 7¾d.; plantation 1st latex, 1s. 8d.

The metal prices are supplied by British Insulated Cables Ltd.

The Lead Market.

Price Recovers after 15s. Fall—Electrical Consumption Still Poor.

IN their lead market report dated August 28th, James Forster and Co. state that from Monday to Thursday inclusive values fell each day, the fall being 15s. per ton on the week for August and 12s. 6d. for November shipment. A quick change was witnessed on Friday, however, the buying being very heavy, the result being the recovery of values to last week's close, i.e., £32 17s. 6d. for August and £32 7s. 6d. for November, against £32 17s. 6d. and £32 8s. 9d. at the end of last week.

Friday's advance was started by rumours of buying on the part of Germany—who in the earlier part of the week was reported a seller—and was helped by eager covering of "bears" for all positions.

Consumers continue their policy of hand-to-mouth buying and very few have covered their requirements for forward. Consumption is quite active in the domestic trade, but electrical consumption leaves much to be desired, due, largely, to the coal strike. With a recovery in the latter trade, which is to be looked for, consumption in this country would soon reach last year's level.

CANADIAN STANDARDS.

British Manufacturers' Difficulties in Catering for the Canadian Market.

DISCUSSING the oft-repeated allegation that British manufacturers are slow to recognise the value of the Canadian market, our Canadian contemporary "Electrical News," says that while this is partly true there are other factors detrimental to the interests of British manufacturers in this field.

Conditions in Canada (it states) are, in the main, that Canadians accept as standard the equipment which has been accepted as standard in the United States. That standard naturally conforms to manufacturing practice in that country. This applies to all of the provinces except Ontario, and although it is quite true that Ontario has a standard of its own established by the rules and regulations of the Hydro-electric Power Commission, this standard is based so largely on United States practice that when it becomes a question of approval practically the same obstacles stand in the way of the British manufacturer in Ontario as in the rest of the Dominion.

The "Safety" Factor.

"There seems to be no reason," it continues, "why electrical equipment to be used in Canada should submit to the standards of any one country. What we are most concerned with is whether the equipment is safe—whether it is well guarded against hazard to life and property. Surely any manufacturer should be free to offer his product in Canada if it satisfies these conditions.

"Those who complain that the British manufacturer is not sufficiently aggressive may be overlooking the fact that at the present time the Britisher is frequently prevented from offering for sale here equipment of the very highest standard. This results from the reasonable enough condition that British manufacture and United States manufacture have not followed along exactly the same lines. Details more or less insignificant, such as the form or the dimensions, that have nothing to do with the efficiency or the safety of the equipment sometimes stood in the way. Surely these are matters that may be left to the wishes of the customer?

High Quality British Switches.

"It happens that at the moment there is a British manufacturer of switches in Canada who finds that existing standards make it difficult to get the approval of the Chicago Underwriters or of the Ontario Hydro. There is not the slightest suggestion, however, that this manufacturer's switches are not built to a very high standard. Indeed, it would appear that the standard of the British manufacturer is equal to anything that has ever been reached on this continent."

Our esteemed contemporary concludes by expressing its unqualified conviction that the inclusion of this particular British manufacturer's product in Canadian electrical firms' stocks would "very considerably raise the standard of the average stock."

Fuel Economy.

Sir Alfred Mond to be First President of the New Institution.

WE understand that Sir Alfred Mond, M.P., has accepted an invitation to become the first President of the Institution of Fuel Economy Engineers. This news is of more than ordinary interest, in view of the fact that Sir Alfred has recently accepted the chairmanship of the new National Fuel and Power Committee appointed by the Government in accordance with the recommendation of the Coal Commission. It will doubtless be very advantageous for the new Committee to be so closely allied with the Institution of Fuel Economy Engineers.

The first meeting of the 1926 Winter Session of the Institution of Fuel Economy Engineers will be held on Friday, September 24th, at 6 p.m., in the Lecture Theatre of the Royal Society of Arts, John Street, Adelphi, London, when Dr. A. E. Dunstan will read a paper on "Liquid Fuels." Dr. Dunstan will deal not only with liquid fuels at present in use, but also with the lesser known fuels upon which extensive research work is now being carried out throughout the world. Dr. Dunstan is chief chemist to the Anglo-Persian Oil Co., a research worker in the field of liquid fuels, and intimately associated with the Institution of Petroleum Technologists and the Institution of Chemical Engineers.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BARCLAY YOUNG AND CO., LTD., 115, Hammersmith Road, W., electrical engineers. £10 0s. 10d. July 13th.

BREMER, Mr. A. H., Sunderland Street, Houghton-le-Spring, electrical contractor. £14 8s. 4d. July 8th, and £11 10s. 3d. July 16th

HAMMOND, Mr. E., 73, Carlton Street, Bradford, electrical contractor. £27 14s. 8d. July 30th.

J. AND B. RADIO SUPPLIES, 34, Oxford Street Chambers, Reading, electrical engineers. £23 5s. 10d. July 15th.

RAWLINGS AND CO., 33, Broad Street, Hereford, electrical contractors. £17 15s. 8d. July 12th.

WIRELESS SUPPLIES AND INSTALLATIONS, Town Hall Buildings, Banbury, electricians. £22 14s. 5d. July 27th.

Bills of Sale.

CRIMIN, Harry, 69, Sturge Street, Heeley, Sheffield, electrica engineer. Filed August 30th. £40.

SMITH, William, 24, Hampstead Road, Elm Park, Liverpool, electrical engineer. Filed August 26th. £70.

Deed of Arrangement.

HOWSON, David, 79, Westwood Road, Goodmayes, and ETTRITCH, Ernest Charles, 35, Norfolk Road, Seven Kings, trading at 2, Facade, High Road, Goodmayes, as HOWSON AND CO., electrical and wireless engineers. Filed August 25th, by order on terms. Trustee, E. H. Hawkins, 4, Charterhouse Square, E.C., I.A. Secured creditors, £141; liabilities unsecured, £329; assets, less secured claims, £208.

Receiverships.

BARLOW AND REDRUTH, LTD.—L. H. Sheddon, of 77, Darlington Street, Wolverhampton, was appointed receiver on August 13th, under powers contained in debenture dated August 12th, 1926.

WELCO PATENTS, LTD.—E. Greenhill, of 7, Newhall Street, Birmingham, was appointed receiver on August 16th, 1926, under powers contained in debentures dated August 29th, 1924, and May 28th, 1925.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

AUROLITE ELECTRICAL SUPPLIES, LTD., LONDON, W.C.—Registered August 13th, £100 debentures to Col. H. B. H. Hamilton, 5, Cranley Gardens, S.W. J.P.; general charge. Nil.* December 31st, 1925.

CENTRAL ELECTRIC AND RADIO CO., LTD., Eastbourne.—Registered August 7th, £300 2nd debentures; general charge; also registered August 7th, £200 debentures balance of £750; general charge.

ELECTRICAL AND ALLIED INSTRUMENT MANUFACTURING CO., LTD., Leyton. Registered August 17th, £410 17s. 6d. deb., to P. E. Jones, 330, High Road, Leytonstone; general charge. *Nil. December 31st, 1925.

HEWITTIC ELECTRIC CO., LTD. (late WESTINGHOUSE COOPER HEWITT CO., LTD.), Hersham. Registered August 20th, £20 000 deb., to Hackbridge Electric Construction Co., Ltd., Hersham; general charge. *Nil. November 18th, 1925.

LLANDUDNO AND COLWYN BAY ELECTRIC RAILWAY, LTD. (late LLANDUDNO AND DISTRICT ELECTRIC TRAMWAY CONSTRUCTION CO., LTD.).—Registered August 5th. Trust deed dated July 30th, 1926, securing £100 000 prior lien debenture stock and a premium of 5 per cent. (in priority to trust deeds securing first debenture stock); charged on the railway undertaking, etc., also general charge. *£85 000. March 15th, 1926.

MIDLAND COUNTIES ELECTRICAL ENGINEERING CO., LTD., Smethwick. Registered July 22nd, mortgage, to Bank; charged on property in Grice Street, West Bromwich. *Nil. December 31st, 1925.

"M. K." ELECTRIC, LTD., London, N.—Registered August 9th. £1 000 debentures, part of £10 000; general charge. *£4 000. April 20th, 1926.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

CASTELLINA CO., LTD., Great Marlborough Street, London, W., alabaster importers and wireless and electrical dealers. At the adjourned meeting of the creditors in this matter (see last week's ELECTRICIAN), held at the Manchester Hotel, Aldersgate Street, E.C., Mr. E. W. Smith, the liquidator, said that he had been in consultation with the debenture holders and had nothing further to report. After some discussion, it was decided that the voluntary liquidation of the company should be continued with Mr. Smith as liquidator.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Bankruptcy Information.

KINZETT, F. E., AND SON, 54, Fielding Road, Chiswick, Middlesex, wireless factors. Receiving order, August 25th. Creditor's petition.

PADGETT, Harold, and NICHOLSON, Arthur, trading as "PADGETT AND CO.," 218, Spring Bank, and 10, Beverley Road, Kingston-upon-Hull, electrical and radio engineers. First meeting, September 9th, 11.30 a.m., Official Receiver's office, 37, Scale Lane, Hull. Public examination, October 25th, 2 p.m., Guildhall, Alfred Gelder Street, Hull.

YEUDALL AND SPROTT (Robert YEUDALL and Harry SPROTT), electrical engineers, 47, Sinclair Street, Helenburgh. A sequestration petition has been presented, at the instance of William Harper and Co., wholesale wireless factors, mechanical and electrical engineers, 132, Bothwell Street, Glasgow.

Notice of Dividend.

SCOTT, Thomas, and CAMPBELL, James, trading as T. SCOTT AND CO., 42, Handyside's Arcade, Percy Street, Newcastle-upon-Tyne, wholesale electrical suppliers. Supplemental dividend, 4d. per £, payable September 2nd, Official Receiver's Office, Pearl Buildings, 4, Northumberland Street, Newcastle-upon-Tyne.

Notices of Intended Dividends.

COOKE, George Venables (trading as the WAKEFIELD WELDING CO. and the ALBION ACCUMULATOR SERVICE), 80, Ings Road, Wakefield, Yorkshire, oxy-acetylene welder and accumulator charger. Last day for receiving proofs, September 4th. Trustee, B. S. Briggs, Official Receiver, 21, King Street, Wakefield.

JENSEN, James Leslie Roy, trading as JENSEN AND McNICOL, 140a, Seabank Road, Wallasey, Chester, wireless accessories factor. Last day for receiving proofs, September 11th. Trustee, E. D. Symond, 11, Dale Street, Liverpool, Official Receiver.

Partnerships Dissolved.

ENCORE MANUFACTURING CO. (Harold William JACKSON and Frederick William WEST), manufacturers of wireless accessories, 16, Lower Richmond Road, Putney, from July 17th, 1926. Debts received and paid by H. W. Jackson, who will continue the business.

MAY (G. W.) AND CO., Albert Edward WILES, Ernest William WILES and George Willey MAY), radio specialists and electricians, 100, Northdown Road, Cliftonville, Margate, by mutual consent as from August 21st, 1926.

Bankruptcy Proceedings.

HAWKINS, Albert Bernard, and HAWKINS, Harold, trading as HAWKINS BROS., 101, Station Hill, Kidderminster, electrical and wireless engineers. The first meeting of the creditors of the above was held on August 30th at the Lion Hotel, Kidderminster. The statement of affairs showed gross liabilities of £403, of which £385 was expected to rank, against net assets of £33, or a deficiency of £352. Debtors attributed their failure to lack of capital, bad trade, and heavy costs of judgments. The matter was left with the Official Receiver as trustee.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

255 695 A. Dukinfield-Jones. Electrical resistances. (3/11/25.)
242 950 M. F. H. Gouverneur and F. J. Stevens. Insulators. (6/11/24.)
244 106 Aktiebolaget Baltic. Holder for thermionic valves. (4/12/24.)
255 719 Igranic Electric Co., Ltd. Electric heating devices. (4/12/25.)
245 141 Compagnie Francaise Pour l'Exploitation des Procedes Thomson-Houston. Method of assembling the elements of electric cells. (24/12/24.)
245 166 H. G. Andre. One-way conductor for rectifying alternating current. (26/12/25.) (Addition to 224 871.)
255 722 H. H. Leage. Method and means for fixing and bonding metallic-sheathed electric wires and cables. (2/1/26.)
246 816 British Thomson-Houston Co., Ltd. Radiating antenna systems. (30/1/25.)
245 802 X. Bullinger. Bearings for small electrical generators for cycles, motor-cycles and the like. (10/1/25.)
250 906 British Thomson-Houston Co., Ltd. Electric discharge devices. (16/4/25).
255 730 Wurttembergische Metallwarenfabrik, A. Wolf and E. Bauer. Electroplating baths for simultaneously obtaining metallic deposits of various thicknesses. (25/1/26.)
247 071 Metropolitan-Vickers Electrical Co., Ltd. Apparatus for converting alternating electric current into direct current. (18/2/25.)
253 864 Westinghouse Brake and Saxby Signal Co., Ltd. Electrical measuring apparatus. (18/6/25.)
248 380 International General Electric Co., Inc. Electric switches. (26/2/25.)
250 912 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Electric discharge tubes. (18/4/25.)
255 773 Brandes Laboratories, Inc. Audio-frequency transformers. (4/11/25.)
255 790 General Electric Co., Ltd. Filaments for electric incandescent lamps or other purposes. (26/11/25.)
255 795 Akt.-Ges. Brown, Boveri et Cie. Electric switches. (4/9/25.) (Addition to 206 522.)
242 688 R. F. Bossini. Electrolytic rectifiers for alternate currents. (17/7/24.)
242 693 A. E. Burrow and A. G. L. Prahm. Construction of electrical switch (7/8/24.)
242 698 A. E. Alexander (Signal Engineering and Manfg. Co.). Electromagnetic bells. (11/8/24.)
242 699 A. E. Alexander (Signal Engineering and Manfg. Co.). Electromagnetic bells. (11/8/24.)
220 940 Signal Engineering and Manfg. Co. Electromagnetic bells. (22/8/23.)
242 702 S. Z. de Ferranti and Ferranti, Ltd. Induction electricity meters. (11/8/24.)
242 705 F. B. Cox. Control switches for varying the resistance of a circuit. (12/8/24)
242 710 A. Reyrolle and Co., Ltd., B. H. Letson and R. C. Minton. Electric relays. (14/8/24.)
242 713 Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.) and A. M. Searle. Automatic telephone systems. (15/8/24.)
242 714 Major, Smith and Stevens, Ltd., and P. H. Stevens. Control of poly phase electro-motors. (15/8/24.)
242 715 T. W. Ross and Metropolitan-Vickers Electrical Co., Ltd. Regulating or control systems for dynamo-electric machines. (15/8/24.)
242 720 A. F. H. Morant. Crystal detectors for wireless reception. (27/8/24.)
242 730 Brookhirst Switchgear, Ltd., and J. A. Hirst. Electric switches. (28/8/24.)
242 737 J. W. Dungey. Telephone receivers. (12/9/24.)
242 742 British L. M. Ericsson Manfg. Co., Ltd., W. D. Norbury, and F. Bates. Electrical condensers. (26/9/24.)
224 506 Compagnie Electro-mecanique. Supporting frame for electric lines. (5/11/23.)
242 750 W. H. Brown. Electric supply meters. (11/10/24.)
242 753 W. Meacher. Apparatus for converting electric currents. (6/9/24.) (Divided application on 17 749/24.)
242 759 W. Rawsthorne. Method for separating the set from the aerial in wireless receiving and transmitting sets. (20/10/24.)
242 761 H. F. Abraham. Wireless receiving apparatus. (20/10/24.)
224 877 British Thomson-Houston Co., Ltd. Electron discharge devices. (13/11/23.)
242 768 Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd. (W. Dubilier.) Electric condensers. (27/10/24.)
242 785 Siemens Bros. and Co., Ltd., and W. G. Patterson. Automatic and semi-automatic telephone systems. (11/11/24.)
242 787 A. S. Cachemaille (Westinghouse Lamp Co.). Electric incandescent lamps. (12/11/24.)
242 807 Crompton and Co., Ltd., and W. F. Jones. Electric rheostats. (19/12/24.)
242 819 Siemens und Halske Akt.-Ges. and F. Doring. Selecting switches for use in telephone systems. (6/1/25.)
242 847 G. Green. Telephone receivers. (2/3/25.)
238 845 General Electric Co., Ltd. Electric luminous discharge tubes. (22/8/24.)
232 103 Siemens-Schuckertwerke Ges. Means for influencing the power factors of alternating current mains. (10/4/24.)
231 534 O. Sattelberg. Electric conductors. (31/3/24.),
231 905 Maschinenfabrik Oerlikon. Emergency braking-system for electric vehicles. (5/4/24.)
232 243 Siemens-Schuckertwerke Ges. Protective arrangement for alternating current electric machines. (12/4/24.)
232 258 British Thomson-Houston Co., Ltd. Dynamo-electric machines. (14/4/24.)
232 624 British Thomson-Houston Co., Ltd. Electric resistance elements, and method of making same. (18/4/24.)
234 113 Telefunken Ges. fur Drahtlose Telegraphie. Means for tuning aerials and oscillatory circuits coupled with an aerial. (14/5/24.)
234 842 International General Electric Co., Inc. Protective arrangements for alternating-electric current circuits. (31/5/24.) (Addition to 230 501.)
235 197 International General Electric Co., Inc. Selective relay for the protection of electric lines. (3/6/24.)
235 869 Siemens-Schuckertwerke Ges. Process for avoiding inadmissible tension conditions in switched-off circuit portions of alternating-current electric supply systems. (18/6/24.)
240 792 Soc. Anon. des Anciens Etablissements E. Picard. Variable electric condensers. (4/10/24.)
242 911 A. H. Roberts. Electric cables. (23/6/25.)

Applications for Patents.

August 9th.

19 595 F. B. Cox. Electric switchgear.
19 600 M. E. Elliott. Variable inductances.
19 601 M. E. Elliott. Inductance, etc., coils.
19 613 J. Y. Johnson (I. G. Farbenindustrie Akt.-Ges.). Metallic cores for electro-magnets, etc.
19 594 Sir B. Longbottom and E. Greenhalgh. Electric arc welding apparatus.
19 598 E. P. Murray. Crystal detectors.
19 604 F. M. T. Reilly. Loud speakers. (1/6/26.)
19 605 F. M. T. Reilly. Loud speakers. (6/1/26.)
19 641 E. N. Snowden. Electro-therapeutic apparatus. (23/7/25.)
19 639 P. M. Woodhouse. Electric accumulators.

August 10th.

19 734 Aspden Flywheel Dynamotor Syndicate, Ltd., and R. L. Aspden. Electric starters for internal-combustion engines.
19 745 British Thomson-Houston Co., Ltd. Electric discharge devices. (10/8/25, U.S.)
19 714 Hazeltine Corporation. Thermionic valve circuits. (27/2/25, U.S.).
19 746 International General Electric Co., Inc. Voltage, etc., regulators. (10/8/25, Germany.)
19 715 Plessy Co. (1925), Ltd., and W. E. Thomas. Thermionic valve circuits.
19 739 N. Schmitt. Watertight electric fuses.
19 721 W. Simpson. Crystal detectors.
19 752 Soc. Francaise Radio-Electrique. Thermionic valve circuits. (10/8/25, France.)
19 747 Western Electric Co., Inc. Serving machines for manufacture of electrical cables. (16/11/25, U.S.)

August 11th.

19 777 H. Clarke and Co. (Manchester), Ltd., and H. Ingham. Battery eliminator for wireless receivers, etc.
19 843 F. G. Creed and Creed and Co., Ltd. Telegraphic receiving apparatus.
19 767 F. Creedy. Dynamo-electric machines for welding, etc.
19 816 G. L. Darby and Oldham and Son, Ltd. Galvanic batteries.
19 838 Edison Swan Electric Co., Ltd., and T. W. Price. Thermionic valves.
19 810 T. V. Edwards. Wireless apparatus.
19 848, 19 849 Elstree Radio, Ltd., and J. H. Reyner. Wireless receivers.
19 791 G. W. K. Harwood. Electric cooking stoves.
19 808 International General Electric Co., Inc. Selective protection of systems of electric conductors. (11/8/25, Germany.)
19 819 Lodge-Cottrell, Ltd. (Metallbank und Metallurgische Ges.). Electrical gas-purifying apparatus.
19 784 S. Y. White. Electrical amplifier circuit. (11/8/25, U.S.)

August 12th.

19 935 W. H. Apthorpe and Cambridge Instrument Co., Ltd. Electrical relays.
19 947 British Thomson-Houston Co., Ltd. Electric current-converting systems (12/8/25, U.S.)
19 914 E. G. Budd Manufacturing Co. Electric welding apparatus. (15/8/25, U.S.)
19 915 E. G. Budd Manufacturing Co. Electric welding apparatus. (27/8/25, U.S.)
19 953 Celestion Radio Co., C. French and E. J. Marriott. Thermionic valve circuits.
19 930 P. W. Harris and J. Robinson. Wireless signalling.
19 963 B. Hesketh. Electrical resistances.
19 869 H. B. Jackson. Electric irons.
19 954 Sir O. J. Lodge, M. M. Melinsky and E. E. Robinson. Electric couplings for wireless signalling, etc.
19 951 F. Rizzo. Electric signalling systems.

August 13th.

20 014 J. B. Bignamy. Vernier dial for wireless apparatus.
20 030 British Thomson-Houston Co., Ltd., and A. G. Salisbury. Electric switches.
20 022 J. C. N. Eastick and L. E. K. Eastick. Electric switch.
20 039 General Electric Co., Ltd., M. S. H. Hunt and A. Kinnes. Electric switches.
20 040 General Electric Co., Ltd., and G. R. Myers. Control of electric circuits.
20 017 H.T.C. Electrical Co., Ltd., and H. O'Connell. Electrical plug-and-socket connections.
20 050 G. A. Juhlin and Metropolitan-Vickers Electrical Co., Ltd. Electric switches, etc.
20 004 B. G. Levis. Manufacture of electric insulators.
19 995, 19,996 D. P. Long, Siemens Bros. and Co., Ltd., and Wilkins. Automatic telephone systems.
19 971 C. W. Marshall. Filament-heating circuits for thermionic valves.
20 040 J. W. Milnor and Western Union Telegraphic Signals. Method of amplifying telegraphic signals.
20 075 C. Oliver and Oliver Pell Control, Ltd. Radio-frequency choke coils for wireless telephony.
20 015 J. W. Purkis. Thermionic valve circuits.
20 034 E. E. Robinson. Wir less signalling.
20 074 G. G. N. Taylor. Loud speakers.
20 067 C. C. Webb. Wireless receiving sets.
19 979 W. H. Wilkinson. Electric washing machines.

August 14th.

20 111 C. P. Allinson. Wireless signalling.
20 123 G. B. Alvey, R. E. Grime and Mather and Platt. Starting and synchronising of rotary converters.
20 078 F. N. Giles. Collapsible electric box sign.
20 114 R. O. Hughes. Locking devices for electric lamps.
20 080 D. Litty. Supplying high-tension current from direct-current mains for wireless receivers.
20 124 J. M. Nemirovsky. Tuning coils for wireless telephony, etc.
20 091 C. Zwicker. Variable electric condensers. (28/6/26, Germany.)

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Friday, September 3rd-6th.
Women's Engineering Society.—Leeds University. Fourth Annual Conference.

Friday, September 3rd-10th.
World Power Conference.—Basle.

Friday, September 3rd-4th.
Institute of Metals.—Autumn meeting, Hall of the Association des Ingenieurs, 16, Quai des Etats-Unis, Liége.

Saturday, September 4th-18th.
National Radio Exhibition.—New Hall, Olympia, Kensington.

Monday, September 6th.
Electrical Contractors' Association (Derby Branch). Ordinary meeting.

Monday, September 6th-18th.
Universal Smoke Abatement Exhibition.—Bingley Hall, Birmingham.

Wednesday, September 8th.
Electrical Contractors' Association (Sheffield Branch).—Angel Hotel. Ordinary meeting. 5.30 *p.m.*

Wednesday, September 8th-10th.
Municipal Tramways Association.—Annual Conference, Liverpool.

Thursday, September 9th.
Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.
Electrical Contractors' Association (East Yorks Branch).—Metropole Hall, Hull. Ordinary meeting. 3.30 *p.m.*

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THE ELECTRICIAN

ESTABLISHED 1861.

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ACCIDENT PREVENTION.

ACCIDENTS, says the old proverb, will happen. But in these materialistic days we are not content to accept this statement and a great deal of time and ingenuity is therefore being expended in trying to prevent them from happening. This we shall never be entirely able to do, unless human nature changes, as is obvious when the causation of these mishaps is considered. The human element lies behind all accidents, and the best that can be done therefore is to reduce the part it plays, or the dreadful results that arise from the part being played badly, to a minimum. Sometimes the human factor is far to seek. If a motor armature suddenly disintegrates it may be due to bad design, to faulty workmanship, or, coming nearer, to faulty supervision. All these things augur a lack of skill or knowledge somewhere and can be corrected. The same may be said of most of the accidents which occur on machinery, as these arise from the operator being not sufficiently expert or too ignorant to know what he is doing. This very large class of accidents can be minimised by increasing our knowledge in one or more directions. There is, however, another class of accident which arises rather from too much than too little skill, a state of things which breeds contempt and leads to trouble. Mr. SCOTT RAM produces many examples of this type of mishap in his annual report. A large proportion of accidents that occur in factories are undoubtedly due to this cause and can only be overcome by propaganda applied in a striking and sometimes startling fashion.

The problem is on the one hand economic. We do not say that the greater attention that has been been paid to the subject of accident prevention in recent years by industrialists is due entirely to the Workmen's Compensation Acts and other legislation; or to the force of public opinion which holds that a workman must be maintained when he has suffered injury in his employer's time. But it has gradually been borne in upon employers that it does not pay to have frequent accidents in their works, and that it is worth while, if on the score of production alone, to prevent such occurrences taking place.

On the other hand, the problem is psychological, and we are glad to learn that the whole matter is receiving the attention of the National Institute of Industrial Psychology. At the present time, according to a Paper read by Mr. A. STEPHENSON before the British Association, one-third of the industrial accidents are attributable to the use of machinery, and not more than one-third of this third are due to lack of precautions, such as failure to supply guards. Thus the cause of 90 per cent. of the present-day accidents is some weakness, either mental or physical, in the human subject. That this weakness may be ascribed to what is called absence of mind is shown by some figures, which give the result not only of fitting machinery with appropriate guards but of propaganda.

In Bulletin No. 47 of the United States Federal Board for Vocational Education it is stated that one of the big steel firms, employing some 10 000 men, has reduced the number of accidents occurring by 60 per cent. in twelve years. In another case it is estimated that in twelve years over 23 000 workmen, representing 10 per cent. of the entire personnel, have been saved from death or serious injury. It is significant, too, that only one-third of these reductions has been effected by mechanical equipment, the rest having been accomplished by organisation and education. This shows that accidents are not so much caused by lack of skill, or even by faulty design of the plant, as by carelessness.

At the same time it must be admitted that education in the proper methods of using the machinery is an important factor. As a result of an investigation bearing upon the influence of age and experience on accidents, it was considered advisable by the National Institute of Industrial Psychology to train learners on certain lines. The machine speed was slowed down considerably and the learners were allotted only a share of work. Incidentally, the principal difficulty was to obtain suitable instructors. A certain number of workers with previous experience were included in the test gangs in order to determine whether they or the raw novices were more suitable as trainees. An analysis of the work of 87 novices and 53 learners with previous experience shows that the average number of accidents per 1 000 hours exposure was 1·6 in the first case and 1·23 in the latter. This appears to indicate a reduced tendency to accident with increased age, as the workers with previous experience were older than the novices. But it also seems that ability to acquire the neuro-muscular co-ordination required by the particular process and to attain the necessary degree of manual skill and dexterity is at least as important a factor as age or experience. If this is so, it would enable those who for any reason are unsuitable for performing a particular series

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of operation to be eliminated at the outset by suitable tests and thus the tendency to accidents among the operatives due to lack of skill reduced still further.

There is, however, another important factor, and we are glad to see that Mr. STEPHENSON deals with it. That is the effect of artificial illumination. The difference between the number of accidents recorded between 3.30 and 6 p.m. in the summer and winter quarters respectively is marked, especially in the first hour during which artificial illumination is in use. Then comes a period of apparent adaptation during which the accident frequency decreases, and this in turn is succeeded by an increase of 140 per cent. in the frequency in the winter quarters, as compared with the summer quarters. Further comment on these results is unnecessary in THE ELECTRICIAN.

Finally, we may return to the economic aspect of accidents. Mr. STEPHENSON emphasises that quite trivial accidents may entail a heavy loss in production. The further possibility of the transfer of emotional effect to other workers in the immediate proximity of the accidents may also result in varying degrees of loss of self-control. Of course, the after effects may be beneficial on the principle that the burnt child dreads the fire.

In conclusion, Mr. STEPHENSON indicates that the problem of accident prevention might be met to a large extent by mechanical safeguards, education and propaganda, the scientific selection of the workers for the job, and the determination of susceptibility to accident. The discovery of this last factor is of importance, and it is to be hoped that researches which are now being conducted will result in success. Only in this way can it be hoped that a reduction in the 120 000 non-fatal accidents which occur each year in our factories will be achieved.

Current Topics.

The World Power Conference.

Now that the World Power Conference at Basle has concluded there will not be wanting a form of stocktaking, and among those who will indulge in this useful and even necessary exercise will be some who will be critical of the benefit of such gatherings. We may refer those who take up this attitude to the opening sentences of M. E. PAYOT'S report on the "Utilisation of Water Power." And, indeed, what he says is such a good explanation of the objects of the conference that we make no apology for reproducing his remarks here. "The times in which we live," he says, "demand that the fullest use be made of economic factors. The engineer is entrusted with the creation of economic installations for the good of mankind. This is demanded especially from the engineer designing and constructing hydraulic power stations. He is expected to make things as simple as possible in connection with installations which, themselves, are extremely complicated in view of the enormous progress of technical achievement. Only a simple, clearly designed installation can be constructed and run cheaply. It is also of great importance than anyone who takes up a new task should make use of the experiences which others have made elsewhere. Experiments must not be unnecessarily carried out at different places simultaneously. If experiments have to be made, it is advisable to carry them out systematically and in common, with a view to obtaining the quickest possible results. It is uneconomic when the same experiment is repeated by someone in ignorance of the fact that that question has already been investigated and cleared up." In these days the intercommunication of nations is so easy and practically all obstacles have been removed from the path of those who wish to interchange information that it would be shirking the responsibilities imposed on them if engineers neglected to take the fullest advantage of the facilities that are available.

Utilisation of Water Power.

THE reports which we have received from our special correspondents at Basle indicate that extremely useful work was done at the Sectional World Power Conference, which assembled under Swiss auspices in that town last week. The three main subjects dealt with: "The Utilisation of Water Power," "Inland Navigation" and "Railway Electrification," are all of great importance, and the Papers presented go far to make clear the problems which engineers working in the different countries have to face in dealing with these matters. The result is a mass of information from which everyone can derive at the very least some useful hints. This extraction of valuable metal has been made easier by the preparation of a general report on the various Papers presented to each section. It will be remembered that we recommended this course when the original Conference was being organised two years ago, and we are glad to see that our recommendation has now been adopted. We summarise M. PAYOT'S report on the "Utilisation of Water Power" on another page of this week's issue. A perusal of it will show that the great care that has been taken in its preparation is amply justified in the result. A large portion of the report is naturally taken up with hydraulic details, but sufficient is said about the design of the electrical equipment to provide much food for thought for electrical engineers, even those of British persuasion. The same applies with perhaps greater force to Dr. E. HUBAR STOCKAR'S report on "The Electrification of Railways," with which we shall deal fully next week. Swiss engineers have once again placed their profession under an obligation by their enterprise in arranging this Conference and by their hospitality to those participating.

The National Radio Exhibition.

THE National Radio Exhibition, which opened at Olympia, London, on Saturday, is the fifth of its kind, and by its size alone is an indication of the important part that this method of communication is playing in the lives of all of us. Electrical signalling without wires assumed a practical form some thirty years ago, but it is not too much to say that the industry with which the present display is concerned has sprung into being since the war, and that its enormous development has taken place entirely within the past five years. For the National Radio Exhibition is really an exhibition of broadcasting receiving apparatus, and in being such an exhibition displays an amount of enterprise and ingenuity which is worthy of the highest congratulation. On another page of this issue we describe some of the more novel apparatus shown. In a later issue we shall deal with the more important question of tendencies in some detail. It will be sufficient here to state some general and early impressions. The larger sets of the super heterodyne type seem to have left the experimental stage, and can now be regarded as suitable for use at least by the skilled listener. Welcome progress is still being made towards greater compactness and simplicity, and it is gratifying to see that greater attention is being paid to the problem of low frequency amplification with a view to eliminating distortion. The real novelty of the exhibition is, of course, Sir OLIVER LODGE'S N circuit, which has been designed to prevent that annoying phenomenon, howling. It is combined with a set which at any rate is simple enough, as it consists solely of one tuning condenser and a filament control. At this end of the broadcasting circuit an almost ideal simplicity is being reached, if it has not yet been attained. It remains to obtain equal constancy at the transmitting end, so that the necessity of adjustment on that score may also be eliminated.

Electricity and Smoke Abatement.

THE Smoke Abatement Exhibition, which opened at Birmingham on Monday, will leave no doubt in the mind of the visitor that the Smoke Abatement League of Great Britiain realises that one of the greatest obstacles to the attainment of the ideal they have in view is the continuance

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of the open fire. A larger number than ever before of devices are on view whose object is to eliminate or short-circuit the open fire, among which pride of place must be given to the combined exhibit of the British Electric Development Association. This takes the form of a number of rooms—kitchen, bathroom, living room—fitted with electrical appliances of various sorts designed to demonstrate the comfort of electricity in the home. The latest types of electrical fires, heaters, cookers, and other adjuncts may also be inspected on the stands occupied by several of the large electrical manufacturing firms. Some electric tools and ovens for industrial use are on view, and there are electrical refrigerating and ice-making machines. At a time when we are all tuning ourselves up to think about lighting, this exhibition is a useful reminder that there are other things that electricity can do better than anything else. Abating smoke is one of them.

Electricity in Factories.

THE report of the Senior Electrical Inspector of Factories (Mr. G. SCOTT RAM) for the year 1925 which has just been issued makes, as usual, interesting reading. The increasing employment of electricity for all purposes has, we are glad to learn, resulted not in an increase, but in a decrease in the number of accidents, the figures being 414 for 1925 as against 433 in the previous year. The non-fatal cases were 24 and 27 respectively. Nine of the fatal accidents occurred on high tension or extra high tension systems and seven were in generating stations or sub-stations belonging to authorised undertakers. Both fatal and non-fatal accidents were generally due to one of two principal causes: Faulty design or installation, and carelessness. An example of the first class was an unprotected high tension potential transformer terminal near an instrument which required occasional attention. An example of the second class was of a man who laid his pipe on the ledge just inside an inspection door a few inches from a live conductor and in reaching for it touched the conductor. As usual, a number of accidents occurred from failure to earth the metal work of apparatus, especially portable lamp holders. Mr. RAM discusses, as he has often done before, the relative safety of direct and alternating current to the disadvantage of the latter. In support of his contention he gives a number of figures which goes to show that though there are more accidents with direct current, fewer of them involve shock and of these only a small proportion are fatal. Although the number of accidents is only half that from direct current the proportion of shock accidents is 60 per cent., and of these 25 per cent. were fatal or ten times the proportion of those with direct current. A new type of accident is that caused by the ignition of the oil in oil-switches. This occurrence may lead to considerable damage if the number of switches in one room is considerable. This is the dark side of the picture. But a satisfactory inference that may be drawn from the figures given is that the more electricity is used the safer it becomes.

Demonstration Electric Homes.

THE trade in general has now received its copy of that famous booklet, "Wiring the Homes of Great Britain." We shall be forgiven, however, for insisting that it is not sufficient to obtain this "Field Service Pocket Book" in quantities, however large, but that it is necessary also to study it carefully and to inaugurate at once the campaign of which it gives what in military circles is called the "General Idea." We have no doubt that this great push will be a success, but the amount of its success depends on the enthusiasm with which local committees undertake the various duties imposed upon them. In this connection a most important factor will be the organisation of Demonstration Electric Homes, a matter which is fully dealt with in one of the sub-booklets issued with the main publication. This method of demonstrating the advantages of domestic electricity to the public is of course not new, but its application has been too localised. It is now necessary that, in conjunction with their other activities, the Electrical Circles should appoint an active and enthusiastic committee to procure, furnish and equip one or more homes in their district. The theory of such a demonstration is perfectly simple. For it enables full advantage to be taken of the *genius loci*. An electric cooker in a contractor's or supply undertaking's showroom may to the uninitiated appear a fearsome piece of apparatus. Installed in a well-equipped kitchen (and this is an important point) it loses its terrors and assumes not a little attractiveness. We shall not be going too far to say that upon the skill with which these homes are organised will largely depend the success of the campaign. It is essential that the work should be begun at once.

"Come to Bouverie House."

READERS of THE ELECTRICIAN who are also readers of the daily papers will learn first that we have recently established ourselves in new offices at Bouverie House, Fleet Street, London, E.C.4, and, secondly, that a "Come to Britain" movement has been started to induce Americans and other foreigners to visit these shores more frequently and in greater numbers. It is no good, however, to attempt to persuade visitors to come to Britain and then to leave them to amuse themselves. For there is one universal trouble with all foreign travel that though the travellers visit museums, churches and theatres, they generally leave the country without getting any adequate impression of its domestic, business or personal sides. That is where Bouverie House comes in. We have established a reception organisation on these premises, and we have full facilities for putting foreign visitors in touch with those with whom for technical or business reasons they wish to become acquainted. We can go a step further and arrange for the social entertainment of those who through no fault of their own are strangers in a strange land. We hope that all our readers, British and foreign, will assist in making our efforts a widespread success.

The Coal Dispute—A New Phase.

THE coal strike has entered a new phase. Hours, wages, reorganisation, the Royal Commission's Report, have all, for the moment, dropped into the background, and we are faced with a struggle between the political and the industrial forces which, while for the moment it concerns coal, has far wider implications. Mr. COOK and his associates, who are, of course, politicians and not industrialists, have, with a skill which does them credit, forced the political issue, and, not unnaturally, they find all the politicians, as distinguished from the industrialists, solidly behind them. In recent years a state of affairs has been matured in which everything must be done from Whitehall. It is almost impossible to build a cottage until the plans have been passed by somebody in the Ministry of Health. Everything is being centralised, and wages agreements are to be no exception to the rule. The political skill with which Mr. CHURCHILL devises a national agreement which shall be only an agreement for the districts to arrange their own affairs, does not help matters. A national agreement means that districts will only be able to get along with the practical work of earning wages and obtaining coal after they have given most of their brain power to the task of conforming to the terminology of national formulæ. Mr. EVAN WILLIAMS made it clear in his interview with the Government on Tuesday that this national political machinery was forced upon the owners as a result of the control necessitated by the war, and very few business men will be found who differ from his opinion that the way to get good coal and good wages is to handle each area with a full knowledge of the local conditions, unhampered by unnatural political conditions imposed by central, national and, therefore, unpractical organisations.

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NOTES ON WIRELESS MATTERS

The Rectifier in Telephonic Receivers—Its Peculiar Duty and Position—Relationship between Types and Differences in their Performance.

By L. B. TURNER, M.A., M.I.E.E.

AMONGST all the constituent parts of the multi-stage wireless receiver, with their complexity of desired and undesired ways of functioning, the rectifier occupies a peculiar position. It is the uniting link between the high frequency and low frequency stages, and deals within itself with currents of both frequencies; it is the only element of the chain

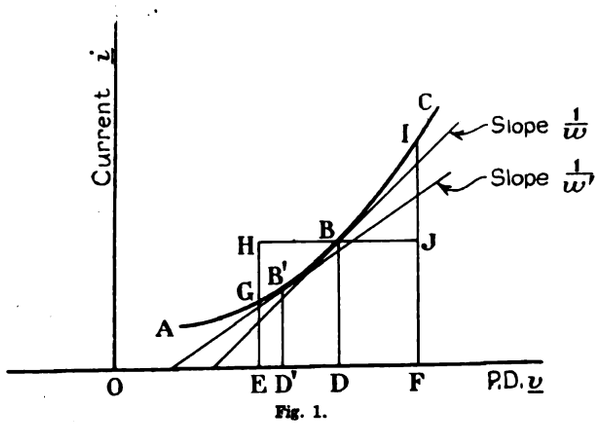

Fig. 1.

wherein the simple rectilinear relation between e.m.f. and current should be departed from; and its behaviour cannot be adequately examined without reference to absolute magnitudes to an extent not shared by the amplifying elements on both sides of it. The amplifiers, when arranged to function properly (i.e., rectilinearly) are affected only by the dimensions of the circuits; but the rectifier's performance depends not only on the circuits but also on the strengths of the carrier wave and on the strengths and frequencies of the side bands coexistent at any instant.

It is not surprising, therefore, that the behaviour of the rectifier is harder to follow than is the behaviour of the amplifiers. Despite the fact that, as an instrument, the rectifier, in the forms of crystal detector and Fleming valve, was already well known before the amplifying triode became available, it does not appear to have received its due share of attention. It is proposed here to review briefly the actions in the rectifier, and the relations subsisting between the several types of rectifier.

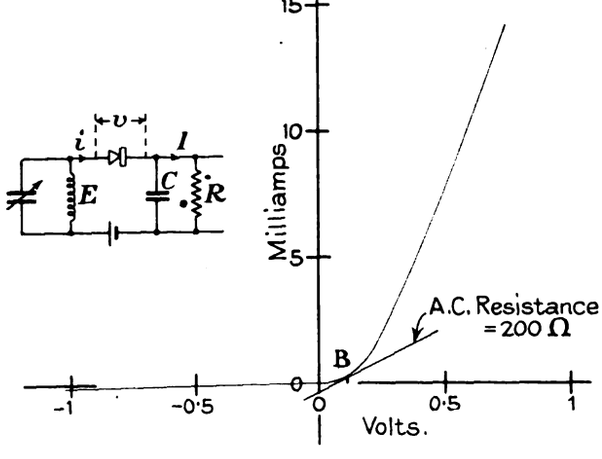

Fig. 2.

The three types of rectifier employed in telephony are the crystal rectifier, and the two types of triode rectifier depending on asymmetric anode current changes (simple anode, or "bottom bend," rectification) or on asymmetric grid current changes (cumulative grid rectification, or, briefly, grid rectification). Each has its votaries, although the third, whose action is usually considered the hardest to understand, is far the most popular.* The root principle of all is, of course, that in a conductor with a curved characteristic ABC (Fig. 1), a steady alternating P.D. of amplitude DE = DF superposed on a steady P.D. OD, produces positive and negative current amplitudes GH=/=IJ. The alternating P.D. of zero mean value thus effects a current change whose mean value is not zero, and which is therefore capable of affecting a Bell's receiver or like instrument. Quantitatively, if the curve in the neighbourhood of B is expressed in the form

$$i = a + b_1 v + b_2 v^2 + b_3 v^3 + b_4 v^4 + \ldots$$

the mean current change (i.e. "rectified current") due to the alternating P.D. of amplitude E is

$$I = \tfrac{1}{2} b_2 E^2 + \tfrac{3}{8} b_4 E^4 + \ldots$$

It often happens that the characteristic curve, over the region utilised, is sufficiently closely expressible by the first four terms of the series—i.e., taking $b_4, b_5, \ldots$ each zero. Then

$$I = \tfrac{1}{2} b_2 E^2;$$

the rectified current varies as the square of the alternating P.D.

It is to be borne in mind that I is either a steady current

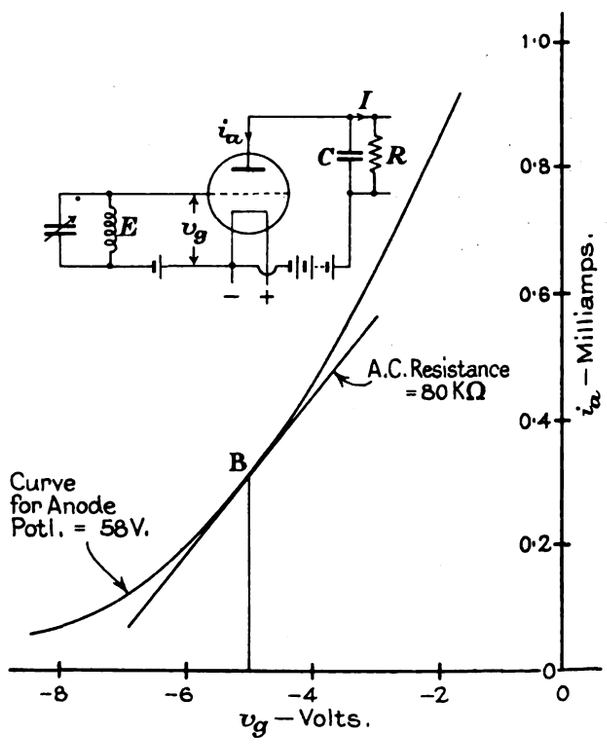

Fig. 3.

or, in comparison with the radio-frequency, a slowly varying (acoustic frequency) current.

In laboratory measurements the rectifier is sometimes used to operate a microammeter of very small resistance. But ordinarily its function is one of two others, viz., either (*a*) to actuate a current-taking power-controlled instrument, such as a Bell's receiver; or (*b*) to actuate a current-less potential-controlled instrument, the grid of a thermionic amplifier. In either of these cases I flows through a large impedance, here taken as the resistance R in Fig. 2. R must be shunted by a capacity C to bypass the high frequency alternating component of the total current traversing the rectifier. In case (*a*), R is of the order of w (Fig. 1), the rectifier A.C. resistance †; and in case (*b*) it is much greater. The rectified

* "The commonest form of detection used throughout the world is the grid leak and condenser method."—P. P. Eckersley, "Problems in Broadcast Receiver Design," "Experimental Wireless," August, 1926, p. 501.

† To conform with the British Engineering Standards Association decision that the slope resistance dv_a/di_a of the anode-filament path of a triode is to be called the "anode A.C. resistance."—See Editorial, "Experimental Wireless," August, 1926.

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current thus itself introduces a new term into v, viz., the steady or slowly varying back-pressure RI, and the region of the characteristic worked over changes its centre from B to B'. I consequently takes a value smaller than when R is zero.

If the drop RI is small, i.e. if B' is only slightly removed from B, this value is

$$I = (\tfrac{1}{2}b_2E^2 + \tfrac{3}{8}b_4E^4 + \ldots) \div \left(1 + \frac{R}{w}\right);$$

but if the signal is strong, the denominator lies between $(1+R/w)$ and $(1+R/w')$. This change of state-point from B to B' under the action of the signal greatly complicates the analytical treatment. In practice it necessitates the use of a method of trial and error in order, with a given characteristic curve, to calculate the rectified current I for any specified signal E.

In case (*b*), viz., where the rectifier is employed to actuate an amplifier, the output of the rectifier is the change of P.D. across R effected by the signal. The practical interest of case (*b*) very much exceeds that of case (*a*). Although the present examination in large measure covers both cases, it is case (*b*) which is particularly referred to.

In the crystal rectifier the curved characteristic is the plot of crystal contact P.D. against crystal contact current, as shown for a modern commercial crystal rectifier in Fig. 2.

In the anode rectifier the curved characteristic is the plot of grid-filament P.D. v_g against anode current i_a with constant anode potential, as shown for an ordinary bright filament triode in Fig. 3.

In the grid rectifier the curved characteristic is the plot of grid-filament P.D. v_g against grid-filament current i_g, as shown for the same triode in Fig. 4. It is not here necessary, as far as any direct effect on rectification is concerned, to shunt R with a condenser, although for other reasons it is usually convenient to do so. The rectified current flows not through R but through the grid leak r; and the grid condenser c in Fig. 4 plays the same part as do the condensers C in Figs. 2 and 3. It is usually convenient to rearrange the circuit of Fig. 4 into that shown in Fig. 5, but the performance is unchanged.

In what respects, if any, do the performances of the three rectifiers differ? Of course their efficiencies are unequal; equal signals E will give unequal output P.Ds. RI in the three cases. In this respect the grid rectifier is distinctly the best, largely because the essential high frequency performance ends at the grid, leaving us the anode to use for low frequency

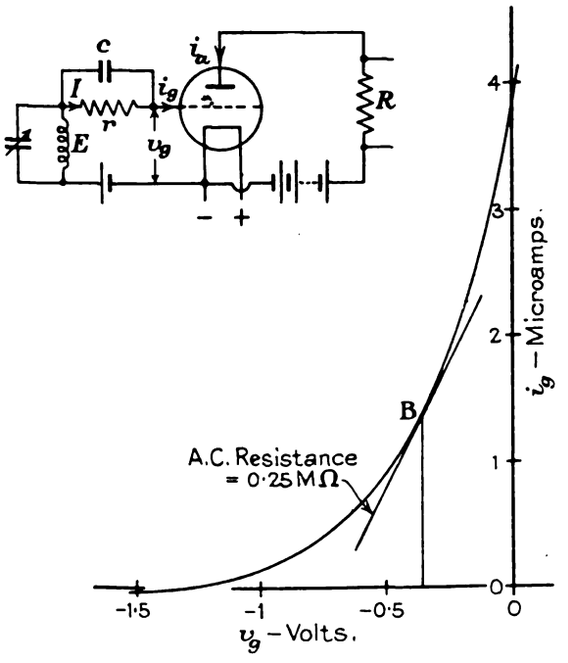

Fig. 4.

amplification without the trouble of providing another filament, grid and glass envelope. The one triode is, in fact, performing the two distinct services of rectification and amplification. The grid conditions are first selected to favour the former service, and the anode conditions (anode potential and value of R) are then chosen to favour the latter service.

In connection with efficiency there is this sharp distinction: on the one hand, both crystal and grid rectifiers must damp the high frequency circuit, since the rectified current is tapped therefrom; on the other hand, the anode rectifier need take no power from the high frequency circuit. Efficiencies cannot be compared without bringing these facts into consideration.

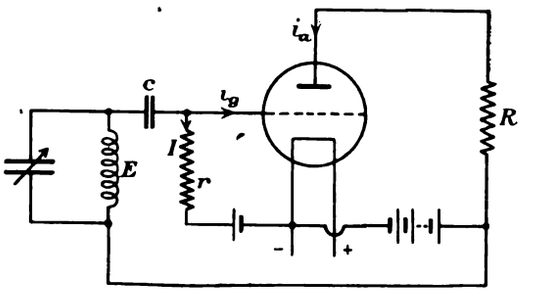

Fig. 5.

The upshot is that in practice there is no very serious distinction between efficiencies to be made.

In practical convenience, the grid rectifier is much superior to the anode, for it requires no potential divider and is unaffected by wide changes in the high tension supply voltage. The fact, too, that the state-point is on a steep straight part of the anode current characteristic carries a further advantage when it is desired to effect retroaction from rectifier anode back to the high frequency circuits.

(*To be continued.*)

REVIEW.

Introduction to Theoretical Physics. Vol. I. By ARTHUR HAAS. Translated by T. VERSCHOYLE. (London: Constable and Co.) Pp. ix + 331. 21s. net.

Lord Rayleigh has told us, in his "Life" of his father, that the late *doyen* of British physics, though feeling some personal gratification on the translation of his "Theory of Sound" into German, expressed the opinion that the appearance of a German edition was hardly necessary, since "mathematical symbols, though not universally understood, are at least international." As the greater part of the present work is of a similar character, Dr. Haas might echo Lord Rayleigh's remark.

The volume is divided into two sections, one dealing with mechanics, including the general theory of vector fields, particle and rigid dynamics, wave motion and potential. The treatment is somewhat condensed, and the absence of exercises reduces its usefulness from the point of view of the English student. The author's standpoint is as classical as St. Paul's Cathedral, and he has, in a grand manner, ignored the rifts which the last two decades have made to appear in an imposing structure. Thus, though Hamilton's principle is sketched, the application of the greatest current interest—viz., to the Bohr-Sommerfeld theory of the atom—is ignored. Chapters IV and V are excellent, and are fundamental to the latter portion of the book and to all progress in modern physics.

The second portion of the book deals with the electromagnetic theory, and mainly with that portion known to the ordinary student as the "Maxwell stodge," an irreverence of phraseology and attitude which will welcome the author's use of the "rot-rot" notation as a contribution to the gaiety of the class-room. The mathematical foundation having been well and truly laid, the modern student who works through it will confess to disappointment that the subject of self- and mutual induction should be so airily treated, being practically dismissed in a single generalised integral, and the engineering student will wonder why the subject of wave propagation along wires is not included in Chapter IX, seeing that space is found for an almost similar investigation on pp. 287–289.

Most readers will, we fancy, conclude their perusal of this volume with a feeling of regret that the important developments in mechanical, electro-magnetic and optical theory brought about by the work of Planck, Einstein and Sommerfeld are not treated. "The conservatism of British Universities," wrote a cosmopolitan publicist in 1908, "has long been the despair of Continental educationists." To this chorus of regrets Dr. Haas has, we presume, not contributed. To Maxwell's classical work the author pays unstinted tribute, but a greater than Maxwell is here, though in common with other prophets he is insufficiently appreciated in his own country.

J. PALEY YORKE.

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THE UTILISATION OF WATER POWER.

General Report Presented to the Basle World Power Conference—Economic Aspects of Turbine Choice—Some Electrical Problems.

THE various papers on the subject of "Utilisation of Water Power" which were presented at the Basle sectional meeting of the World Power Conference have been summarised in a general report by M. E. Payot. For the purpose of this report the papers are arranged in three groups, dealing respectively with general considerations and constructional work, with machinery and switchgear, and with progress of water power development. In the following article we give a summary of M. Payot's comments on the information provided by the different authors.

The paper by Mr. Gruner (Switzerland) shows the existence of an individual type of low head power station due to the uniform character and volume of the Swiss rivers. The tendency to carry the exploitation of natural water resources still further is evident from the combination of these low head stations with storage stations or steam driven stations.

Turbine Construction.

Some extremely interesting questions are raised in dealing with the individual portions of the installation. These include the security of the river bed down stream from the weir or dam, the buoyancy of the weir, the constructional material, the design of weir sluices and turbine inlets, and the provision of suitable paint for the iron constructional work.

The cross section of the power station is entirely determined by the turbine construction. While certain stations are protected against the inflow of water by being rendered completely watertight, others are traversed by a large number of channels which carry off any water which enters. Both methods have proved adequate, but it would be interesting to know which is the better from the economic point of view.

Another interesting question is that of the division of the entire structure by means of expanding joints, and an expression of opinion as to the extent of these divisions would be desirable.

High-head power stations are discussed by Mr. Büchi (Switzerland). The great amount of solid matter carried down by mountain rivers in Switzerland requires special means to be taken to prevent its accumulation and penetration into the forebays. The accumulation of water supply for high-head stations necessitates a weir of some form, which is generally the most expensive part of the storage works, and there is still difference of opinion as to the best construction used. It would prove valuable, therefore, to have a discussion on the question of gravity and arched dams as regards construction and degree of safety. Tunnels form another aspect of the high head station, especially the so-called pressure tunnels, and an interchange of opinion on this subject would also be interesting.

Movable Dams.

Mr. Karlsson (Sweden) discusses movable dams, and rightly points out that the reliability of the sluices in winter does not so much depend on their construction as on the design of the piers. Mr. Karlsson's report is of particular value to those whose power stations suffer from ice formation. In dealing with the subject of switchgear, the reporter takes the opportunity of suggesting a discussion as to why the efficiency of American turbines is always given as several per cent. higher than the efficiency of corresponding European designs. This is a question which should be considered by the I.E.C. or some other international tribunal, or by a special commission of the World Power Conference itself.

Mr. Ungerer's (Germany) report contains some interesting references to the economic aspect of the choice of a turbine. The Kaplan turbine is compared with the propeller and Francis turbines, special consideration being given to gearing. Developments appear to tend more and more towards the vertical type and in M. Payot's opinion it seems very desirable to have a clear division between the turbine and the generator. The thrust bearing particularly should be mounted on the turbine, instead of being placed as usual on the top of the generator, so that when the generator has to be taken down for repair, it is not necessary to dismantle the thrust bearing as well. This has been done at Eglisau and at Partenstein, and it would be interesting to ascertain why this design is not used more often.

Another important problem is brought up by the high runaway speed of high-speed turbines, and of the correlated questions as to how far the appliances designed to prevent this are quite reliable.

In dealing with a very interesting report of Mr. Wallem (Germany), M. Payot draws attention to the question of whether the vertical or horizontal shaft is more advantageous for hydro-electric machinery. Mr. Wallem says that the electrical engineer prefers sets with horizontal shafts, but that the hydraulic engineer always prefers the vertical arrangement.

The protection of generators is another matter which requires to be cleared up, and if possible, unified. A multiplicity of relays makes the operation more difficult, and their maintenance and constant inspection demand special knowledge on the part of the attendants, so that both from an economic and operative point of view, cheap, and above all, simple appliances must be aimed at. The problem of the cooling of the generators and their protection against burning out appears to be nearing solution. More and more use is being made of synchronous condensers which not only improve the power factor, but are specially useful for voltage control. Mr. Wallem draws attention to the use of separately excited induction machines, and mentions their advantages as opposed to the synchronous condenser. The transition to the use of individual exciters, thus dispensing with main field rheostats has meant that special attention must be given to the connections of the exciter if stable regulation is to be obtained.

Large Transformer Progress.

Great progress can be reported in the construction of large transformers, the size of the units being only limited by transport possibilities on the railways. Attention is also paid to the initial compression of the coils, and mention is made of a solution which allows of subsequent adjustment without opening the oil tank. Circular coils are practically always used together with forced cooling and oil conservator for modern large transformers. The so-called Buchholz protective device is very interesting, and it would be well worth while if a report on results hitherto obtained could be given.

The design of modern switchgear installations tends to avoid the many-storey arrangement. Efforts are further made to carry out the so-called one-man system, i.e., to construct the installation in such a way that every operation can be carried out from one spot. In this case the isolating switches must also be provided with remote control. It is satisfactory that, in the case of outdoor stations, the flat method of construction is used wherever possible. In cases where the outdoor installation is not practicable, the so-called semi-covered construction presents an interesting solution. The exchange of experiences hitherto made with outdoor installations would doubtless prove very instructive. The opportunity might be made use of to discuss the measures taken to prevent freezing of isolating switches. The question of the setting of oil switches is still being studied and tests made. Interesting solutions are proposed which should be discussed. The design of the oil switches themselves is still in course of development, and it might therefore be valuable to have a discussion on what has so far been achieved. The design of the bushings is also receiving much attention, and, to give an instance, the use of the layers of condenser type bushing for connecting up the instrument transformers is especially interesting. The question of overload protection probably represents the most difficulties. Those engaged in the electrical industry long for a simple and really reliable selective protective system. Experts and manufacturers should exchange opinions on the suggestion made so far for solutions. Over-voltage protection is also of great importance, although the application of extra high tensions has a good effect and has greatly restricted the use of over-voltage protective devices. A discussion should be opened on the question of extinguishing transformers and earthing choke coils.

In the report of Mr. Wyssling (Switzerland) on matters dealing with the electric equipment of Swiss hydro-electric power stations, practicaliy the same questions are treated as in Mr. Wallem's report. Mr. Wyssling mentions that an

(*Concluded on page* 296.)

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THE NATIONAL RADIO EXHIBITION.

Britain's Biggest Wireless Show—A Representative Display—The Trend of Design—Downward Price Tendency Noted.

DIFFERING from all previous British wireless exhibitions by reason of the fact that it is truly representative of the products of British manufacturers, the National Radio Exhibition, which opened at Olympia, London, last Saturday, and remains open until September 18th, is a great improvement on earlier shows.

The general trend of design, as reflected by the exhibits, seems to be in the direction of greater selectivity and simpler methods of attaining this, and the provision of receivers in which the number of control features is reduced to the minimum.

In almost all types of apparatus there is a noticeable downward price tendency. For instance, valve prices are reduced, cheaper h.t. accumulators are available, and there are several new types of loud speaker at prices ranging from £2 to £5, and a four-valve cabinet set with valves, batteries, loud speaker, etc., for £12 12s., exclusive of royalties.

In THE ELECTRICIAN last week we gave a concise idea of the novelties to look for at Olympia, and this is now supplemented by a more detailed account of the outstanding features of interest:

At Stands 127 and 130 the British Thomson-Houston Co. show three new valves and a loud speaker based on an entirely new principle. It is designed to respond over an extremely wide range of acoustic frequencies. Another new departure is a three-valve "two station" receiver which has a change-over switch permitting reception of a station on either high or low waves without the necessity of altering the controls once these have been set.

In addition to their ordinary apparatus, Radio Instruments, Ltd., are exhibiting, by courtesy of the Sudan Government, a heterodyne unit receiver, complete with battery control unit and switchboard. As is necessary with apparatus for use in the tropics, the instruments are, of course, insect and rot proof, and are for this purpose fitted in steel cases, the components being mounted on Admiralty grade paxolin. New receivers shown by this firm include a two-valve set selling at a popular price, and including a cabinet containing an aerial inductance with reaction and low frequency transformer; and a dual rheostat for bright or dull emitter valves, anti-vibration valve holders, and a device for compensating for inefficient aerials. There is also a new five-valve set specially designed for selectivity. Included in the components section is a retro-active tuner, reactive anode unit, and an improved form of the "R.I." permanent mineral detector, which latter is now fitted with a device for the prevention of accidental damage to the crystals during adjustment.

Gilfillan Bros., Ltd., make a special feature of a new four-valve set, the Gillan monodyne, which, as its name implies, is a powerful single control receiver, entirely self-contained, and requiring neither aerial nor earth.

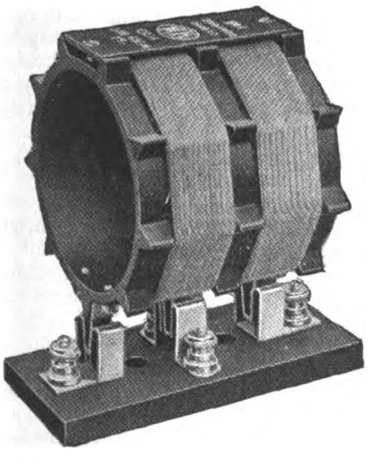
The components demonstrated by the Varley Magnet Co. include the Varley anode resistance, specially constructed to prevent any possibility of shorting under the varying potentials in use, and a multi-cellular high frequency choke, which has, in addition to having the bare turns of wire silk separated, the individual turns and layers of the winding itself adequately air spaced in a special manner.

On Stand 142, L. McMichael, Ltd., display models of their seven-valve supersonic receiver, which is available in various forms of cabinet. A special feature is made of their neutralising condenser for use in balancing out the inter-electrode capacities of valves, etc. It is fitted with an ebonite base for baseboard mounting, and is also provided with a one-hole fixing device for panel mounting, if desired.

Crystals of every kind are to be seen on the stand of Neutron, Ltd., who show, for the first time, their semi-permanent Pantector detectors, and a new range of dry batteries. They have also a novelty in the form of a chemical earth compound, of which further details will be given in a forthcoming issue.

Manufactured under the patents of Mr. R. Borlase Matthews and Mr. W. H. Reed Pike, the Felcourt press-button dual station wireless set is an attractive feature shown by Felcourt Products, Ltd. This receiver has been specially designed to meet the demand for a fool-proof set with an absolute minimum of control features. All that the listener has to do is to press the loud speaker or telephone plug into a socket on the panel of the set. Programmes can be received from both the local B.B.C. station and Daventry, the user being able to transfer

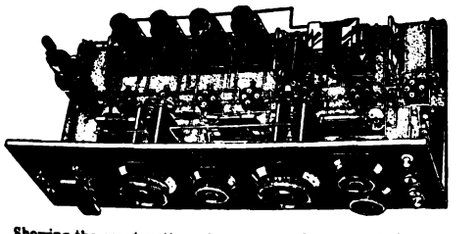
APPARATUS SEEN AT OLYMPIA.



The "Dimic" coil and base (L. McMichael, Ltd.)

The "Tablecone" loud speaker (Brandes, Ltd.)

Showing construction of the "Eelex" coil (J. J. Eastick & Sons.)



Showing the construction of a new 7-valve supersonic set (L. McMichael, Ltd.)

The "Ellipticone" loud speaker (Brandes, Ltd.)

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rom one station to the other by simply pressing a button. Even the trouble of connecting and disconnecting batteries is eliminated in this case by an automatic battery box which, it is claimed, makes it unnecessary for the user to know even the difference between positive and negative terminals.

New Components.

Several new components are shown this year by Benjamin Electric, Ltd. One of these is a new self-contained rheostat in which the whole of the resistance wiring is incorporated within the dial itself; there is nothing to go behind the panel except a short length of spindle and a lock nut with soldering tags. The firm is also exhibiting a complete new range of valves, and their "Clearatone" valve holder is now offered with two ingenious attachments—a grid leak and a fixed condenser and grid leak—the object being to supply a compact unit which does away with wiring and economises space.

A special feature of the Brownie Wireless Co.'s show is a new two-valve amplifier. It is specially made to accommodate the Brownie No. 2 receiver, but can be used as a separate self-contained unit.

An innovation made this year by the Chloride Electrical Storage Co., Ltd., is the provision of a range of low tension batteries in glass boxes. In the full range of other Exide batteries shown is a type of small unspillable low tension cell, specially designed for portable outdoor sets.

Several improved models of receivers are shown by the Eagle Engineering Co., Ltd. These include the Super No. 9, which embodies a master switch for cutting off all batteries, and a new eight-valve super-heterodyne portable set in a leather carrying case. A new line in amplifiers is introduced in the form of a H.F. choke coupled unit.

A particularly interesting feature of the exhibit of Cleartron Radio, Ltd., is a two-valve set incorporating the new "N" circuit invented by Sir Oliver Lodge. Another feature is a condenser which is believed to be the first British-made one to have die-cast plates. The moving plates are cast round the centre spindle, whilst the fixed plates are provided with lugs, attached to two Bakelite strips, arranged to minimise dielectric losses.

A comprehensive range of accumulators for wireless use is shown by the Hart Accumulator Co., Ltd. For low tension circuits there is a series of cells assembled in special moulded pressed glass boxes, while for those who prefer celluloid cases there is a range for all requirements. An interesting accumulator in this series is the "MEU," which is fitted with a special device for obviating any splashing of the acid from the cell. Adapted for conditions involving very considerable movement from the vertical, this cell may be completely inverted without any loss of electrolyte. There is also a particularly attractive range of high tension batteries.

In addition to their standard models, S. G. Brown, Ltd., show several new designs in loud speakers, including a disc loud speaker which is very attractively finished, either in cream and oxidised silver, or black and gold. Circular in shape, and of 14½ in. diameter, this disc speaker has a large conical diaphragm which is entirely enclosed between inner and outer protecting cones of a suitable metal, the whole instrument being supported on a standard and base by means of the back outer cone.

Judging Life of a Filament.

The Mullard Wireless Service Co., Ltd., present their range of P.M. valves for 2, 4 and 6 V. An interesting feature of the display is a giant model showing the construction of this series, and a free competition is being run in which visitors are asked to judge the life of a certain number of P.M. filaments. The company also show a wide range of transmitting, rectifying, modulating and receiving valves.

The Dubilier Condenser Co., Ltd., offer several new products, one of which is the "Vanicon" variable air condenser with vernier. It is a modified form of the existing condenser, and has had a special type of end plate introduced to minimise dielectric losses. An entirely new type of variable condenser which is claimed to provide the electrical equivalent of a mechanical vernier gearing throughout the whole range of the condenser is the "Univane," in which the rotation of the control knob moves only one vane of the condenser at a time. As soon as one movable vane has been rotated into the position where it inter-leaves with the fixed vanes a second vane is picked up, and is rotated into position as the knob is turned. The number of times that the knob has been rotated is shown on a small auxiliary indicator. Other interesting exhibits are the "Duwirohm" resistances, "Dubilicon" multiple condensers, "Duvarileak" variable resistances, and "Duvolcon" tone-control units.

Incorporating the new "Allclear" tri-coil unit, which is said to dispense with the old type of moving coils, but at the same time giving constant re-action, whatever the aerial tuning on two circuits, a four-valve receiver shown by Wm. Dibben and Sons has several distinctive features. It is tuned in actual metres, has a brass panel, finished gilt, the metre reading being taken through a small window in the panel. There are no knobs on the front panel, the tuning being effected by means of a small knob in a little recess at the end of the cabinet.

The well-known range of Ericsson radio apparatus is shown by Ericsson Telephones, Ltd., the display including several models of totally enclosed two-valve sets, and the popularly priced "Super-tone" loud speaker. Components shown by the firm include a patented dual filament resistance, transformers, condensers, and a wave trap suitable for almost any set. This trap is fitted on the company's four-valve set.

An indoor aerial which is claimed to give results equal to those of an average outdoor aerial is a special item provided by the Radio Reception Co., who also show "Recepco" triple purpose coils and coil mounts.

Radiax, Ltd., are showing, in addition to their loud speakers and accessories, a new fixed condenser, the "Cartrodenser," which, as its name suggests, is of cartridge form and requires no fixing or drilling. Soldering tags are fitted for use if required, but they are equally satisfactorily fixed by forming the ends of the bus bar wire into a loop and clamping to one of the terminal screws.

A Multi-Purpose Battery.

Storage batteries of new and original design are presented by the D. P. Battery Co., Ltd., whose low tension "Kathanode" batteries embody the chief features of the larger "Kathanode" cells. A special form of patented separator is used by which it is claimed that intimate contact is made with the whole of the plate surface, at the same time maintaining an extremely low internal resistance with free acid circulation. There is also a D.P. high tension battery which is made up in 30 V units with tappings for every two Volts. Another interesting item is the "Hylo" battery, which can be used as either a 2, 6 or 24 V unit. A patent commutator switch fitted over the battery enables the cells to be connected in series, or series parallel at will, by the simple operation of turning a knob. A further position of the switch isolates all cells when the battery is out of use. By means of the commutator switches the batteries may be connected in series for charging from the supply main, without the necessity for disconnecting from the set. A "safety charge indicator" is permanently connected in the charge circuit, and by a dull red glow indicates that the batteries are charging correctly.

Interesting features of the British Radio Corporation's exhibit are the new B.R.C. five-valve cabinet receiver, which is of the neutrodyne type with two high-frequency stages balanced together give exact readings on all dial stations, and the B.R.C. neutralised high frequency transformer, which, though similar to those used on the company's five-valve long range instrument, has been modified slightly to provide constructors with a solution to selectivity and full range reception from 200 to 2 000 metres.

On the stand of the Reflex Radio Co. is a very interesting range of coils, both mounted and unmounted. Their special improved winding gives scientifically proportioned air spaces, and at the same time a rigid and entirely self-supporting structure. Another interesting exhibit is the bakelite holder, which certainly strikes a new note in plug design, as do the two and three-way "Numount" coil holders.

Probably the most revolutionary departure from conventional design is shown in the lateral action variable condenser developed by Ripaults, Ltd. In this component precisely similar banks of rectangular plates are provided, and, by means of a specially designed cam, one set is caused to intermesh with the other by a true lateral action in such a manner as to give an almost perfect straight line frequency reduction. The condenser occupies little space; the dial is of 4 in. diameter, and is divided into 360 deg. instead of the more usual 180 deg., giving a direct vernier control, which is said to be equivalent to that obtained with expansive types of vernier dial.

(*To be continued.*)

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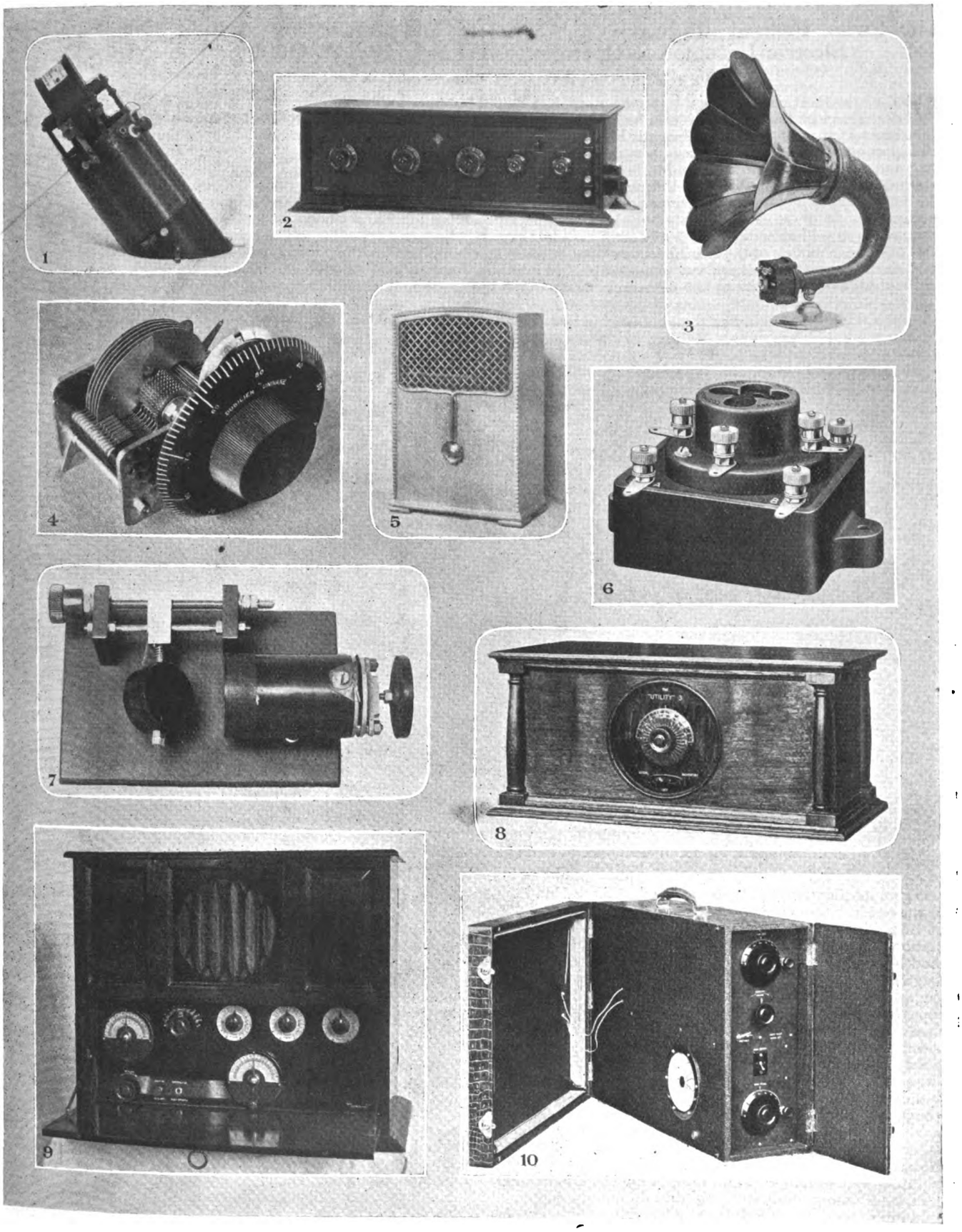

MORE RADIO EXHIBITION FEATURES.

1. A P.R.C. combination neutralised H.F. transformer (200 to 2000 metres).
2. The B.R.C. 5-valve long-range receiver.
3. The latest "Amplion" loud speaker, with the new wood ribbed flare.
4. The new Dubilier "Univane" condenser, with revolution indicator.
5. An attractive "Tangent" cabinet-type loud speaker.
6. A novelty is the "Cosmos" resistance capacity coupling unit.
7. The "Ormsby" R.T.C. unit (universal aerial tuning with reaction).
8. An attractive set by Wilkins and Wright, Ltd.
9. S. Montague's standard retrosonic model, with door open.
10. A portable set in leather case by the Eagle Engineering Co., Ltd.

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THE WORLD POWER CONFERENCE.

The Swiss Federal Railways—A Complete and Interesting Exhibit—No Failure of Electric Locomotive Operation—A Large French Outdoor Sub-station.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.I.C.E., M.I.E.E., F.R.A.S.

ONE of the most complete and interesting exhibits that is being shown at Basle in connection with the World Power Conference is that of the Swiss Federal Railways. A completely constructed overhead line is run through one of the halls and eventually passes into a full scale model tunnel. The overhead wires are suspended on the catenary system. All the fittings are bolted on with clips, no solder being employed—specimens of these fittings and insulators are displayed separately, as well as complete sets of drawings. In the hall itself, there are models of the electric locomotives, while in the yard outside, a full size engine can be inspected. In addition to the details of the overhead line construction, the drawings is now gradually proceeding with the subsidiary lines. While this work was largely started as a Government measure to prevent unemployment, it has been found to be of very great economic benefit to the country. In a chat with the chief engineer of the Swiss Federal Railways, the writer elicited a very interesting fact, that although naturally there had been a number of engine breakdowns, no electric locomotive had so far failed to get home under its own power. This is a striking feature in favour of the modern electric locomotive. In addition to the Swiss locomotives there were also full sized examples of the electric locomotives employed in Italy.

From a careful study of this exhibit, more can be learned in

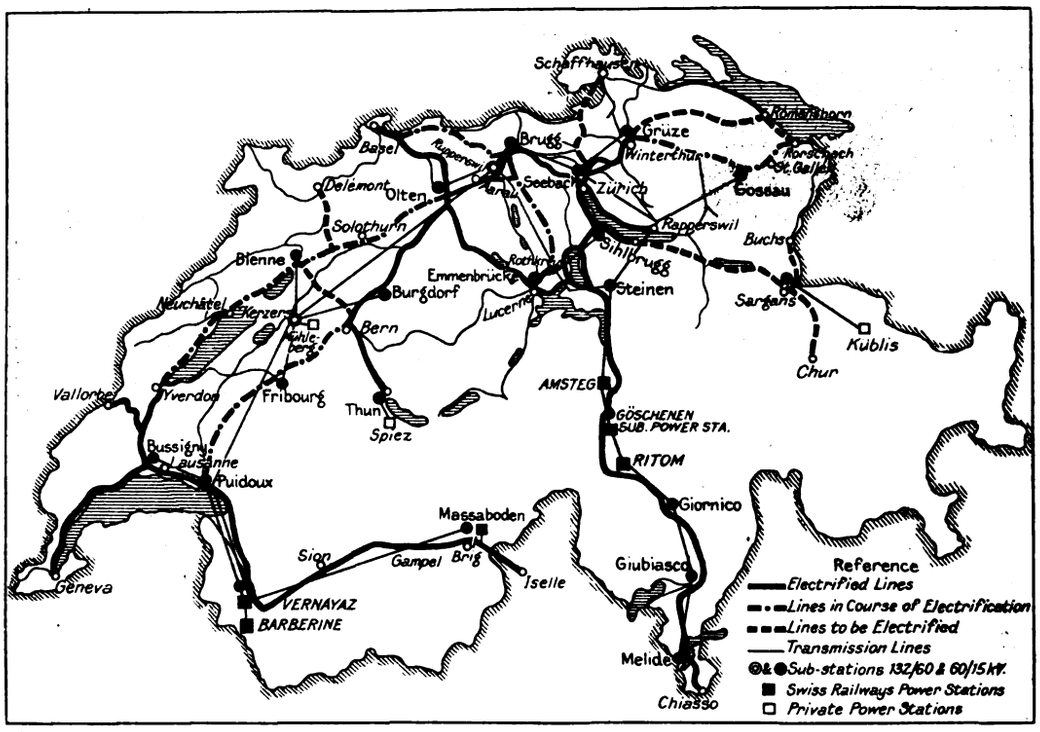

Fig. 1.—Map showing the sections of the Swiss State Railways which it is proposed to convert to electric traction by the end of 1928.

also give particulars of the locomotive designs and the details of the outdoor transformer stations. There is a model of one of these at Ruperswill. The enormous size of such a sub-station as this, can best be appreciated by the fact that the model—which is to the scale of a 1/50th—measures 8 ft. in length; this means that the actual station is about 600 ft. long. These modern out-door sub-stations present an unusual appearance looking more like an enormous transporter crane than anything else, as they are formed of a mass of overhead constructional angle iron work.

Single core cables for 60 000 V are being employed in the Swiss railway tunnels. The method of jointing these cables is shown by sectional boxes. The cable is laid in concrete troughs provided with concrete covers, these troughs are held in concrete racks. The cables are insulated with impregnated paper which is lead covered and then wrapped with hemp in the usual way. It is noteworthy that Continental cable manufacturers have developed so far into a field which has hitherto been held almost exclusively by British manufacturers. In the tunnel itself, a very striking panoramic view was arranged of one of the typical lines in the country, which very clearly demonstrated the methods of overhead construction. Light channel steel posts set in concrete footings are universally employed as supports for the overhead lines. The outlook on to this scene was from a replica of an engine driver's cab, in which the usual controls, meters, etc., were fitted, so that the onlooker had the same view as that of the engine driver.

Nearly 750 miles of the Swiss railways are now electrified (see map), that is all the important through lines; the work a few hours than a much longer time spent on the actual railway, so complete are all the drawings, samples, and full scale erections to demonstrate all variations.

A model to the scale of 1/50th is exhibited in the French Section of the La Neuveville outdoor sub-station which is some 750 ft. in length—again an extraordinary size. It is divided into two main parts, the one dealing with 30 000 kVA in 14 lines each at 120 000 V and capable of conducting 20 000 kVA. The second portion of the station is arranged for 60 000 kVA in five lines of 65 000 V each of these has a capacity of 20 000 kVA. This sub-station is somewhat similar in general appearance to the Ruperswill station mentioned above.

One of the features of a hydro-electric scheme that is often overlooked, is the varying supply of water with the different seasons of the year. Heretofore, in the majority of cases it has always been the custom to regulate the water level by means of sluices. Though very often in large installations these sluices are operated electrically or hydraulically, it is quite a recent idea to make these sluices entirely automatic. At the Basle exhibition, several automatic spill-way gates and weirs designed to maintain a uniform water level were shown by working models. There were several different forms of these, but they all followed the same principle of balance.

The hydro-static and hydro-dynamic pressures working on the flaps are balanced by a counter-weight, the moment of which, regarding the axis of rotation, is equal in all positions of the flap, to the moment of the forces which tend to press down the flap, as long as the surface of the water maintains

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its normal height. When the water rises above the height of the weir, the pressure is increased on the flap and the latter is pressed downwards, at the same time the torque of the counter-weight is increased in such a manner that owing to the position of the flap, the normal water level is kept uniform until the flap is horizontal and the counter-weight is at its highest position. An increase of 1 in. in the water level is sufficient for automatic operation. In cases of extreme floods, the flaps open fully to the section of the whole river and as soon as the water begins to fall, the flap automatically resumes its original position.

There are many advantages in this method apart from that of saving human intervention, as it provides security against floods and prevents an irregular discharge of water, which so often causes trouble with users of the same water lower down the course of the river. These flaps also provide an uninterrupted passage for ice, trees, etc.

Almost every nation, is occupied nowadays in making a careful analysis as to the possible availability of all its water resources; hence, it is not to be wondered that improved methods have been evolved for estimating the powers available from streams. The general tendency of the design of these instruments seems to be taking the form of a propeller which is immersed at different points in the cross-section of the stream to be measured. In the better designs of these instruments, propellers drive small electric generators from which direct readings can be obtained on properly calibrated voltmeters. The containing casings of the latest type of these instruments are stream-lined. The readings are taken by the aid of a carrier rope suspended across the river to be measured; running on this carrier rope, is a light cage to carry two men and the instruments.

A considerable portion of the exhibition is taken up with models, which show the progress of the enormous works that have now been in hand for a number of years and will eventually connect the Black Sea, via the Danube and the Rhine, to the North Sea, thus enabling the Central States of Europe to ship their goods in 1 000 ton barges, direct to the border of the North Sea. Probably eventually these barges will be actually towed over to British ports. In this way, the transport costs of the mid-European nations will be enormously reduced. It almost seems absurd to talk of ports hundreds of miles inland, yet even the city of Basle has recently constructed for itself a modern port to deal with its share of the traffic on these modern waterways of mid-Europe.

Turning to the proceedings of the Conference as mentioned last week, the first sectional meeting was held on Tuesday, August 31st, in the Hall of the Exhibition. This hall was decorated in the most delightful and unexpected manner. The walls were of a brilliant orange-red colour, which, when contrasted with the marigolds and brilliant green foliage decorating the front of the stage, combined to produce an effect which was refreshing in the extreme without becoming in any way gaudy. At the back of the stage there was a drop scene, which, by means of ingenious lighting effects, represented a realistic fresh morning sky. The proceedings were opened, not with speeches, but with a symphony by Smentana played by the best Basle orchestra. The symphony appropriately represented the different stages in the course of a river on its way down to the sea. Certainly a very delicate way of introducing the subject of water power.

Dr. Tissot (President of the Swiss National Committee of the World Power Conference) was the first to clear away the ice which had been so adequately broken by the orchestra. He recalled the inauguration, on July 9th, of the International Exhibition for Inland Navigation and the Utilisation of Hydraulic Power which had a direct bearing on the meeting of the World Power Conference. He welcomed the Swiss Government in the person of M. Chuard, Minister for the Interior, the municipality of Basle represented by its president, Dr. Aemmer, and the delegates from the 39 participating countries. He thanked the authorities and the various organising bodies, financial, industrial, and technical, whose support had made possible the realisation of this conference. He suggested that the choice of Switzerland as the meeting place for this event was certainly justified by the progress that country had made in the exploitation of natural resources and by the development of its electrical industry. After giving a survey of the programme of this conference, Dr. Tissot expressed his gratitude to the electrical manufacturers of Great Britain, by whom, he reminded those present, the organisation of the World Power Conference was created.

Fig. 2.—A group of those participating at the World Power Conferences taken at Andermatt on September 4th. Amongst the group may be distinguished: Dr. Tissot, President of the Swiss National Committee of the W.P.C., Dr. Huber Stockar, of the Swiss Federal Railways, Sir John Snell, Mr. Patchell, Mr. Roger T. Smith, Mr. Angelo (Denmark), Mr. Faraker (Australia), Dr. Kano (Japan).

M. Chuard, in reply, said that the year 1926 would remain in the minds of citizens of Basle as a year of great importance. He welcomed the foreign delegates in the name of the Swiss Government. He was delighted to know that there was a desire for such intercourse and he hoped that meetings, such as the present one, would assist in dispelling that distrust bred by nationalism which was so detrimental to the progress of scientific development and would set up in its place a desire for international co-operation.

Brief speeches of thanks for the welcome were made by Mr. D. N. Dunlop and Dr. Aemmer.

In the afternoon the subject of the "Utilisation of Water Power" was discussed. M. Chuard, who presided, pointed out that 43 reports on this matter had been presented and that to save time a summary had been prepared by M. E. Payot, as general reporter. This report, an abstract of which will be found on another page of this issue, was then read, and five of the original Papers dealing with water power developments on the Neckar, Yser and Glommen and in Switzerland were given a short discussion.

An official banquet took place in the evening.

On Wednesday morning the remaining Papers on water power were dealt with, while in the afternoon of the same day the subject of "Inland Navigation" was considered.

The proceedings on Thursday were devoted to a consideration of the subject of "The Electrification of Railways."

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CORRESPONDENCE.

ELECTRIC REFRIGERATION.

[To the Editor.]

Sir,—In The Electrician of July 30th under "Current Topics," the above subject is discussed. Domestic electric refrigeration in the United States is increasing at a rapid rate, and, as a result, the cost of electrical refrigerators has been considerably reduced during the past few years. The apparatus has now reached the stage of development where it may be considered quite reliable and satisfactory.

There is an evident misprint in the article referred to in regard to revenue, which is stated to be of the order of $30.00 a month. Very few installations would be made if such charges were anticipated, and from actual experience, in cases where the rate for electricity is 8 cents for the first 12 kWh and 2·2 cents for all additional energy, together with a minimum charge of $2·00 per month, it has been found that the charge never exceeds the minimum, except in July and August, when it is usually somewhat in excess.

The advantage of the electrical refrigerator is apparent in the case of apartment houses where it is very inconvenient to get ice placed in ordinary refrigerators, but even in single residences, the convenience and improved conditions under which food is kept are well worth the investment.—I am, etc.,

C. H. Haddrell, A.M.I.E.E.

Swampscott, Mass.

THE PRICE OF ELECTRICITY.

[To the Editor.]

Sir,—I notice in the current number of The Electrician some considerable space is devoted to the forthcoming programme of the E.D.A. May I suggest that a little publicity as to the still prevailing high rates for current would also be of value. "Grinding my own axe," may I call attention to the price of electricity in this locality. The charge is the modest sum of 11d. per kWh with no alternative for power and a minimum of 14s. 6d. per quarter. To say the least these figures appear out of all reason in these days of modern generating plant. As an electrical engineer I am fully aware of the advantages to be gained by the uses of electricity, but not being a millionaire I have to considerably curtail the current consumed, and can in no case make any use of "appliances" of any kind.—I am, etc.,

Geo. Smith.

Banstead,
September 6th.

Utilisation of Water Power.

(*Concluded from page* 290.)

increase of efficiency is the great aim of machinery manufacturers. The vertical type of construction is preferred by Swiss constructors for hydro-electric plant. The so-called segmental bearings have been adopted in Switzerland in numerous forms and meet all requirements adequately, including good starting and stopping characteristics. The warm air emanating from the generators has been used in many cases for heating the attendants' quarters of the power station.

The 15 kV single-phase generators used by the Swiss Federal Railways have received special treatment. These generators are required to withstand a test voltage of three times that of normal so that special measures have had to be taken in order to lessen glow discharges. Mr. Wyssling is of opinion that, having regard to the runaway speeds of the turbines, the construction of generators for water turbines will tend towards the turbo-alternator type. The synchronous induction machines at the Wäggital power station for driving the pumps are of special interest. They permit the pumping operations to be carried out without throttling at various water levels. They are used in addition as synchronous condensers. Special mention is made of the cooling of transformers and reference is made to the fact that the so-called "iron disease" in transformers has been abolished by new methods of manufacture. Builders of transformers are now loth to make tappings on transformers, but, as working conditions cannot do without it at present, interesting designs of tapping switches have been evolved. Oil-filled bushing insulators are being increasingly used. The question of protective resistances for oil switches still requires to be cleared up. The practice of mounting the resistances in the oil tanks themselves is being discontinued.

FLEXIBLE JOINTS.

Modern Power Plant Applications.

(CONTRIBUTED.)

Of considerable interest to power stations is the modern flexible joint for pipe lines which, it is claimed, gives an absolutely tight joint with water, sea water, compressed air, petrol, benzole, crude oil, natural gas, and town's gas, and in fact most liquids or gases other than steam, at all pressures ranging from vacuum to over 4 000 lb. per sq. in. At the same time the flexibility is such that each length of pipe can be moved in any plane to an angle of 1deg. to 5deg. from the straight, depending on the diameter, so that in practice the pipe line can simply be laid on the floor or on the bare ground without any regard for alignment, bending, and curving in a remarkable manner. Also, a considerable amount of end play is allowed so that the line can elongate as well as bend, subsidence having no effect, and the subject is important from the point of view of cooling water, supply, as well as boiler feed before the economiser.

The pipes, which may be of steel, cast iron, wrought iron, earthenware, hard asbestos composition, or any other material,

View showing a portion of the rising main from Doornport dam to the high level reservoir.

are made with a small rim or shoulder at each end and placed together roughly, while round them is fixed a closed metal housing ring bolted through projecting lugs. This metal ring has inside a rubber ring bent over double, something like a flat inverted "U" in cross section, each end of which rests on the corresponding flat rim or shoulder of the pipe. The result is to give an absolutely effective joint which, as the pressure increases, becomes tighter and tighter since the rubber ring is merely forced up against the outer metal cover and down on to the pipe end without affecting the flexibility.

Facilitating Jointing.

Further, the joint can be made or disconnected in a few minutes, even in the dark or under water, and all kinds of bends, elbows, tees, "Y" pieces and other fittings are available, while valves with the "Victualic" rims are also supplied. A rubber ring in this way gives no trouble, even under extremely difficult conditions, such as miles of pipe line laid on the bare ground for carrying natural gas at 250 lb. pressure, and, in fact, it is claimed these rings will last longer than the pipe itself, and certainly over 100 years. Some remarkable proofs of the resistant properties of the joint have been obtained from time to time. Thus, in one case, for example, in a well-known chemical works a gas pipe passing through a building which caught fire had the outer metal rings actually blistered with the heat without effecting the tightness of the joints, while sections of oil pipe line for experimental purposes have been burst bodily at 2 500 to 3 000 lb. hydraulic pressure, the pipe splitting open while the joint was untouched.

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NEWS IN BRIEF.

A King's Big Lighting Bill—Electric Heaters for Rain Gauges—Proposed German Electrical Trust—Pop(u)lar Electrolytic Disinfectant Fluid.

FOR electric lighting the late King Rama of Siam paid £37 500 annually.

Electrically-operated rolling steel warehouse doors are becoming popular in America.

Glasgow electricity consumers increased last year by 4 035 to 65 674 at the end of May.

A new rain gauge on the roof of the Air Ministry is electrically heated to prevent freezing in cold weather.

An electrical method for determining the temperature in works chimney shells is being tried in the U.S.A.

Four firms are showing electric ovens at the Bakers' Exhibition at the Agricultural Hall, London, this week.

A new central battery telephone exchange has been installed in the Post Office buildings, South John Street, Liverpool.

Blackpool Corporation has received sanction to borrow £10 000 for the purchase of electrical cooking and other apparatus for hiring purposes.

A special electricity tariff will be in operation at Blackpool for the illumination week, and tradesmen are being asked to adopt colour lighting schemes.

Preston's covered market has been brought up to date by the installation of a system of electric lighting, there being 71 lamps in an area of 4 318 sq. yd.

The Oxford Electric Co., and Hill, Upton and Co., gave free assistance at the Oxford Military Tattoo, held on behalf of Oxford and Bucks Light Infantry charities.

Disregarding cheaper Continental offers, Belfast Corporation has placed the order for its power house extension with the Metropolitan-Vickers Electrical Co., Ltd.

Connected to Glasgow electricity mains are 2 946 cookers, 141 wash boilers, 28 403 radiators, 2 939 kettles, 18 275 irons, 2 034 vacuum cleaners, and 1 546 sundry appliances.

Aberdeen Chamber of Commerce is informed by the Postmaster-General that the question of an extension of the main underground telegraph cable to Aberdeen is now under review.

Already objections are being raised against the word "television." As an alternative a "Times" correspondent suggests "teleopsis," and also proposes to substitute "teleope" for "televisor."

At many of the new coal mines in Nottinghamshire electric power is used, and electric light is being provided in the houses which have been or are being built for employees. A notable case is a new village in the Boughton Road district of Ollerton, the houses in which are electrically equipped.

The "Daily Telegraph" Melbourne correspondent states that the resolutions of the last Imperial Press Conference in favour of reduced cable rates have been pigeon-holed for 10 months, and have never been discussed either by the Australian Commonwealth Cabinet or any individual Minister.

It is reported from New York that negotiations are proceeding between several leading German electrical firms and the New York financial house Dillon, Read and Co., with a view to issuing a loan of $30 000 000. The object of the loan (it is said) is to pave the way for establishing a German Electrical Trust, on lines similar to those of the German Steel Trust. Siemens-Schuckertwerke is interested in the scheme.

In connection with the extension of the Bath municipal electricity generating plant, which has been in progress over two years, the outer shell of a large condenser for the new 7 000 kW turbine set was recently unloaded from the lorry on which it had travelled from the Brush Co.'s works at Loughborough and placed in position at the Bath electricity works. The casting weighs 18 tons and is 14 ft. in height and 9 ft. 6 in. square.

It has been decided to convert the manually-operated telephone system in the Moravian industrial town of Mayrish-Ostrau to automatic working on the Relay automatic system. There will be a central exchange of 2 500 lines, which will be extended later to 7 000 lines, and will be capable of further extension to 10 000 lines. In addition to the main exchange at Mayrish-Ostrau, six local exchanges will be erected, one for 200 lines in Witkowitz and others in Marienberg, Radvanitz, Hohenstadt and Kruschen and Schonbrunn.

Burnley Electricity Committee is considering the establishment of an all-electric house.

Croydon branch of the E.C.A. is renewing its subscription to Croydon Chamber of Commerce.

On the average, Blackburn Electricity Department is disposing of 1½ electric cookers a day.

A British patent has been granted for secret combination electric switches for use on motor cars.

London County Council is inviting applications for the position of electrical engineer in its Tramways Department.

Dislocation in the Liverpool telephone services was caused last Saturday, due to an explosion in a manhole at Walton.

The Great Northern Telegraph Co. announces that there is no longer any delay in the transmission of cablegrams to and from Tokyo and Yokohama.

East Kent E.C.A. branch reports that it is difficult for electrical apprentices to obtain the necessary training owing to the lack of facilities in the district.

In spite of the increased exploitation of Italian hydro-electric resources, coal imports rose from 4 257 558 to 5 724 569 tons in the first five months of 1926.

Special letters of appreciation have been sent by the E.C.A Council and by the Manchester branch to the Sheffield branch for its recent generous donation of £200 to headquarters.

At the fifth "Bristol First" exhibition, which closes tomorrow (Saturday), the Bristol Electricity Department has an attractive exhibit. Cooking demonstrations are given at frequent intervals.

In 1925 Canada imported batteries valued at $1 064 445, comprising 23 796 storage batteries, worth $1 026 093 and primary batteries valued at $38 352. The domestic production of batteries amounted in value to $6 845 316.

A device to guide ships into the harbour during foggy weather has been established at Calais. It comprises a siren and submerged apparatus which radiates the sound, so that it can be picked up by ships equipped with the necessary receiving apparatus.

According to the U.S. Geological Survey, the total output of electrical energy in the U.S.A. for the first six months this year showed a gain of 12 per cent. over the corresponding period of 1925, the figures being 35 330 000 000 and 31 633 000 000 kWh respectively.

A correspondent of the "Daily Telegraph" states that the Belgian Government is considering plans for the commercialisation of the State telephones and telegraphs, or, at any rate, of the former, and that American syndicates are awaiting an invitation to submit offers for the concession.

The London E.C.A. branch is investigating allegations that tenders by several E.C.A. members, who were also registered contractors, for an installation at Bermondsey Baths, were passed over in favour of Bermondsey Electricity Department, despite the fact that the contractors' tenders were lower.

Dr. F. W. Alexander, Medical Officer of Health of the Borough of Poplar (London) stated, in his report for the year 1925, that the old wooden structure which has hitherto served as an electrolytic disinfectant depot has been demolished and replaced by an extensive solid building, and additional plant has been installed, consisting of five 30 A graphode electrolysers supplied by Mather and Platt, Ltd. During the year 72 165 gallons of electrolytic disinfectant fluid were manufactured and broken down to 144 330 gallons for distribution, compared with 70 350 and 140 700 gallons, respectively, for the previous year.

The Seth Thomas Clock Co. is assembling for installation in the tower of the Paramount Building, New York City, what is described as the largest single unit clock ever manufactured. It will have two dials, each 26 ft. in diameter, the hour hands will be 12 ft. and the minute hands 17 ft. in length. At night, stars 4 ft. in depth, representing the hour marks, will be illuminated by 300 W lamps and the minute marks by 50 W lamps, while the hands will also be outlined by 50 W lamps. Electric flash lights (white at the hour and red at the quarters) will appear at the top of the building (450 ft. above street level). The clock will be wound automatically by electricity.

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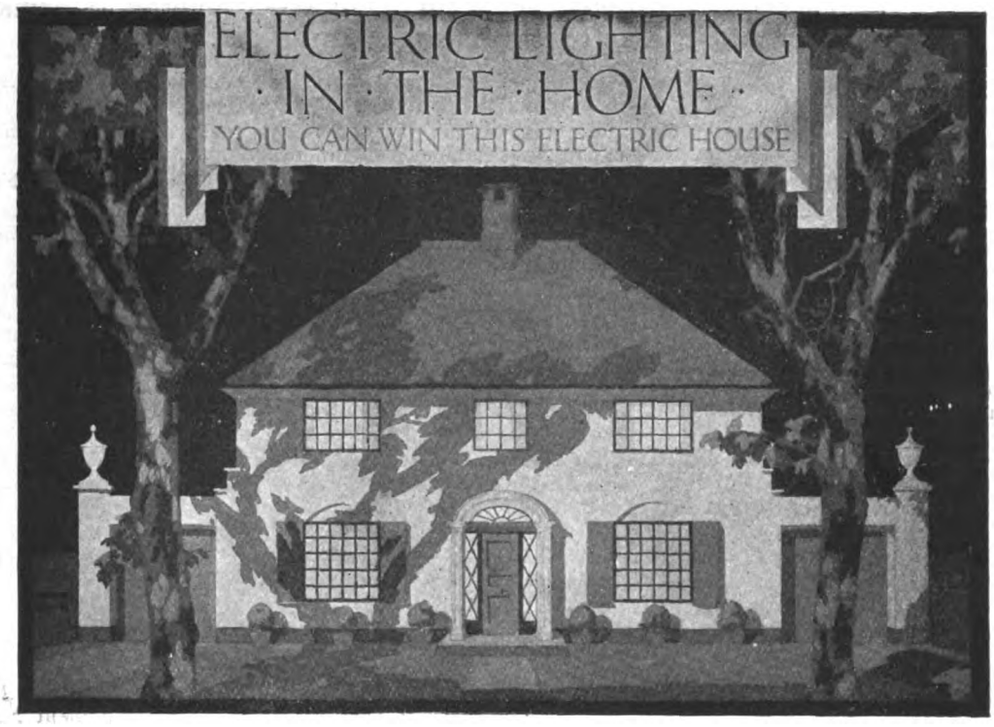

REPRODUCING the striking coloured cover, by Gregory Brown, of the "Better Home Lighting Competition Book" containing the forms for the popular ballot for the all-electric house shown in the picture.

EVERY electrical contractor should obtain a supply of these books in readiness for the big demand that will be made for copies next month.

"WIRING THE HOMES OF BRITAIN."

Further Points about the Great Electrical Trade Push for Better Home Lighting—A Vast Field—The Contractors' Task—Useful Hints.

A CONSIDERABLE amount of space was occupied in last week's issue of THE ELECTRICIAN by preliminary details of the great E.D.A.-E.L.M.A. joint campaign for "Wiring the Homes of Britain," which will start at the beginning of October, and will operate until the end of March next.

By now, copies of E.D.A. Publication No. 1 000 will be in the hands of electrical traders, and we would specially emphasise the need for a most careful perusal and assimilation of its contents. It affords a remarkably complete and concise guide to the whole campaign, and stands, in regard to the successful individual prosecution of the campaign, in precisely the same relation as the wonderful lamp did to Aladdin's cave of treasure.

Besides obtaining for themselves a thorough working knowledge of the programme, and of the way in which it is to be carried out, the principals of businesses should also encourage their staffs to make themselves thoroughly acquainted with the scheme, for no one can be really enthusiastic over an effort of the object of which they are unaware.

It cannot be too widely and frequently asserted that the campaign definitely means big business for all participants, and that its success is already assured. The only uncertain factor is the share of that business that will accrue to any one individual in the trade; but it is only uncertain in that the individual's personal share depends very considerably—and rightly so—upon the amount of his personal co-operation in the effort.

This month of September should be devoted by all members of the trade to the making of every possible preparation in readiness for "The Day." A few of the chief things to be done in order to achieve this end were suggested in THE ELECTRICIAN last week, but the urgent need for immediate action warrants their recapitulation here:—

(1) Apply at once to the E.D.A., 15, Savoy Street, Strand, London, W C 2, for as many copies as can conveniently be employed, of the competition book (E.D.A. No. 1 002), for which the public will ask from October 1st onwards. It is available (to the trade only) at £4 10s. per 1000 copies.

(2) Obtain E.D.A. free coloured competition window bills E.D.A. No. 1 001).

(3) Organise, or help to organise, local demonstration electric homes.

(4) Obtain the special posters, poster stamps, window trims, etc., prepared by the E.D.A.

(5) Supplement the national advertising by local paper advertising. Suitable blocks are supplied at cost.

(6) Do at least *one* good deed for the campaign every day.

The "staff work" of the campaign has been so well and thoroughly done that very little *thinking* is required of participants in the "push"; *action* is the chief consideration.

Those who might have been inclined to hesitate at the task of organising a local demonstration electric house, will find in E.D.A. Publication No. 1 003, a wealth of information based on experience, with numerous successful efforts of this kind. It shows in the clearest manner how to set to work to secure the co-operation of builders, house-furnishers, etc., and how to lay-out, organise, promote, finance and run such exhibitions.

This demonstration part of the scheme is very important, and it is hoped that local electrical interests in every town throughout the country will co-operate in establishing a veritable chain of all-electric demonstration homes. It should be remembered that public interest in these local efforts will be stimulated by the national advertising campaign.

Here are a few hints, from the booklet, on the best ways of stimulating and keeping alive interest in these demonstrations:—Official welcome by the Mayor or other prominent citizen; a prominent local lady to open the home; prominent public or business people should be specially invited each day; architects, builders and other tradesmen, who cannot attend during normal opening hours, should have a special view when the home is closed to the public; a broadcasting set might be switched on occasionally; tea, with electrically-cooked light refreshments should, be provided, at least on the opening day; free unit vouchers (for 10 kWh) might be given—at the house only—to consumers taking certain apparatus on seven days' trial.

The booklet is packed full of similarly useful hints, and even gives instructions for the training of demonstrators, and a suggestion for the chairman's address to the staff, before the opening of the exhibition!

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THE RADIO MANUFACTURERS' DINNER.

Fusion of Manufacturers' Associations Announced—Stability in the Trade—Simplified Apparatus—British Broadcasting Unequalled.

COINCIDING as it did, with the official announcement of the fusion of the two radio manufacturing associations, the National Association of Radio Manufacturers and Traders and the Society of Radio Manufacturers into a Radio Manufacturers' Association for manufacturers only, the dinner organised by the radio manufacturers of Great Britain, and held at the Piccadilly Hotel, London, on Tuesday, emphasised the forward move that has been made in the radio industry and consolidated the improved conditions which have made possible the organisation of a National Radio Exhibition which is truly national, and open to all British manufacturers.

Sir William Bull, M.P., presided, and in addition to many well-known figures in the wireless industry, the guests included Mr. Vernon Hartshorn, M.P., Sir Nicholas Grattan Doyle, M.P., Capt. Ian Fraser, M.P., Mr. J. C. W. Reith, Sir William Noble, Mr. H. Shaughnessy, Mr. C. W. Sully, Mr. H. J. Galliers, Mr. T. Trimnell and others. Several of the speeches were broadcast.

Proposing "Success to the Radio Exhibition," Sir William Bull said he was impressed by the fact that all the goods shown at the Exhibition were British. He found the public was tremendously impressed by the broadcasting studio system, and he was convinced that in broadcasting we led the world. In spite of the anomalies that had existed, the trade had in no way taken advantage of the position. What the B.B.C. did in the interests of the public was also in the interests of the trade. The present exhibition marked the beginning of better times for the wireless industry, though the trade was now severely overcrowded. Already there must be nearly 3 000 000 homes equipped with wireless apparatus, and he feared there was not room for all who sought to cater for the radio requirements of the public.

The vast majority of the public was not at all interested in radio apparatus as such; simplicity, ease of operation and mistake-proof construction were now the guiding features.

Seconding the toast, Mr. Vernon Hartshorn, M.P., said that broadcasting, which had won the goodwill and affection of all, had a tremendous influence over the lives of the people. The success of the radio industry depended upon its capacity for meeting the aspirations of the country and he was greatly pleased to find that such improvement and simplification of apparatus had been made in so short a time.

Mr. W. W. Burnham, who responded, said that radio was a real live industry, although it was only four years old, and it now offered highly specialised apparatus, all of British make; it was, moreover, simple apparatus, and offered at very reasonable prices. They could say with truth that this country now had good transmission perfectly reproduced.

Despite sanguinary forecasts in the popular Press, future radio inventions would be confined to matters of detail only. The trade attached the greatest importance to the B.B.C., and hoped that it would carry on with the help of Mr. J. C. W. Reith. In this connection he hoped that at least one of the Commissioners would be appointed by the trade. An ideal representative would be Sir William Bull.

The Radio Exhibition bade fair to become a great success, and this would be largely due to the efforts of Mr. A. E. Moody and his committee, and also to Mr. Grant Strachan, whose co-operation had proved invaluable. He was glad to say that the manufacturers' associations had at last joined hands, and from that day would function as one association, to be known as the Radio Manufacturers' Association.

Mr. W. H. Lynas, in proposing the toast of the guests, said that the presence of so many distinguished guests proved that the radio industry had "arrived." The first great public recognition of the industry came during the General Strike, when the great mass of the public realised what radio really meant to them.

The number of people employed in the industry ran into at least six figures, and the British exports of wireless apparatus last year exceeded £1 500 000. From this it would be seen that, though young, the industry was lusty, and was pulling its weight.

The motor trade, said Mr. Lynas, was more closely allied to wireless than any other, and in saying this he did not want to depreciate the electrical industry. Future prosperity would be fostered by the amalgamation of the two manufacturers' associations, but the manufacturers could not function without the close co-operation of the wholesalers and retailers.

Sir Nicholas Grattan Doyle, M.P., in a witty response, expressed his relief at finding that his speech would not be broadcast. It was different in the case of Sir William Bull, who had been "cabin'd, cribb'd and confined" and "instead of being the old William Bull of the House of Commons—irresponsible to a degree—was put into an iron clamp in front of this silly little thing [the microphone]." It had been said that with wireless there would have been no French Revolution; it was caused by wild and unchecked rumours. In the General Strike these things were adequately dealt with by radio.

In proposing "The British Broadcasting Co.," Captain Ian Fraser, M.P., held that broadcasting was not given sufficient funds and facilities to develop as it should. He thought the public would demand that a bigger proportion of money be allotted for the broadcasting service, and greater freedom in the use of power at broadcasting stations.

Responding, Mr. J. C. W. Reith said he believed that broadcasting would be still more successful in the future than in the past. With as great a degree of confidence in the Broadcasting Corporation as possible, and as much money and as much autonomy as possible, the future was assured. He welcomed the possibility of having Sir William Bull as a trade director of broadcasting, and even if this appointment were not made there would still always be the open door and listening ear for accredited representatives of the trade.

Mr. A. E. Moody, who proposed the health of the Chairman, said Sir William Bull had recently played the part of King Canute; it was to be hoped that he would be more successful than his ancestor in stemming the tide of foreign competition.

Some of the guests at the radio manufacturers' dinner held at the Piccadilly Hotel, London, on Tuesday, in celebration of the first really representative British National Radio Exhibition. A report of the speeches is given above. *Photo.: Swaine.*

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MUNICIPAL TRADING.

Manchester Electricity Department Not to Sell Electrical Appliances.

AT a meeting of Manchester City Council, on September 1st, the question of empowering the Electricity Department to undertake the sale of electrical equipment in the showroom at St. Ann Street, or in other showrooms, arose on a report prepared by the electrical engineer (Mr. H. C. Lamb).

Coun. J. Binns moved that negotiations be entered into for leasing the premises No. 30, St. Ann Street, for the purpose of exercising the Corporation's full legal powers for the sale of electrical equipment. The engineer's report, he said, showed that out of 57 large cities in the United Kingdom from whom data had been collected, 33 sold electrical equipment. The engineer estimated that in the third year a sales department in Manchester would easily cover its expenses.

He failed to see why vested interests in Manchester should be allowed to throttle the expansion of the electrical undertaking.

Coun. T. F. Regan seconded the motion. He said that if the Electricity Department were allowed to sell apparatus more people would be encouraged to visit the showroom, and the convenience of the visitors would be greatly increased. Bolton had a showroom which sold about £60 000 worth of equipment last year.

Coun. Dora Taylor was sure that women would greatly appreciate the advantage and convenience of being able to go to the showroom, and there order the apparatus they wanted.

Showroom Results.

Coun. White, opposing the proposal, said when the Manchester showroom was opened its purpose was to encourage the consumption of electrical energy. It was not sound to argue that the showroom, run under present conditions, was costing £2 700 a year without return. Something like 2 000 electric cookers had been placed on the mains since the showroom was opened. Each cooker consumed £8 to £10 worth of energy in a year. The showroom had also greatly stimulated the sale of radiators, and the radiators had still further increased the sale of energy. He had no doubt that profit could be made, but he suggested that the electrical engineer, in his report, had not taken into account certain expenses that were bound to be incurred if they converted the showroom into a saleroom.

Coun. L. B. Cox said that when Coun. White admitted that profit would be made, he made out a good case for converting the showroom into a saleroom.

Coun. C. A. Toyn opposed the proposal because, as he said, its one aim was to extend municipal trading.

The proposal was defeated by 70 votes to 36.

Coun. J. W. Sutton moved that the Council accept the report, and give instructions that district showrooms would best serve the interests of the Electricity Department and the convenience of the public.

Coun. W. Mellor seconded the motion. The development of municipal housing schemes, he said, had largely increased the users of electrical appliances, and to such people district showrooms would be much more convenient than a central showroom.

The proposal was defeated by 65 votes to 33.

Fractional Horse-Power Motors.

B.E.S.A. Issues Further Sections of New Standardisation Rules

A FURTHER section of the revision of Publication No. 72, 1917, "Standardisation Rules of Electrical Machinery," has just been issued by the British Engineering Standards Association. The revision is taking the form of the issue of eight separate specifications, covering fractional horse-power motors, industrial machines, turbo-alternators, large machines other than turbo-alternators (two specifications), transformers, rotary converters and traction motors.

The new publication is B.E.S.A. Publication No. 170-1926, and covers fractional horse-power motors (including fan motors) of less than 1 H.P. per 1 000 revs. per min. The outstanding sections still to be published are those for transformers and rotary convertors.

Copies of this new publication may be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, price 1s. 2d. post free.

THAT £5 5s. WORD!

Readers' Suggestions to be Judged by National Register Committee.

THE task of judging the hundreds of suggestions submitted by readers of THE ELECTRICIAN in connection with our offer of £5 5s. for a suitable title for registered electrical installation contractors is a somewhat arduous one, and in view of the fact that the Executive Committee of the National Register of Electrical Installation Contractors will have to deal at its September meeting with two months' routine business, the final scrutiny of the suggested titles cannot, THE ELECTRICIAN is informed, take place at the Committee's meeting this week. We are, however, informed that the competitors' replies are now under investigation by a special committee who will report to the Executive the result of their examination. The question will then be put on the agenda for the next meeting of the Executive in October, and if at that meeting the appropriate title can be found, it should not be long before registered electrical installation contractors are given the right to describe themselves by a distinctive title, the use of which will not be extended to non-registered contractors.

Although it is not desirable yet to discuss fully the many interesting, and sometimes amusing, words that have been so ingeniously coined by readers of THE ELECTRICIAN, we have been surprised to note the large number of well-nigh unpronounceable words that have been submitted, and also the very considerable number of separate individual suggestions of the word "Electractor."

One or two competitors, in an endeavour to achieve originality at all costs, have sent in some very intriguing efforts, though others hold the view that the suitable title which is being sought for is already in existence.

In fact one reader maintains that the word "electrician" is the right word, "as the modern electrical engineer has immeasurably outgrown the sphere covered by the title 'electrician,' in the early days of the industry."

This reader thinks a good case can be made for the use of the word "electrician" specifically with reference to electrical installation contractors, and in support of this view puts forward the following considerations:—

(1) It is sufficiently and appropriately distinctive.

(2) It is already generally used by the public, and they, therefore, would not need to be educated to its adoption.

(3) Persons engaged in the higher and heavier branches of the industry may well come under the more imposing title "electrical engineer," further defined or qualified by either or any of the terms, consulting, railway, telegraph and telephone, power, tramways, transmission, etc.

(4) No loss of dignity need accrue to anyone, but it would be necessary to ensure substantial qualifications on the part of every registered "electrician," and for that reason the status of that branch of the industry would be enhanced.

The Electricity Bill.

Further Criticisms of its Provisions by British Chambers of Commerce.

AT the forthcoming autumn meeting of the Association of British Chambers of Commerce, the following motion from the Leeds Chamber is to be considered:—

The Association of British Chambers of Commerce views with great apprehension the provisions of the Electricity Supply Bill, even as amended in Committee. In particular, the Association is of opinion—(1) That the management of stations by efficient undertakings and the supply by them of electricity direct to the consumers in their own area should not be interfered with; (2) that the provision of a supply for other areas could be assured by an obligation on these undertakings to supply the Board in bulk on fair terms; (3) that these amendments are necessary to safeguard the consumers in industrial areas against the burden which would arise from the supply in unprofitable areas, and from the cost of the standardisation of frequency; and (4) that the expenses of the Electricity Commissioners and of the proposed Electricity Board should be a charge on the Treasury, as in the case of other Government Departments, and not be borne by the consumers of electricity.

Further criticism was supplied by Mr. R. P. Sloan, chairman of the Newcastle-upon-Tyne Electric Supply Co., Ltd., at last Friday's meeting of the Newcastle Chamber of Commerce, who is reported to have said that the bulk of the provisions of the Bill represented a retrograde step.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

SCUNTHORPE U.D.C. has rejected a recommendation to increase the salary of the electrical engineer, Mr. A. L. Boyle, from £450 to £475 per annum.

Mr. H. E. Dralle, of the Westinghouse International Co., and a specialist on the electrification of oilfields, has left the U.S.A. for a year's tour of various countries, including England.

Mr. P. J. Hannon, M.P., is a member of a British party which is being entertained at Biarritz by Capt. A. Loewenstein, the "mystery millionaire," who controls a large hydro-electric enterprise at Barcelona.

Mr. James Rodgers, formerly engineer and manager of Curran Bros.' electricity undertaking at Ballyclare, has taken up the position of engineer and manager of the Launceston and District Electric Supply Co.

Mr. Archibald Black, whose book on "Transport Aviation" is being warmly commended in aeronautical circles, is an Inverness man by birth and an electrical engineer by profession. He is now living in New York.

Amongst the recipients of knighthoods conferred by the King, and announced last week, is Mr. George Mason Allard, representative of the Government of the Commonwealth of Australia on Amalgamated Wireless (Australasia), Ltd.

Before leaving to take up his new position as tramways manager and engineer at Dundee, Mr. Duncan P. Morrison, Gateshead's tramways manager, was presented by his colleagues with a canteen of cutlery for himself and a manicure set for Mrs. Morrison. Mr. Morrison's father was for many years manager of the Gateshead undertaking.

Mr. A. R. Hardie, a director (and formerly secretary) of the Eastern Telegraph Co., and Mrs. Hardie, have celebrated their golden wedding. Mr. Hardie received the congratulations of Sir John Denison-Pender (chairman of the Eastern and associated companies) and also those of the other directors and the staff. Mr. Hardie had been in the cable service 52 years when he retired from the position of secretary in 1922.

A resolution of Leeds Tramways Committee that "consequent upon the retirement of the chief electrical engineer and the overhead lines superintendent, the staff in the electrical and engineering departments be reorganised as follows: Mr. J. Burbidge to be second assistant electrical engineer at a basic salary of £661 10s.; Mr. A. Bentley to be mains superintendent at a basic salary of £564; Mr. J. Kidd to be power station superintendent at a basic salary of £585 5s.; and Mr. A. A. Allen to be deputy rolling stock engineer at a salary of £475" has been referred back.

Obituary.

The following deaths have been announced:—

MR. WILLIAM SMITH, until recently (when he retired) with the Western Union Cable Co., at Liverpool.

MR. THOMAS H. TRIMMER, on August 29th, aged 60 years, who had since 1900 been electrical engineer at Oakover House, Ticehurst.

MR. JAMES TIMBS, on September 1st, aged 78 years. For over 20 years he had been on the staff of the Dartford electricity works. Last month he was knocked down by a motor cycle and sustained a compound fracture of the leg.

Mr. WILLIAM HENRY ALLEN, chairman of W. H. Allen, Sons and Co., Ltd., engineers, Bedford, on September 3rd, at the age of 82. He was born at Cardiff, was educated at Weston-super-Mare and Brecon, and was trained as an engineer. At the age of 36 he began manufacturing in Lambeth, and in 1893 bought a site near the station at Bedford. This was the nucleus of the western quarter of Bedford known as Queen's Park which now has a population of over 5 000 people, many of whom are employed at the works of W. H. Allen, Sons and Co., Ltd., which was incorporated in 1900. Mr. Allen was a member of the Royal Institution and the Institution of Civil Engineers, a vice-president of the Institution of Mechanical Engineers, and a member of the council of the Institute of Metals. His works supplied much of the pumping equipment of large irrigation schemes in Egypt, and installed electrical equipment in vessels of the Royal Navy and Mercantile Marine, and in dockyards, including the dockyards of the Japanese Admiralty. Mr. Allen was well known for his interest in the welfare of his workpeople and for his generosity.

BUSINESS ITEMS.

Changes of Address, Representatives, and other Developments.

ON and after September 20th the Manchester "Exide" sales depot will be at 18, Bridge Street, Manchester.

Mr. E. C. Hart, the Irish representative of the Chloride Electrical Storage Co., Ltd., has removed to more convenient premises at 8, Pearse Street (late Great Brunswick Street), Dublin.

As from September 1st the discount on radio components made by Benjamin Electric, Ltd., are altered to a flat 30 per cent. off list prices, usual conditions regarding carriage, etc., remaining as before.

Alliance Wholesale Electrical, Ltd., has removed to 62, Great Russell Street, Bloomsbury, London, W.C.1. The new telephone number is Museum 9377/8 and the telegraphic address "Lianelec Westcent London."

Owing to a typographical error the telephone number of the Manchester branch of Philips Lamps, Ltd., was inadvertently given in their advertisement in THE ELECTRICIAN last week as "Central 3580." The correct number is Central 3560.

Overseas Representation.

British manufacturers of telephone and electrical cables who wish to be represented by a Belgian agent in Brussels on a commission basis for Belgium and the Belgian Congo, are asked to apply to the Department of Overseas Trade. (Reference No. 224.)

An electrical sales agency in Montreal desires to represent on a commission basis in Eastern Canada British producers of electricity meters, electrical porcelain and high tension specialities. Particulars from the Department of Overseas Trade. (Reference No. 249.)

A Calcutta firm of manufacturers' agents and merchants, with a London branch, desires further British agencies for electrical accessories and lampware. Particulars (Reference No. 216) may be had from the Department of Overseas Trade, 35, Old Queen Street, London, S.W.1.

A commission agent at Rio de Janeiro (Brazil) desires the local representation of British manufacturers of various goods, including electric cable and wire and other articles for electrical installations. Details from the Department of Overseas Trade. (Reference No. 266.)

Fire Damage Over-estimated.

Inquiries made by THE ELECTRICIAN into the conflicting reports of the damage caused by the fire at the Brighton works of Allen West and Co., Ltd., during the storm last week show that the position is not nearly so serious as some accounts indicated. There has been no irreparable loss of records, the firm's production will not be much affected; in fact, the majority of the employees re-started their normal work at the ordinary hour the day after the fire. A certain amount of work in progress was lost or damaged, and consequently a few specific orders will be slightly delayed, but in any case not more than about a week. Temporary arrangements have been made to deal with the work formerly carried out in the building which has been destroyed, but practically the whole of this is now being carried on in other parts of the works. A view of the fire damage, specially taken for THE ELECTRICIAN, is published on our picture page this week.

Wingrove and Rogers, Ltd., Mill Lane, Old Swan, Liverpool, have recently acquired the business of British Electric Vehicles Ltd., Southport. Wingrove and Rogers, Ltd., have been manufacturing controllers under their own patents for British Electric Vehicles, Ltd., since 1919, and they will now manufacture complete, all standard designs of B.E.V. trucks and locos in their own Liverpool factory. The present management and the technical staff of British Electric Vehicles, Ltd., are being retained, so that continuity of design will be secured, and business during the transition period will be carried on without interruption. For the convenience of customers in the South of England a London office has been opened at 63, Queen Victoria Street, E.C.4, under charge of Major G. D. Ozanne, who joins them from the Radio Communication Co., Ltd., where he was manager of the broadcasting department, and Mr. N. E. Bayliff, who has hitherto represented British Electric Vehicles, Ltd., in this district. Application has been made to the Board of Trade to amalgamate the two names in the form: "Wingrove and Rogers British Electric Vehicles, Ltd."

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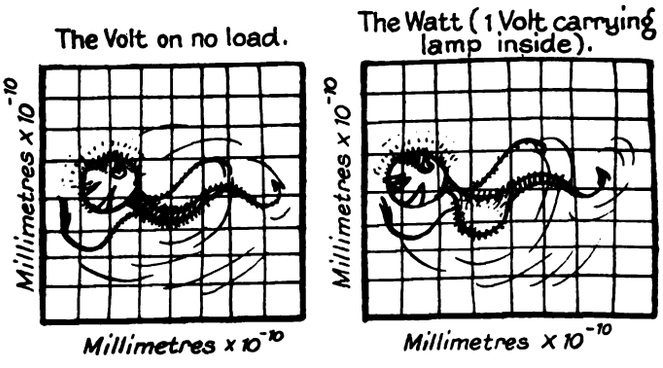
IN LIGHTER VEIN.

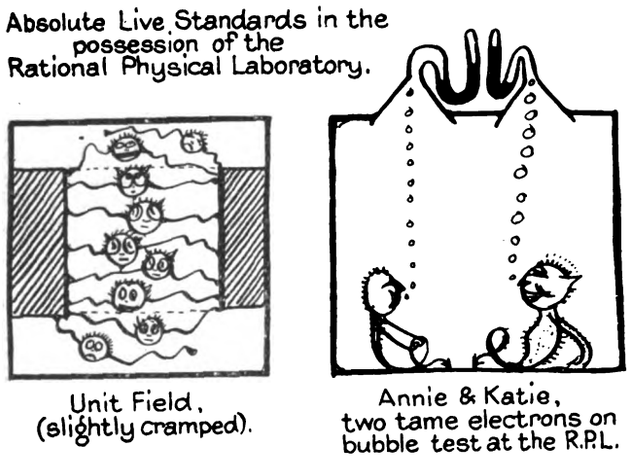
Some Extracts from Our New Glossary of Electrical Terms.

RECENT discussions on the B.E.S.A. Glossary of Electrical Terms have once more shown how difficult it is to define anything in such a manner that it is clear, definite, permits no misinterpretation, and can be understood by the bulk of those who, by their daily connections, are in close contact with them.

* * *

Most definitions admit some variation in interpretation (hence the lawyers !), as an expression is not always visualised in the same way, for example, by a University professor and a wireman. Any attempt to define terms so that the meaning, limit and language are easily understood by all, deserves every assistance, for, although a ceiling rose by any other name


The Volt on no load.
The Watt (1 Volt carrying lamp inside).
Millimetres x 10⁻¹⁰
Millimetres x 10⁻¹⁰
Millimetres x 10⁻¹⁰
Millimetres x 10⁻¹⁰


Absolute Live Standards in the possession of the Rational Physical Laboratory.
Unit Field, (slightly cramped).
Annie & Katie, two tame electrons on bubble test at the R.P.L.

would look as neat, a clear, concise, conception of what is meant by any term is essential if slovenly thinking and misunderstanding are to be avoided.

* * *

The attempt of the B.E.S.A. has, therefore, our sympathy, and has tempted us to reproduce here part of an effort of our own, commenced some long time ago. We drafted a series of definitions which were submitted to 15 committees, each representing a different branch of the profession. After a lapse of some considerable time, the revised drafts were returned and sent on to the printer for him to produce a clean copy on which would appear the points on which all had agreed. The proof arrived—a plain sheet bearing the date, two fullstops and a comma !

* * *

In no way discouraged, we changed the method, and a similar single sheet was passed from one committee to another in series, and after it had been ten years in the circuit, we were obliged to short circuit it. The result is without parallel.

* * *

The draft came to the professors when they were in a sea of simplified spelling, and left them on the crest of a wave of realism. Floating to the Wireless Section on a wave of Esperanto, it was now a little on the Heaviside, but this was rectified by the eddy currents which carried it to the contractors, who gave it a cubist cut in the then prevailing fashion.

* * *

Pulverised by power station engineers, it drifted to the draughtsmen, who set it square, after which it was eventually washed back to the professors in the strong current of the futurist or vivid visualisation movement. During a momentary pause due to the General Strike (another black mark against it), the draft was snatched from the circuit, so bringing to a conclusion an interesting experiment in perpetual motion.

* * *

NEW GLOSSARY OF ELECTRICAL TERMS.

OR HOWE TO DO IT.

[In 2 Sections: (*a*) Trade Terms; (*b*) Technical Terms.]

[*Edited, sterilized, tested at* 10 000 *V without much resistance, impregnated and made edible by* 15 *committees in series, each of* 27 *members in parallel, and profusely illustrated from life. (The correct thread of these remarks is* 2 *B.A. When examining the illustrations use coloured glasses—not provided—to give the* 4*th dimension*)].

SECTION A.—TRADE TERMS.

33⅓ per cent. less 5 per cent. cash 2½ per cent. monthly account.

SECTION B.—TECHNICAL TERMS (Abstract only).

VOLT.—That unit of pressure which presses unit current through unit resistance without much trouble.

AMP.—That unit of current which is pressed (quite easily) through unit resistance by unit pressure.

OHM.—That unit of resistance which allows (with pleasure) unit current to be pressed through it by unit pressure.

$\sqrt{-1}$.—(See "Right-angle bend.")

WATT.—Take one volt and one amp., mix well and bake in a slow oven for quite a long time. Serve hot, with Hackney trimming to produce maximum demand.

WATT-HO !—There is no such thing as a watt-ho !

MOTOR.—A mechanical arrangement of fast and loose parts producing movement when fed with electric current.

GENERATOR.—Read the previous definition backwards.

RIGHT-ANGLE BEND.—(See $\sqrt{-1}$—its a good step, unless you are a miles walker !)

[Owing to lack of space we are unable to give more abstracts from this monumental work, but the complete set of volumes will shortly be on sale or return.—ED.]

* * *

A reader sends us the following copy of a letter from a Scandinavian merchant in Porto Rico, to an English maker of pumps :

"Gentlemen, I get he pump i by from you, but wy for gods sake you doan send me no handle. I loose to me my customer wats the use a pump wen she doan have no handle, shur i think you doan treat me write. My customer he holler for water like hell from the pump you know he is so hot summer now and the win he no blow the pump. She got no handle so wat the hell I goan to do with it. If you doan send me handle pretty quick i send her back and i goan order some pump from —— Company. Goodbye. Yours truly, ——. Sine i write this i find the goddam handle in the box so excuse to me."

Forty Years Ago.

A Few Random Pickings from "The Electrician" of September 10th, 1886.

ITEMS and events recorded in THE ELECTRICIAN of September 10th, 1886—exactly forty years ago—recall that :—

Russia was experimenting with telephony for military purposes.

* * *

Developed water power resources in the U.S.A. totalled nearly 14 000 H.P.

* * *

A battery was introduced in which the zinc carbon plates were separated by gelatine containing acid.

* * *

Mr. Desmond G. Fitz-gerald read a paper on "Lithanode"—a new discovery—at the British Association meeting.

* * *

A small chloride of silver cell for wear inside hat linings was being offered to the public as a cure for nervous headaches !

* * *

The formation of an "Industrial Electrical Association for the Advancement of Electrical Energy" was being discussed.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given.

HILLHALL PRESBYTERIAN CHURCH, LISBURN.—Electric light installation in church and manse, or alternatively in church, manse and school. Particulars from Mr. J. M. Harvey, 46, Llewellyn Avenue, Lisburn.

COMMISSIONERS OF HIS MAJESTY'S WORKS, ETC., September 10th.—Electric wiring in steel conduit at Edinburgh Castle. Specification, etc., from the Architect, H.M. Office of Works, 122, George Street, Edinburgh; deposit £1 1s.

INDIA STORE DEPARTMENT, September 10th.—Supply of power station switchgear and auxiliary plant, in connection with Great Indian Peninsular Railway electrification. Specification (£1) from the Director-General, India Store Department, Belvedere Road, Lambeth, London, S.E.1.

INDIA STORE DEPARTMENT, September 10th.—One 300 kW d.c. steam driven electric generating set, with boiler, condenser, cooling tower, auxiliaries, switchboard, etc., for Peshawar Cantonment power station. Specifications (5s.) from the Director-General, Branch No. 11, Belvedere Road, Lambeth, London, S.E.1.

KEIGHLEY GUARDIANS, September 10th.—Supply of electrical goods for the Institutions. Particulars from Mr. Sam Green, clerk to the Guardians, Keighley, before September 10th.

STAINES GUARDIANS, September 11th.—Electric light installation in part of the Infirmary, London Road, Ashford, Middlesex. Specification from the Master of the Institution.

STANDING JOINT COMMITTEE OF GLAMORGAN QUARTER SESSIONS AND COUNTY COUNCIL, September 11th.—Electric light installations at Port Talbot Police Station, Court and Weights and Measures Premises. Specifications from the Port Talbot Police Station or the County Hall, Cardiff.

TUNBRIDGE WELLS TOWN COUNCIL, September 11th.—Two watertube boilers, superheaters, economisers, mechanical stokers, forced and induced draught plant, steel stack, overhead coal bunkers, coal elevator and conveyors, and truck tippler. Specifications from Mr. R. N. Torpy, borough electrical engineer.

FIFE ARMS HOTEL, BRAEMAR, September 11th.—Electric light installation for the hotel and stable buildings. Plans and schedules of quantities from the architect, Mr. George Bennett Mitchell, 1, West Craibstone Street, Bon-Accord Square, Aberdeen.

WEST RIDING COUNTY COUNCIL, September 11th.—Electric light installation at Marsden Council Mixed and Infant Schools. Specification from Mr. W. Heeley, divisional clerk, 4, Macaulay Street, Huddersfield.

BRISTOL DOCKS COMMITTEE, September 13th.—Electric light installation at Shed V, Canons' Marsh. Particulars from the engineer, Mr. Thomas A. Peace, Avonmouth Dock, Bristol.

BURNLEY GUARDIANS, September 13th.—Electrician's work. Forms of tender from the clerk, Mr. H. E. Purton, Union Offices, Burnley.

CHESTER CASTLE, September 13th.—Electric wiring. Specification, etc., from Cramp and Frith, 33, Brazennose Street, Manchester; deposit £2 2s.

ECCLES CORPORATION, September 13th.—Electric light wiring and fittings and electric bell alarm system in the new extension of the Public Baths, Cromwell Road, Patricroft. Specification, etc., from the Borough Electrical Engineer, Electricity Works, Cawdor Street, Patricroft; deposit £1 1s.

LONDON COUNTY COUNCIL, September 13th.—Three watertube boilers with auxiliaries. Specifications from General Manager, L.C.C. Tramways, Victoria Embankment, London, W.C.2; deposit £3.

MINNEY STREET CONGREGATIONAL CHURCH, CATHAYS, CARDIFF, September 13th.—Electric light installation. Specification can be seen at the Schoolroom until to-day, September 10th.

SHEFFIELD GUARDIANS, September 13th.—Electric light installation at Nether Edge Hospital. Specification, etc., on personal application, to the Clerk of Works, Firvale House, Sheffield.

ST. MARYLEBONE (LONDON) BOROUGH COUNCIL, September 13th.—Supply and fixing of electric overhead runway for removing house refuse from storage pit to screening plant. Particulars from the Borough Engineer, Town Hall, Marylebone Road, London, N.W.1.

MANCHESTER CORPORATION, September 14th.—Supply of tramway pole sleeves. Specifications from Mr. H. Mattinson, Corporation Tramways Department, 55, Piccadilly, Manchester.

PONTYPRIDD GUARDIANS, September 15th.—Six months' supply of electrical materials to Central Homes, Pontypridd, Llwynypia Hospital and Church Village Children's Homes. Forms of tender from Mr. W. Spickett, Clerk to the Guardians, Pontypridd.

STALYBRIDGE AND DUKINFIELD JOINT SEWERAGE BOARD, September 15th.—Electric light and power wiring. Specifications from C. J. Lomax and Sons, 37, Cross Street, Manchester.

HOME INSTALLATION PROSPECTS FOR 1·08d. EACH!

IS it worth while paying 1·08d. to get a prospective new customer to walk, of his own accord, into an electrical contractor's shop or showroom?

If you think it is worth while, ask the E.D.A. for a supply of the Better Home Lighting Competition booklets (E.D.A. 1002), which are supplied at the rate of £4 10s. per thousand.

BELFAST EDUCATION COMMITTEE, September 16th.—Electric lighting work in connection with the adaptation of the old Town Hall, Victoria Street, as Education Offices. Specifications, etc., from the Architect, Education Offices, College Square, Belfast.

INDIA STORE DEPARTMENT, September 17th.—One 5-ton travelling electric jib crane. Specification and form of tender (5s.) from the Director-General, Branch No. 14, Belvedere Road, Lambeth, London, S.E.1.

INDIA STORE DEPARTMENT, September 17th.—(1) Two-colour and (2) single-colour litho printing machines with motors, and (3) vertical cross-tube boilers (100 lb. pressure). Specifications (5s.) each from the Director-General, Belvedere Road, Lambeth, London, S.E.1.

HALIFAX CORPORATION, September 18th.—Wiring 58 houses in Nursery Lane. Particulars from the Borough Engineer; deposit £2 2s.

ISLINGTON (LONDON) GUARDIANS, September 20th.—Electrical supplies for six months. Forms of tender from the clerk, Mr. Albert King, Guardians' Offices, St. John's Road, Upper Holloway, N.19. Apply personally or send stamped brief-size envelope.

BIRMINGHAM CORPORATION, September 21st.—Supply, delivery and erection of plant for refuse disposal and salvage works. Specifications from the Superintendent, Salvage Department, 161, Corporation Street, Birmingham; deposit £1 1s.

WARRINGTON GUARDIANS, September 21st.—Electrical supplies for six months. Tender forms from the clerk, Mr. Arthur Bottomley, Museum Street, Warrington.

BATTERSEA (LONDON) BOROUGH COUNCIL, September 22nd.—(1) E.h.t. and l.t., d.c. switchgear for 1 000 kW motor-converter, and outgoing d.c. feeder switchboard, for Nine Elms sub-station; (2) works power switchboard for Lombard Road generating station. Specifications, etc., from the Electrical Engineer, Electricity Works, Lombard Road, Battersea, S.W.11.

CROYDON GUARDIANS, September 23rd.—Six months' supply of electrical fittings and appliances. Forms of tender from the Clerk, Union Offices, Mayday Road, Thornton Heath. Send stamped addressed envelope.

MERSEY RAILWAY CO., September 24th.—Supply of electrical sundries (tender form No. 10) and metallic and

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carbon filament lamps and fittings (form 13). Forms from Mr. J. Shaw, general manager and secretary, Central Station, Birkenhead.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

INDIAN STORES DEPARTMENT, SIMLA, September 14th.—Steam raising plant, feed pumps, oil separator, cooling tower 300 kW, 440/520 V, steam engine driven d.c. generating set, complete with condensing plant; switchboard and connecting cables and accessories for Peshawar (Cantonment) Power Station. (Reference 20 816/1926.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, September 14th.—Telephonists' telephones and handsets. (Reference B.X. 2 696.)

CAPE TOWN ELECTRICITY DEPARTMENT, September 15th.—Supply of cables. (Reference B.X. 2 802.)

CONSTANTZA (ROUMANIA) PORT ADMINISTRATION, September 15th.—Supply and erection of eight electric portal cranes. (Reference A.X. 3 399.)

EGYPTIAN MINISTRY OF THE INTERIOR, September 15th.—Supply and installation of electricity distribution system for the town of Luxor, including 6 830 metres of h.t. and 1 210 metres of l.c. armoured cable, 6 transformer cabins, 12 transformers (from 10 to 50 kVA), copper cable, poles, cable boxes, cut-outs, insulators, lamps, etc. (Reference B.X. 2 737.*)

JOHANNESBURG COUNCIL, September 18th.—Underwriters' wire. (Reference B.X. 2 766.) Supply of 6 600 V truck-type ironclad switchgear panels. (Reference B.X. 2 767.)

SYDNEY CITY COUNCIL, September 20th.—One h.t. d.c. Kenetron valve testing set for underground cables. (Reference B.X. 2 748.)

POSTS AND TELEGRAPH DEPARTMENT, MELBOURNE, September 21st.—Switchboard keys and parts. (Schedule 26/720.) (Reference B.X. 2 699.)

JOHANNESBURG COUNCIL, September 23rd.—Switchboard-type overload relays. (Reference B.X. 2 809.)

AUCKLAND ELECTRIC POWER BOARD, September 27th.—One 14-ton electrically-operated crane. (Reference A.X. 3 415.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 28th.—Three motor-driven low lift pumps with control apparatus, for Taieri drainage scheme. (Reference A.X. 3 274.)

NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMWAYS (CHIEF ELECTRICAL ENGINEERS' BRANCH), September 29th.—One drag link ash conveyor. (Reference A.X. 3 432.)

VICTORIAN GOVERNMENT RAILWAYS, September 29th.—Two motor driven disc grinding machines and necessary equipment. (Reference A.X. 3 433.)

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, October 4th.—Pole oil switches. (Reference B.X. 2 795.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 5th.—Supply of one four-motor overhead travelling crane and runway for the Waikaremoana Electric Power Development, Section 30. (Reference A.X. 3 517.)

POSTS AND TELEGRAPH DEPARTMENT, MELBOURNE, October 5th.—Switchboard cords. (Schedule No. 115.) (Reference B.X. 2 747.)

NEW PLYMOUTH (N.Z.) HARBOUR BOARD, October 16th.—Supply, delivery and erection of 30-cwt. portal electric horizontal luffing jib crane, fittings and accessories. (Reference A.X. 3 458.)

SYDNEY COUNCIL, October 18th.—Two 100 ton electrically-operated overhead travelling cranes. (Contract 1 033.) (Reference A.X. 3 467.)

CHRISTCHURCH (N.Z.) DRAINAGE BOARD, October 19th.—Supply and erection of three sets of electrical centrifugal pumping plants. (Contract 26 329). (Reference A.X. 3 215.*)

VICTORIAN GOVERNMENT RAILWAYS, October 20th.—Supply and delivery of rail motor equipment. (Contract No. 39 614.) (Reference A.X. 3 449.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Telephone plugs and sleeves. (Schedule C.120.) (Reference B.X. 2 709.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Lamps, lamp caps, and lamp sockets. (Schedule C.124.) (Reference B.X. 2 800.)

SYDNEY ELECTRICITY DEPARTMENT, November 1st.—Supply, delivery, erection, setting to work, testing and maintenance at Bunnerong power station of boiler feed pumps. (Reference A.X. 3 470.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Supply of 110 000 V transformers for Waikaremoana power scheme (section 17). (Reference B.X. 2 744.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Indoor control gear and switchgear for Waikaremoana electric power development (section 14). (Reference B.X. 2 675.)

VICTORIAN RAILWAY COMMISSIONERS, November 3rd.—Supply of 77 miles of seven-strand h.d. copper cable.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone transformers. (Reference B.X. 2 797.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone protective apparatus. (Reference B.X. 840.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, November 10th.—Supply and erection of steam turbine-driven centrifugal boiler-feed pump. (Contract No. 770.) (Reference A.X. 3 534.) November 10th.—Supply and erection of motor-driven centrifugal boiler-feed pump. (Contract No. 771.) (Reference A.X. 3 536.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 16th.—Supply of timing clocks for indicating the duration of telephone trunk line calls. (Reference B.X. 2 827.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 23rd.—Lightning arresters and transformers. (Reference B.X. 2 792.)

SOUTHLAND ELECTRIC POWER BOARD, INVERCARGILL, N.Z., December 1st.—Supply of a 3 000 H.P. horizontal Francis turbine and 2 350 kW generator. (Reference B.X. 2 822.)

VICTORIAN RAILWAY COMMISSIONERS, December 1st.—Rotary converter or rectifier set, with switching equipment for its automatic operation.

Tenders Accepted.

LIBERAL CLUB, MELTHAM.—E. Thornton, electrical installation work.

NEWMILNS CORPORATION.—J. Laird and Co., electric wiring of 24 cottages, £108.

MANVERS STREET BAPTIST CHURCH, BATH.—H. L. Bush and Co., electric light installation.

SOUTHERN RAILWAY.—British Thomson-Houston Co., Ltd., six months' supply of Mazda lamps.

HONLEY URBAN DISTRICT COUNCIL.—Smith and Hargraves, electrician's work in eight houses.

GLASGOW CORPORATION.—J. Laird and Co., electric lighting work at Bellefield Sanatorium, £962 14s. 8½d.

CROWLAND PARISH COUNCIL.—Spalding Urban Council, supply of electricity for public lighting with 43 lamps.

POST OFFICE STORES DEPARTMENT.—Metro-Vick Supplies, Ltd., 12 months' supply of Cosmos vacuum tungsten lamps.

BELFAST GUARDIANS.—J. Dowling and Sons, Ltd., electric light installation in Corry's Buildings, at the Workhouse, £224 15s.

HORSHAM GUARDIANS.—Saunders and Son, electric light installation at the institution, £273 5s. 3d., plus £11 1s. 8d. for electric irons, etc.

GORDON CLEANING CO.—Buglass and Jamieson, Ltd., electrical work in connection with extension of the company's factory at Huntly, Aberdeen.

GREAT WESTERN RAILWAY.—Electromobile, Ltd., and Ransomes, Sims and Jefferies, Ltd., four electric trolleys for Alexandra Dock Warehouse, Cardiff; Fielding and Platt, two electrically driven pressure pumps at Reading.

LONDON COUNTY COUNCIL.—Baxter and Caunter, Ltd., British Central Electrical Co., Ltd., British Electrical and Manufacturing Co., Edison Swan Electric Co., Ltd., Wm. McGeoch and Co., Ltd., Metro-Vick Supplies, Ltd., G. S. Peckham and Co., and Walsall Hardware Manufacturing Co., Ltd., electrical fittings; L. Andrew and Co., Attwater and Sons, Butterfield and Renton, Dacier, Ltd., Hamnett and Andrew, Ioco Rubber and Waterproofing Co., Ltd., Mica Manufacturing Co., Ltd., Rubber Industries, Ltd., G. L. Scott and Co., Siemens Bros. and Co., Ltd., and W. D. Symons and Co., Ltd., insulating materials.

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ELECTRIC BAKING.

Good Display of Electric Ovens at the Bakers' Exhibition.

ELECTRICITY is playing an increasing part in the processes incidental to the production of food, and this fact is well demonstrated at the thirtieth International Bakers' and Confectioners' Exhibition at the Royal Agricultural Hall, Islington, London, which remains open until this (Friday) evening.

The Metropolitan-Vickers Electrical Co., Ltd., demonstrate their conveyor-type electric oven. The oven body is double cased, the inner and outer cases consisting of stout sheet metal mounted on a strong steel framework, and the space of 5 in. between the casings is packed with mineral wool. Steam is injected through a vent pipe when necessary, as in the case of baking Vienna bread. The dimensions of the oven overall are 100 in. deep, 97 in. wide and 70 in. high, and the total weight is 3 tons. The outside is finished with white vitreous enamelled panels with nickelled fittings, and is attractive and easy to clean. A chain conveyor, on which are placed the goods to be baked, is worked by an electric motor, and travels slowly round the oven. There are 12 heating elements, which can be withdrawn for inspection at any time, easily, whether hot or cold, and are guaranteed to have a life of three years, but are expected to last five years on an average. With all elements in circuit the energy consumed is 50 kW, but the average is well below that figure. Every oven is fitted with both automatic and hand temperature regulating apparatus.

The General Electric Co., Ltd., demonstrate baking in Magnet electric ovens, which are made in quarter and half-sack sizes, the oven spaces being 4 ft. by 4 ft. and 8 ft. by 4 ft. respectively ; the maximum energy required for them is 10 kWh per hour in one case and 18 kWh in the other. These are the quantities of energy required for heating the ovens, but the average consumption when baking is 5 to 7 kWh per bake for the smaller, and 10 to 12 kWh for the larger oven. The elements are in steam-tight tubes at the top and bottom of the oven, the top and bottom sections are independently controlled by three-heat switches, and the elements are easily removable whether the oven is in use or not.

Artofex Engineering Works, Ltd., of 6 and 8, Pentonville Road, London, show brick-built electric ovens which take about five hours to bring up to baking temperature, but are said to store sufficient heat to bake three batches of bread and small goods to follow. The maximum consumption of energy per sq. ft. of baking surface is 0.45 kWh, or, in other words, 140 kWh will bake three sacks (1 150 lb.) of bread, besides a considerable quantity of small goods. These ovens are built with one, two or three decks, and have three-heat control.

Barron's (Leicester), Ltd., of 148, Curtain Road, London, E.C.2, also show a three-decker electric bread oven, an electric water heater, and various bakers' electrically driven machinery. This firm also supplies one, two and three deck portable ovens for hotels, restaurants, etc.

Baker, Perkins, Ltd., and David Thomson, Ltd., of Willesden Junction, show a two-deck electric oven (4 ft. by 4 ft. 6 in. inside measurement) which has been made for the Admiralty for use on shipboard.

E.P.E.A. and the General Strike.

President Discusses the Association's Attitude during the Dispute.

MR. A. J. Ostler, President of the Electrical Power Engineers' Association, addressing members of the Association at Edinburgh last Saturday, explained the reasons for the decision of their National Executive Council to maintain supplies during the general strike. Continuity of supply, he said, was a point of faith with every supply engineer, and the principle had always been accepted that the electricity supply industry should not become a cockpit for disputes arising outside the industry.

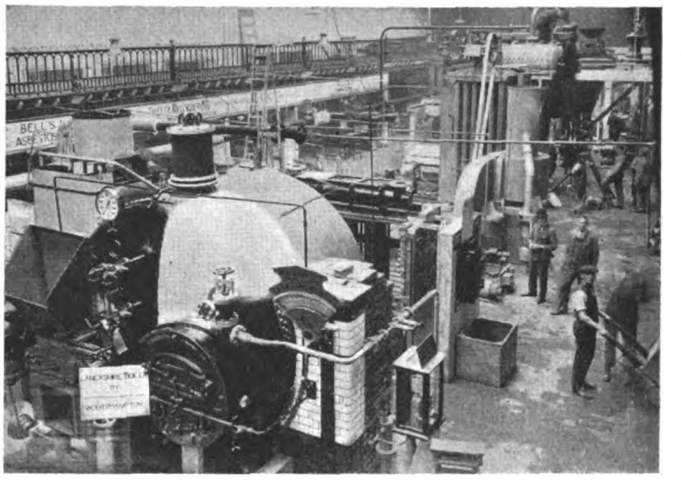
A general stoppage of electricity supplies would have had disastrous consequences, which would have reacted upon the industry probably in a greater proportion than in other industries, and would have retarded its progress for a long time.

The influence and authority of the Joint Boards were increasing, and a better spirit of understanding between the two sides had developed. He believed it was only a matter of time when all supply authorities would be represented on the National Board.

SMOKE ABATEMENT.

Large Show of Electrical Aids to Smokeless Factories and Homes.

ORGANISED jointly by the E.D.A. and the Birmingham Electricity Supply Department, with the co-operation of Midland electricity undertakings, an interesting electrical display has been prepared for the Smoke Abatement Exhibition which opened at Birmingham on Monday, and is arranged in several sections. There are two small stands, 15 ft. by 15 ft., each of which comprises a power section containing electric furnaces, plating dynamo, polishing lathes, automatic



Part of the model boiler house at the Smoke Abatement Exhibition at Birmingham.

electric chisel, small motors and control panels, electric signs, ventilating blower, bakers' mixing machines, canteen or café coffee percolator, small tools and other factory equipment. There is also a large stand, 70 ft. by 15 ft., consisting of model combined lounge-dining room, bedroom, bathroom, kitchen and a spacious hall of an " all-electric " house. The rooms will contain a good selection of lighting fittings, fires, heaters, cookers, refrigerator, wash-boiler, geyser, ice-cream mixer, drying and airing cabinet, luminous bathroom radiator, and towel dryer, fans, kettles, toasters, irons and other domestic labour-saving appliances.

Boiler House Equipment.

In the centre of the exhibition hall is a display of apparatus for a model boiler house, the equipment being supplied by British Arca Regulators, Ltd., John Thompson, Ltd., Meldrums, Ltd., G. Kent, Ltd., J. Gordon and Co., Ltd., Davidson and Co., Ltd., E. Green and Son, Ltd., Alfred Herbert, Ltd., Liplak Furnace Arches, Ltd., Industrial Combustion Engineers, Ltd., G. Dennis and Co., Ltd., Lea Recorder Co., Ltd., the Paterson Engineering Co., Ltd., and others. Allied with this exhibit are hurricane patent soot blowers by Power House Components, Ltd. ; feed pumps by G. and J. Weir, Ltd. ; boilers and pulverised fuel equipment by International Combustion, Ltd. ; dust separators and conveyors by James Keith and Blackman Co., Ltd. ; models and photos of boilers and pulverised fuel plant by the Mitchell Conveyor and Transporter Co., Ltd. ; indicators by the Electroflo Meter Co., Ltd., and switchboards, etc., by William McGeoch and Co., Ltd.

Other exhibits include pulverised fuel and other boiler house plant by Babcock and Wilcox, Ltd., and furnaces by the Crosthwaite Engineering and Furnace Co., Ltd.

On the domestic side there is a good electrical show furnished by Berry's Electric, Ltd. (" Magicoal " fires) ; the Jackson Electric Stove Co., Ltd. (cookers, fires, water heaters, etc.) ; the British Thomson-Houston Co., Ltd. (cooking, lighting and heating appliances, motors, etc.) ; Electric Fires, Ltd. (" Heatrae " fires, water heaters, low temperature heating tubes, etc.) ; Young, Osmond and Young, Ltd. (tubular heaters, towel rails, etc.) ; Premier Electric Heaters, Ltd. (heating and cooking apparatus) ; the General Electric Co., Ltd. (lighting, heating and cooking apparatus, etc.) ; Metro-Vick Supplies, Ltd. (cookers and other domestic appliances) ; the Delco Light Co., Ltd. (electrical refrigerators) ; Belling and Co. (fires, cookers, kettles, etc.) ; the Electric Appliances Co., Ltd. (vacuum cleaners) ; Electrolux, Ltd. (refrigerators and suction cleaners) ; and Hoover, Ltd. (suction cleaners).

The exhibition will remain open until September 18th.

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ELECTRICITY SUPPLY.

Mersey Power Co.'s Extensions—Electricity Commissioners Refuse Consent to Backbarrow Hydro-Electric Project—Barrow to Protest.

DARWEN Corporation is increasing the price of electricity by 10 per cent. from October 1st.

The price of electricity has been increased by 1d. per kWh at Nelson through the coal dispute.

Bethesda U.D.C. invited tenders last week for loans amounting to £7 255 for its projected electricity undertaking.

Maidstone T.C. has received from the Electricity Commissioners sanction to a loan of £10 000 for mains extensions.

Douglas (Isle of Man) Electricity Committee advises the use of steam plant rather than oil plant at the Corporation's electricity works.

The third quarter of Glasgow Corporation's power station at Dalmarnock will be formally opened by the Lord Provost on September 30th.

B.P. ——— *B.P.* ——— *B.P.!*

THE letters B.P. represent the British Public which, from October onwards, will be the object of a Big Push to spread the use of electricity in the home.

B.P. also stands for that admirable slogan, "Be Prepared." Are you prepared for the part you have to play in "wiring the homes of Britain?" If not, there is still time to apply to the E.D.A. for the necessary equipment . . . if you do it now!

Burnley T.C. has referred back the proposal of the Gas Committee to expend £2 000 on electrical generating plant to be operated by waste heat.

Cuckfield R.D.C. had consented to an application for an Order for the supply of electricity in the district by the Electric Supply Corporation, Ltd.

Heathfield P.C. has approved the application of the Weald Electricity Supply Co. for authority to supply electricity in Heathfield and the Hailsham rural district.

The Mersey Electric Power Co. has almost completed the extension of its Runcorn works which will enable the present output of about 60 000 000 kWh per annum to be doubled.

Tring U.D.C. has confirmed its decision to allow Aylesbury T.C. to place a transformer kiosk in Frogmore Street, and to complete its overhead transmission system in Akeman Street.

Doncaster T.C. has received permission from the Electricity Commissioners to instal at the generating works a 6 000 kW turbo alternator and two 30 000 lb. boilers and contingent plant.

Loans for Peterborough Extensions.

Peterborough T.C. is applying for loans of £37 300, balance of expenditure in connection with the extension of the electricity works, and £2 224 for the conversion of 183 gas lamps to electricity.

Kirkham District Council has had under consideration the question of a supply of electricity from the Preston-Blackpool overhead line for distribution among consumers in Kirkham and Wesham.

Duncan's Electricity Supply Co. has appealed to electricity consumers in the burgh of Ellan to restrict their use of electrical energy, as fuel supplies will only last eight weeks at the present rate of consumption.

An electrical installation for the public lighting of Stanley (co. Durham) was formally opened last week. The complete scheme involves the provision of 559 public lamps, and 210 have so far been provided.

Owing to the increased cost of coal, Dewsbury T.C. has increased the charge for electricity for lighting by 5 per cent., and for power and heating, and on the rateable value and restricted power system by 15 per cent.

The Egham and Staines Electricity Co. has notified the local authorities of its intention to lay cables in Harmondsworth, along School Road and Kingston Road, Ashford, and from Ashford Common to Cadbury Lane.

Liverpool Corporation has authorised application being made to the Electricity Commissioners for sanction to the borrowing of £95 600 for new electricity mains, services, sub-stations and equipment for the Norris Green housing estate.

At Halifax many power consumers' accounts have increased in consequence of the automatic increase in the charge for electricity due to the rise in the price of coal, but decreased consumption owing to trade depression has in some cases more than counterbalanced the extra cost of power.

Electrical undertakings in the West of England are having to rely almost wholly upon foreign coal to keep the works running. A three hundred ton cargo from Rotterdam has been discharged at Teignmouth within the past few days for the use of several of the smaller companies in South Devon.

A Peacehaven Project.

Newhaven R.D.C. has decided not to approve an application by the Peacehaven Electric Light Co. for a Special Order to establish a generating station in the district. Ratepayers at Telscombe asked the Council to oppose the application on the ground that Brighton Corporation had been applied to for a supply.

Guildford T.C. will undertake shortly two big extensions of the electricity mains to supply part of Onslow Village, and to extend the supply in the Aldershot Road area. Direct labour will be employed on the cable laying, but the wiring work on the Aldershot Road estate is being done by local contractors.

It had been hoped that Preston Corporation would be able to give a bulk supply of electricity to Blackpool during the coming winter. The coal stoppage, however, is stated to be affecting the delivery of steel work for the overhead cable between Preston and Blackpool, and it may be early next summer before the work is completed.

Bromley (Kent) T.C. has decided to give the Bromley (Kent) Electric Light and Power Co. notice of its intention to purchase the company's undertaking. The Order was obtained by the old Local Board in 1891, and in 1898 was transferred to the Electric Light Co., the local authority retaining the right to purchase at the end of every seven years.

An engineer of the Grampian Electricity Supply Co. has recently surveyed the burgh of Kingussie, Inverness-shire, with a view to the provision of an electricity supply for the district. The prospects of getting power from the Greynack burn are being considered, although it is believed that greater possibilities of development would be assured by utilising the Tromie river, some three miles distant.

At a meeting of the Western District Committee of Stirlingshire last week a letter was read from the Clyde Valley Electrical Power Co. stating that they had been approached regarding the extension of their cable to Milton of Campsie. The cost was estimated at £3 000, and, as the revenue would be small, they asked whether the District Committee was willing to bear a substantial portion of the cost. The matter was remitted to the local committee to consider.

The Electricity Commissioners have refused consent to Barrow-in-Furness Corporation's application for authority to erect a hydro-electric station at Backbarrow, on the river Leven, and to borrow £90 000 for the work. The Commissioners suggest that the Corporation should negotiate for an increase of its bulk supply from Vickers, Ltd. The General Purposes Committee of the T.C. has decided to protest to the Government against the Commissioners' decision.

Letterkenny U.D.C. recently considered the position in regard to the proposed electric lighting scheme for the town. The Town Clerk said they would require a loan of at least £6 000, and that they had tried to get it and failed. When they had an electrical scheme in view on another occasion several firms in England wrote that they were prepared to offer the money. Mr. Diver said on account of the division in the country they might not be so ready to do it now. The Local Government Ministry has been informed of the position.

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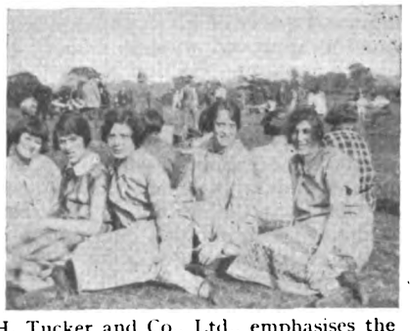
NEWS PICTURES

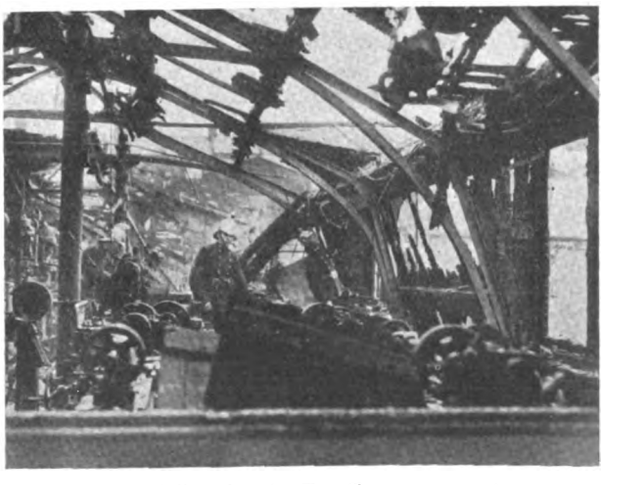
Mr. A. R. Hardie, director of the Eastern Telegraph Co., and Mrs. Hardie, who have celebrated their golden wedding. Our illustration is taken from a photogravure reproduction from a portrait done in oils by a well-known artist, and presented to Mr. Hardie by nearly 1 700 members of the staff on his retirement from the position of secretary, after 52 years' service with the company, and on his election to a seat on the board.

To demonstrate the robust construction of their valves, a wireless firm exhibiting at the National Radio Exhibition dropped this valve on the floor without damaging the filament.



This trio of snapshots taken at the annual sports at Tyseley, of the staffs of J. H. Tucker and Co., Ltd., emphasises the popularity of the tug-of-war events. On the left is the ladies' team (press section) and to the extreme right is the ladies' drilling section team resting after a good pull. In the centre is the men's (tool-room section) team with the cup which they won.

A general view of the National Radio Exhibition at Olympia, the exhibits at which are referred to on page 291. The exhibition is by common consent the most representative of its kind ever held in this country, and it remains open until September 18th.



This photo, specially taken for THE ELECTRICIAN, shows part of the damage done by last week's fire at the works of Allen West and Co., Ltd. Fortunately, as we are able to state on page 301, the damage was much less serious than certain newspaper reports would suggest.

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WIRELESS NEWS.

Scheme for the Registration of Wireless Traders and Repairers.

APPARENTLY encouraged by the success of the National Register of Electrical Installation Contractors, the Radio Society of Great Britain and the Wireless League have, through a joint committee, launched a scheme for the registration of wireless traders and repairers.

The sign for use outside registered wireless traders' premises.

The scheme approximates very nearly to that of the N.R.E.I.C., though the entrance fee is only £3 3s., with an annual renewal fee of £1 1s. The initial fee includes the supply of a sign for display outside the registered trader's premises as well as a certificate of membership. The sign, a reproduction of which is seen alongside, is certainly distinctive, but we could wish that its design were a little more pleasing.

Among the objects of the Register are the elimination of the undesirable trader and the provision for the public of trustworthy information as to the capabilities of wireless traders and repairers.

Qualifications for Registration.

Registration may be given under either of the two following sections: (*a*) approved wireless trader; (*b*) approved wireless trader and repairer. Section (*a*) includes those traders who can be depended upon to sell reliable goods and to give satisfactory service to the public. Section (*b*), in addition to the above, includes those traders who are competent to undertake repairs and maintenance of wireless apparatus and accessories.

Applicants for appointment as traders and repairers must satisfy the Joint Committee of their *bona fides* and will be required to furnish detailed information as to their premises, technical staff, machinery, etc. The premises of those appointed under the scheme will be visited from time to time by accredited representatives of the Joint Committee. These representatives will be independent of all trade influence.

Further particulars can be obtained from the offices of the Joint Committee of the Radio Society of Great Britain and the Wireless League, Chandos House, Palmer Street, London, S.W.1, and at the stands of the respective bodies at the National Radio Exhibition, Olympia.

Wireless News in Brief.

No decision has yet been arrived at in regard to the appointment of a chairman of the new British Broadcasting Corporation.

Permission has now been given to Mr. W. Maton, of Hythe, to relay broadcast programmes from his private "wireless exchange," provided that he and all his subscribers hold wireless receiving licences.

A meeting of the newly-formed Lancashire and Cheshire Radio Wholesalers' Association was held in Manchester on September 1st, but a representative of THE ELECTRICIAN, who attended, was denied admission.

It is stated that Mr. G. Marconi is engaged upon a scheme for preventing collisions at sea, by means of wireless beams sent out from lighthouses, an obvious advantage of this system being that the signals would not be affected by fog.

Standardisation of radio equipment is being carried out in America by the radio section of the Associated Manufacturers of Electrical Supplies. The committees of the different sections of the Association develop standards for the instruments with which they are concerned, and these are submitted to the technical committee of the section, which considers whether they are suitable for the requirements of the industry. The number of radio standards approved up to the present is 31, and others are nearing completion.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

aggregate from January 1st is R.735 793, decrease R.41 401.

The electrification of the Central Railway of Brazil is to be begun shortly. The first portion of the system to be converted will be the Rio de Janeiro suburban lines, comprising about 40 miles of track.

Burnley Corporation expects increased receipts from the running of double-deck cars to the Turf Moor Football Ground, which will be made possible by the removal of an old culvert in Yorkshire Street.

A new tramcar depot and motor garage, covering an area of 4 515 sq. yd., is to be erected adjacent to the "Jungle" garage in the centre of Sheffield, at a cost of £100 000. It will house 100 tramcars and (in the upper storey) 80 'buses.

Traffic receipts on the tramways controlled by the Underground Group and on the Tramways (M.E.T.) omnibuses for the week ended August 28th were £39 800, an increase of £500; the aggregate from January 1st is £1 267 700, decrease £40 000.

The "scarlet and cream" luxury tramcar which has been running on the London County Council lines to Wimbledon for some time has been greatly appreciated, and the L.C.C. has decided to equip similarly 100 cars. About £23 000 will be spent upon the adaptation of existing cars to the new design.

Overhead "points" which transfer the trolley poles of tramcars from one line to the other when the cars reach the termini have been very satisfactory at Bradford. Experiments have been made with a similar method at Leeds, where the changing over of the trolleys causes delay of traffic, and it has been decided to adopt the automatic system.

The first of the new through tramcar services in and between Manchester and Salford was commenced on Sunday, August 29th, and additional routes for the through cars are being adopted week by week. The system of inter-communication, which may save tramways from the abolition predicted by some people, has been largely developed in this area, where the towns linked by tramways include Stockport, Hyde, Ashton-under-Lyne, Oldham, and Rochdale, in addition to Manchester and Salford.

Work in Prospect.

Trade Possibilities for Electrical Installation Contractors.

TRAFFIC receipts on the Madras Electric Tramways (1904), Ltd., in August, amounted to R.99 445, decrease R.3 476.

BRIGG (LINCS).—Housing scheme (20). Particulars, the surveyor.

BURY (LANCS).—Dairy premises. Particulars, Mr. C. R. Cooper, 20, Market Street.

DAGENHAM (ESSEX).—Post Office for H.M. Office of Works, King Charles Street, London, S.W.

DERBY.—New St. Mark's Church, Cowsley Road (£6 000). Particulars, the vicar of St. Paul's, Rev. W. H. Green.

DUMFRIES.—Dance hall, etc., for Mr. James Rankine, 181, High Street.

HODDESDON (HERTS).—Houses (17), Crossfield Road, for Home Makers, Ltd.

KIRKCUDBRIGHT.—Central 'bus garage, The Square, for Brook and Co.

LANARKSHIRE.—Housing scheme (266), Upper Ward District. Particulars, Mr. R. C. T. Mair, 9, Clydesdale Street, Hamilton.

MAIDSTONE.—Extensions, Tonbridge Road Schools (£11 200) Particulars, the contractors, Clarke and Epps.

MIDDLETON (LANCS).—Houses (100), Boarshaw. Particulars, the borough surveyor.

NEWMARKET.—Housing scheme, Fordham and Wicken. Particulars, Mr. A. E. Austin, 4, Hills View, Great Shelford, Cambs.

RUTHERGLEN.—Stonelaw School. Particulars, Mr. John Stewart, 20, Albert Street, Motherwell.

ST. HELENS (ISLE OF WIGHT).—Houses, Great Preston Road. Particulars, Mr. W. J. Day, Ryde.

THORNBURY.—Houses, Patchway. Particulars, Mr. F. W. Davies, High Street.

WALLASEY.—Houses (140), Lateral Road. Particulars, the contractors, Walter Hughes, Ltd., Birkenhead.

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COMPANY NEWS.

N.E.S. Co. Postpones Interim Dividend on Ordinaries—Further Improvement in Henley Shares—Edison Swan Rumours not Confirmed.

A SLIGHT damper has been put on the activity in the electrical share markets by the announcement of the directors of the Newcastle-upon-Tyne Electric Supply Co., Ltd., that, owing to the continuance of the coal strike and the uncertainty of its duration, they have decided to postpone consideration of the payment of an interim dividend on the ordinary shares. The quotation for the shares, however, is only slightly lower than a week ago. A rise of 1s. 3d. has taken place in Westminster Electrics. Metropolitan and District Railway ordinary stocks are respectively 1 and ½ lower; but the £10 shares of the Underground Electric Railways Co. of London have risen half-a-crown. In the manufacturing group Henleys have put on another half-crown.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
	Electricity Supply.				
10	Brompton & Kensington Ord.	31/3	31/3	45/-	24/-
4	Central Elec. Supp. 4% Deb..	90	90	100	67
15	Charing Cross Elec. Ord. (£1)..	44/4½	44/4½	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	49/4½	49/4½	52/6	20/3
6	,, ,, 6% C.P. ..	22/6	22/6	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	59/4½	59/4½	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	13½	13½	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	32/-	32/-	35/-	3/-
11	Metro. Elec. Sup. Ord. ..	36/10½	36/10½	41/6	8/-
4½	,, ,, 4½% C.P...	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/7½	21/10½	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	22/6	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord (£5) ..	16½	16½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	43/9	42/6	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
	,, ,, 6% C.P...	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	139½	139½	123	24
6	,, ,, 6% Pf. Stk.	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69	69	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	78½	78½	102‡	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	50½	50½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98‡	52
5	Lon. & Sub. Trac. A. Deb. ..	78½	78½	89	65
4	Lon. Un. Trams. 1st Deb. ..	47	47	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	64½	64½	101½	49
5	,, ,, 5% Deb. ..	68½	68½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	65	64	84½	19
3½	,, 3½ Pf. Stk.	63½	63½	88½	40½
3½	,, 3½% Deb.	60½	69½	92‡	51
3½	Met. Dis. Rly. Ord. Stk. ..	51½	52	58	12‡
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb.	65	65	73½	48½
—	Underground Elec. Rlys. Ord.(£10)	3‡	3‡	5‡	21/3
5	Yorks. (W.R.)Trams. Ord. ..	11/6	11/6	27/-	1/-
4½	,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
7	Brit. Elec. Tranaformer 7% C.P.	18/1½	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	67/6	67/6	62/-	26/6
6	,, ,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	23/-	23/-	23/4	19/7½
7	,, ,, ,, 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	25/7½	25/7½	29/-	10/-
‡15	Callender's Cable Ord... ..	66/3	66/3	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref...	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)..	12/9	12/9	28/9½	1/11
7½	,, ,, 1st Pref...	21/3	21/3	26/-	5/-
10	Elec. Construction Ord. ..	31/3	31/3	30/4	6/7½
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	16/3	16/3	29/3	7/3
6	,, ,, 6% C.P... ..	18/-	18/-	21/3	10/6
6	Ericsson Telephones 6% C.P...	21/10½	21/3	21/-	12/7½
6	Ferranti 6% Pref.	19/4½	19/4½	18/6	16/9
7	,, 7% 2nd Pref... ..	18/-	18/-	19/-	13/9
5	,, 1st Mort. Deb. Stock..	91½	91½	96½	80½
7½	General Elec. Ord.	31/6	31/3	59/-	13/6
20	W. T. Henley's Ord.	85/-	82/6	86/6	23/3
27½	Johnson & Phillips Ord. ..	66/3	66/3	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	25/7½	25/7½	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	47/6	47/6	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	31/4½	31/10½	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	28½	28½	56/2/6	19½
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	75	74½	87½	60
10	Eastern Ord. Stk.	180½	180½	213½	113/2/6
3½	,, 3½% Pref. Stk.	65½	65½	84/17/6	49
4	,, 4% Deb. ..	79½	79½	103½	60
10	Eastern Extension Ord. (£10)..	10½	10½	21½	10/12/6
4	,, ,, 4% Deb. ..	78½	78½	97½	60
22	Gt. Northern Telegraph (£10)..	27½	27½	42/12/6	19
‖10	Indo-European (£25)	47½	46½	59‡	25
—	Marconi's Wireless T. Ord. ..	15/-	15/-	9/16/3	20/9
7½	,, Int. Mar.	20/-	20/-	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	18½	18½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	78½	78½	10	60/2/6

¶ Plus 3 p.c. in respect of 1921.

‡ Plus share bonus.
‖ Including bonus.

ERICSSON TELEPHONES, LTD.—Div. on original 6 p.c. cum. pref. shs. payable September 15th.

AMERICAN TELEPHONE AND TELEGRAPH CO.—Quarterly div. of 2¼ p.c. on cap. stk., payable October 15th.

RANGOON ELECTRIC TRAMWAY AND SUPPLY CO., LTD.—Intm. div. 8 annas p. £1 sh. on ord. shs., payable September 30th.

BARCELONA TRACTION, LIGHT AND POWER CO., LTD.—Div. 1¾ p.c. on 7 p.c. non-cum. participating pref. shs. payable September 30th.

OFFICIAL QUOTATION.—The Stock Exchange Committee has ordered 119 832 shares of common stock of no par value of the Manila Electric Corporation to be quoted in the Official List.

CLYDE VALLEY ELECTRICAL POWER CO., LTD.—Dirs. have decided to pay intm. div. 3 p.c. actual, less tax, on ord. shs., the same as a year ago, the total for 1925 being 8 p.c., less tax.

WINNIPEG ELECTRIC RAILWAY CO.—Gross earnings for six months ended June 30th, 1926, $2 775 287, agst. $2 683 383. Operating exes. $1 927 204, agst. $1 940 533; net earnings $848 082, agst. $742 850.

VENEZUELA TELEPHONE AND ELECTRIC APPLIANCES CO.—Dirs. have received offer for the undertaking of the company, and will call a meeting of shareholders as soon as terms have been provisionallv arranged.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—The company has this year applied £75 000 in purchases in the market of debenture stock, thereby complying with the provisions as to redemption for the current year.

TYNESIDE TRAMWAYS AND TRAMROADS CO.—Net receipts for half-year to June 30th, £1 784 (against £1 963), plus blce. brought in of £991. After deducting interest on mortgages, etc., £914 remains to go forward. No div. has been paid on ord. shs. since 1922.

SHAWINIGAN WATER AND POWER CO.—The directors have authorised the issue of $2 500 000, par value, of the common stock at $150 p. sh. Stock is offered to shareholders on the basis of one share for each 10 shares held. Subscriptions will be payable in full on November 1st.

NEWCASTLE-UPON-TYNE ELECTRIC SUPPLY CO., LTD.—Intm. divs. at fixed rates have been declared on both classes of pref. shs., but owing to continuance of coal strike and uncertainty of its duration the directors have decided to postpone consideration of payment of an int. div. on ord. shs.

WESTERN TELEGRAPH CO., LTD.—The register of members and the transfer books will be closed from September 16th to 22nd, inclusive, preparatory to paying on September 29th a div. of 5s. p. sh., making with previous divs. a total distribution for the year ended June 30th, 1926, of 10 p.c. tax free.

AMERICAN BOSCH MAGNETO CORPORATION.—Net income for quarter ended June 30th, $104 844, after provision for depreciation but before payment of federal taxes, etc., is equivalent to 50 c. a share on 207 399 shs. of no par capital stock outstanding, agst. £165 263 or $1·19 a sh. on 138 266 shs. in corresponding quarter of 1925. For the half-year to June 30th the net income was $243 752, or $1.17 a sh., agst. $241 895, or $1.75 for the first half of 1925.

SOCIÉTÉ INTERNATIONALE D'ENERGIE HYDRO-ELECTRIQUE.—It is stated that there is in course of formation an important Canadian Electrical Trust which will consolidate and extend the operations of the Société Internationale d'Energie Hydro-Electrique, which is a holding syndicate organised in Belgium by M. Alfred Lowenstein. It owns substantial interests in the Barcelona Traction Co., the Brazilian Light and Power Co., the Mexican Light and Power Co., and other similar concerns.

BRAZILIAN TRACTION LIGHT, HEAT AND POWER CO.—At the recent annual meeting in Toronto, Mr. E. R. Wood, the vice-president, said the new contract with the State of Sao Paulo was very advantageous to the company, and he regarded this as the preliminary to the arrangement of better rates in Rio de Janeiro. The power situation in both states was all that could be desired. The first unit of the company's plant extension would be in operation shortly, and the second unit about six months hence. There were adequate facilities for the production of sufficient energy to meet both present and prospective requirements for a long time.

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EDISON SWAN ELECTRIC CO., LTD.—The time for the ordinary shareholders to send in their assent, if they think fit, to the offer which has been made, through the firm of H. Lescher, Stephens and Co., chartered accountants, to purchase the ordinary shares at 13s. each expires on Tuesday. As we have already announced, the directors recommend acceptance of the offer. Statements have appeared in the Press to the effect that the offer originated with the Power Securities Corporation, which owns the share capital of Balfour, Beatty and Co., and that it is believed to be the intention to amalgamate the Edison Swan Co.'s business with that of the British Thomson-Houston Co. Inquiries made by a representative of THE ELECTRICIAN have elicited from the Edison Swan Co. neither confirmation nor denial of these statements. The Power Securities Corporation informed THE ELECTRICIAN on Wednesday that they "know nothing about it."

New Companies.

CYLINDER TOP OILERS, LTD.—Cap., £7 000. Electrical and general engineers, etc. Solicitor: F. W. Bell, 18, Park Lane, Leeds.

KET METAL AND DEVELOPMENT CO., LTD.—Cap., £30 000. Electrical and general engineers, etc. Reg. office: 75, Windsor House, Victoria Street, Westminster, S.W.1.

F. PORTER, LTD.—Cap., £500. Factors, manufacturers, licensors and licensees of electrical materials, appliances, etc. Solicitors: Goate and Bullock, 35, Bayley Lane, Coventry.

UNITED KINGDOM MANUFACTURING CO., LTD.—Cap., £100. Manufacturers of, and dealers in, wireless and other electrical apparatus, etc. A first director: A. F. M. Hicks (gov. dir.), 235, Queen's Road, Wimbledon, London, S.W.19.

Metal and Chemical Prices.

TUESDAY, September 7th.

		Price.	Inc.	Dec.
***Copper*—**				
Best Selected	per ton	£65 5 0	—	5s. 0d.
Electro Wirebars	,,	£67 5 0	—	5s. 0d.
H.C. Wire, basis	per lb.	9 11/16d.	—	—
Sheet	,,	9 11/16d.	—	—
***Phosphor Bronze*—**				
Wire (Telephone) basis	per lb.	1s. 1 1/16d.	—	—
***Brass* 60/40—**				
Rod, basis	per lb.	7 1/2d.	—	—
Sheet, basis	,,	9 1/2d.	—	—
Wire, basis	,,	10 1/2d.	—	—
***Pig Iron*—**				
Cleveland Warrants	per ton	£4 13 0	6d.	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£13 10 0	—	—
***Lead Pig*—**				
English	,,	£34 0 0	—	5s. 0d.
Foreign or Colonial	,,	£32 12 6	—	7s. 6d.
***Tin*—**				
Ingot	,,	£298 10 0	£3 15 0	—
Wire, basis	per lb.	3s. 10d.	1d.	—
Aluminium Ingots	per ton	£120 0 0	—	—
Spelter	,,	£34 0 0	—	7s. 6d.
Mercury	per bottle	£15 10 0	—	—

Sulphur (Flowers)—Ton £11 10 0 ***Sodium Chlorate***—Per lb. 3d.
,, (Roll-Brimstone)—,, £10 5 0 ***Sulphuric Acid*** (Pyrites, 168°)
Copper Sulphate— ,, £23 10 0 per ton, £7 15 0
Boric Acid (Crystals) ,, £37 ***Sodium Bichromate***—Per lb. 3½d.
Rubber—Para fine, 1s. 8d.; plantation 1st latex, 1s. 7⅞d.

The metal prices are supplied by British Insulated Cables Ltd.

The Lead Market.

Violent Price Fluctuations Accompany Very Slow Demand.

THERE is little change in the actual position of supply and demand (James Forster and Co. state in their lead market report dated September 4th). The former are adequate for all requirements, the import for August reaching over 20 000 tons, and the demand from consumers throughout the week was very slow, and that only for early requirements. However, the prospects of the autumn trade are regarded as quite good, and there is no excess of imports to be expected.

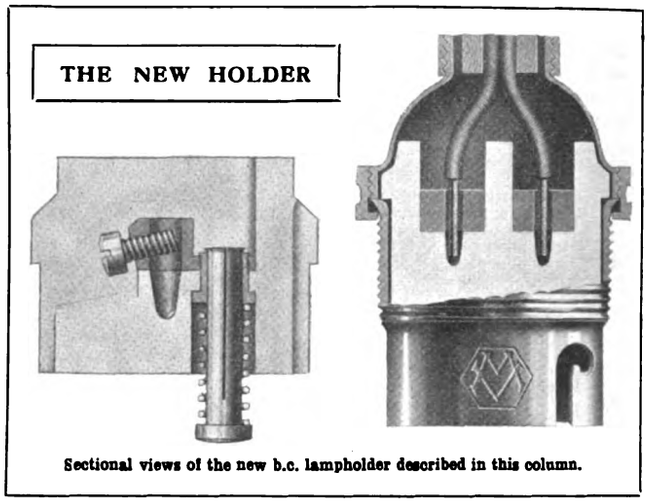
On Monday and Tuesday, markets each day saw a rise of 3s. 9d. per ton, making for August shipment 21s. 3d. advance in the three market days. On Wednesday August shipment sold as low as £32 7s. 6d., September £32 7s. 6d., and £32 for December. On Thursday the closing prices were: September £32 2s. 6d. and December £31 17s. 6d. August sold at £32 5s., a reduction of 20s. in two days. Closing prices on September 3rd were £32 8s. 9d. for September and £32 1s. 3d. for December, against £32 17s. 6d. for August and £32 7s. 6d. for November at the end of last week.

LAMP HOLDERS.

An Improved B.C. Type of Interest to Installation Contractors.

IT is not often that we have to refer to anything new in the shape of lampholders, but the new "Emvee" bayonet cap lamp holder, made by Metro-Vick Supplies, Ltd., under the provisional patents of the Mycromet Manufacturing Co., and just introduced to the market by the first-named firm, is of particular interest.

This fitting, of which we illustrate sectional views showing the new type of plungers and the lamp holder when wired,



Sectional views of the new b.c. lampholder described in this column.

has solid plungers, which slide through long bushes screwed into the terminal blocks, the upper portion of each plunger being split to make good rubbing contact. The phosphor-bronze springs, which are much larger, heavier and stronger than usual, are outside the plungers, and are not depended upon to carry the current.

The terminals are at the back of the porcelain, into which they are deeply recessed, and are very accessible. They are of substantial construction, and there is no fear of stripping the thread of the pinching screw. Another feature is that the porcelain is stronger than the usual pattern, the "S" ridge of which is easily broken if dropped. Owing to its great current carrying capacity, the new lampholder is claimed to be particularly suitable for use with large gasfilled lamps, and appliances such as irons, vacuum cleaners, bowl-fires, etc., can be connected to it without fear of trouble.

The rubbing contact ensures that the current passes direct from the leads to the plungers; moreover, the contact surface at the end of the plungers is said to be more than double that of the ordinary type, while their pressure on the contact plates of the lamp cap is more positive. Being solid the plungers will not burn through should arcing occur.

Wiring is very much simplified, as the bared ends of the wires are inserted direct into the terminals without having to be threaded through the porcelain.

An interesting constructional feature is the provision of adequate bearings for the plungers to slide in, thus keeping them in proper alignment. Further the terminal block cannot come away from the porcelain, being secured to it by a screwed sleeve which is riveted.

The holders appear to be well adapted for outside work as the only metal parts exposed at the front of the porcelain are the springs and plungers, and these become completely shrouded by the porcelain when a lamp is inserted in the holder, and are thus protected from the corrosive action of the atmosphere.

A. H. Hunt Ltd., having secured the sole agency for a well-known French manufacturer, are now able to supply from stock any types of small electrical measuring instruments of the spring controlled or high resistance or moving coil dead beat types.

Bruce Peebles and Co., Ltd., have available for loan for lecture purposes a collection of 135 lantern slides showing a.c. and d.c. motors and generators of all types and sizes, synchronous motors, synchronous induction motors, boosters, motor generator sets, rotary converters, and their special Peebles-la Cour motor converter.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

DE LEENW AND CO., LTD., Sentinel House, Southampton Row, W.C., wireless manufacturers. £57 3s. 6d. July 26th.

ELECTRICITY FINANCE AND DISTRIBUTION CORPORATION, LTD., 121, Cheapside, E.C., electricians. £55 2s. 10d. July 6th.

ENGLISH ELECTRIC WIRING AND FITTINGS CO., 161, West Street, Sheffield, electrical engineers. £22 1s. 5d. August 4th.

HASLAM, William, Irongate, Derby, electrician. £10 1s. 8d. July 29th.

KEATING, Thomas Archer, 186, Westcombe Hill, Blackheath, electrical engineer. £62 11s. 4d. July 16th.

MORTON, Mr. R. W., 2, Spring Road, Hale, Altrincham, electrical engineer. £14 18s. 6d. July 7th.

SMITH, Harold L., 156, Tredegar Road, Bow, electrical engineer. £52 6s. 1d. July 12th.

Deeds of Arrangement.

HEYWOOD, Herbert John, 2, Garvan Road, Greyhound Road, Fulham, and 1, Benbow Road, The Grove, Hammersmith, mechanical and electrical engineer. Filed September 1st. Trustee, G. Hay, 22, Basinghall Street, E.C., C.A. Liabilities unsecured, £520; assets, less secured claims, £102.

STEPHENS, Percival Campbell, 83, Stretford Road, Hulme, Manchester, and 92, Hyde Road, West Gorton, wireless accessory dealer. Filed September 2nd. Trustee, A. Yearsley, 27, Brazennose Street, Manchester, accountant. Liabilities unsecured, £590; assets, less secured claims, £800.

Receiverships.

AUTOCHROME SIGNS, LTD.—H. Button, of 61 and 62, Lincoln's Inn Fields, W.C.2, was appointed receiver on August 27th, 1926, under powers contained in first and second mortgage debentures dated April 9th and August 18th, 1925.

ELLIS AND SONS (1923), LTD.—J. Rutherford, of 9, Basinghall Street, E.C., was appointed receiver and manager on August 27th, 1926, under powers contained in instrument dated January 1st, 1925.

SEEAR, SCOTT AND CO., LTD.—A. J. Kirby, of 7, Drapers Gardens, E.C., was appointed receiver and manager on August 26th, 1926, under powers contained in debentures dated January 26th and August 28th, 1917, January 21, 1919, and March 27th, 1920.

WARNOLITE, LTD.—R. A. Hargreaves, of Lloyds Chambers, Market Street, Colne, was appointed receiver and manager on August 26th, 1926, under powers contained in debenture dated July 7th, 1925.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

KENT BROS. ELECTRIC WIRE CO. AND E. H. PHILLIPS, LTD., London, W.—Registered August 30th, debenture, to bank; general charge. *£10 000. December 31st, 1925.

LIVERPOOL ELECTRICAL INSTALLATION CO., LTD.—Registered August 26th, £1 000 (not ex.) charge, to Anti-Vibration Electric Lamp Co., Ltd., 22, Martin Lane, E.C.; general charge. *Nil. December 31st, 1925.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

LEE AND CHURCHILL, LTD., importers of wireless parts, etc., 3, Hanover Court, Milton Street, London, E.C. At the statutory meeting of creditors in the voluntary winding-up of this company a statement of affairs was presented which disclosed liabilities of £1 956, of which £1 031 was due to unsecured creditors, whilst there were secured creditors, including a debenture for £650, of £925. The assets consisted of stock in warehouse at cost, £392; stock with warehousemen estimated to realise £537; cash at bank, £30; office furniture, £25; good book debts, £292; and doubtful and bad debts, including a dishonoured bill for £500, £730, expected to realise £74, making a total of £1 350, or a deficiency of £606. The liquidator stated that after the secured claims had been satisfied he expected the creditors would get about 8s. in the £. In reply to a creditor the liquidator stated that the company was formed in September, 1924, with a nominal capital of £5 000, of which £825 had been subscribed in cash. A considerable amount of business was done with Germany and bad debts had been incurred. The liquidator went on to say that the turnover of the company during the past year had been about £3 050. There had been a loss on trading for that period, but he could not give any further details as he had not examined the books fully. The debenture holder was a Mrs. Lee. Replying to another creditor, the liquidator said that the stock had been taken on a conservative basis, and there was every possible chance that it would fetch more than the amount set out in the statement of affairs. The debenture was created in April, 1926, and one of the main reasons for liquidation was that a bill for £500 had been dishonoured. The liquidator added that at the present time a receiver for the debenture holders had not been appointed. After some discussion a resolution was passed confirming the voluntary liquidation of the company, with Mr. H. M. Betteridge, accountant, of 8, Henrietta Street, W.C.2, as liquidator.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Company Winding-up Voluntarily.

MIDGLEY CAR LIGHTING CO., LTD.—By Special Resolution August 13th, confirmed August 31st. Sir Albert William Wyon, K.B.E., 3, Frederick's Place, Old Jewry, London, appointed liquidator. Meeting of creditors, 1A, Cockspur Street, London, S.W.1, on Friday, September 17th, at 2.30 p.m. (The company is being wound up for the purposes of an amalgamation, and all creditors will be paid in full).

Notice of Dividend.

UTTLEY, Benjamin, 212, Central Drive, Blackpool, electrician. First and final dividend, 2s. 1d. per £, payable, September 15th, Official Receiver's offices, Byrom Street, Manchester.

Notice of Intended Dividend.

NORTH, Alfred, and NORTH, Fred, trading as A. AND F. NORTH, 38, Bradford Road, and Market Place, Dewsbury, wireless and electrical engineers. Last day for receiving proofs, September 21st. Trustee, F. Gomersall, 16, Bond Street, Dewsbury.

Bankruptcy Information.

BRITTAIN, Percival Frederic, trading as BRITTAIN'S ELECTRIC MOTOR CO., East Down Works, Dermody Road, Lewisham, S.E.13, and at 110, Cannon Street, London, E.C., electrical engineer. Receiving order, September 1st. Debtor's petition. First meeting, September 10th, 12 noon, and public examination, November 17th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

HALL, Frank Southern, 189, Gatley Road, Gatley, Chester, electrician. Receiving order, September 3rd. Debtor's petition.

Bankruptcy Proceedings.

TENUR, LTD., 1C, King Street, St. James's, S.W. Under a compulsory winding-up order made last March upon the petition of a creditor, accounts have now been submitted showing liabilities £5 141 (unsecured £2 511); assets valued at £2 019, but absorbed in debenture claims; and a deficiency of £2 514. With regard to contributories, the issued capital being only £3. The Official Receiver and Liquidator reports that the company was formed in February, 1924, with a nominal capital of £100, to acquire certain rights and benefits in connection with an electric advertising machine called "Mirovista," in respect of which letters patent for Germany had been obtained. The company acquired from Mr. C. G. Moller of Denmark (the vendor) the sole selling rights in Great Britain and Ireland, France, Switzerland, Italy, Holland, Belgium, Spain, Portugal, Sweden, Norway, Turkey, and the U.S.A., and it was also to apply for the International registration of the trade mark "Mirovista." The company entered into contracts with two firms for the exclusive right to use and vend the invention in Great Britain, Ireland, the Channel Islands, the Isle of Man, and South America, but they failed to take the minimum number of machines provided by the contracts, and proceedings commenced by the company for breach of contract were pending at the date of the winding-up order. The failure of the company is attributed to such breach of contract and to inability to find a further market for the company's goods.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

242 915 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. X-ray tubes comprising an incandescent cathode. (21/3/25.)
236 945 British Thomson-Houston Co., Ltd. Supports for brushes of dynamo-electric and like machines. (11/7/24.)
240 798 International General Electric Co., Inc. Protective arrangements for electric installations. (6/10/24.)
242 926 M. Buchholz. Device for indicating and determining the position and extent of sparking and other disturbances in transformers, choke coils, and other electrical apparatus operating in an insulating medium. (24/3/25.) (Addition to 198 936. Divided application on 7 933/25.)
242 928 Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.) (Western Electric Co., Inc.). Transmission of wave energy for high-frequency signalling. (27/8/24.)
242 930 Soc. Anon. des Anciens Etablissements Siegel and Stockman Reunis. Carriers and terminals for electric lamps. (2/3/25.)

BY GUM — IT'S STUCK!

WHAT is? The attractive coloured poster stamp which has been prepared for use in connection with the E.D.A.—E.L.M.A. Better Home Lighting Campaign.

Why not give a hand in "wiring the homes of Britain" by sticking one of these stamps on all letters, accounts and envelopes during the progress of the Campaign? The stamps are supplied by the E.D.A. at 2s. 6d. per thousand.

243 038 J. Scott-Taggart. Amplifying-apparatus, particularly for wireless reception. (24/5/24.)
243 039 J. Scott-Taggart. Wireless receiving apparatus and the like. (18/6/24.)
243 046 E. Liebfich. Production of solutions containing oxides of chromium, and the electrolytic separation of chromium from such solutions. (13/8/24.)
243 049 E. Belin. System of facsimile telegraphy by wireless signals. (15/8/24).
243 054 H. W. Cox. Mechanically-connected fluid tap and electrical switch. (19/8/24.)
243 056 C. Seymour, G. Shearing, and H. G. Hughes. Thermionic valves or vacuum tubes for wireless telegraphy and telephony. (19/8/24.)
220 945 R. H. H. Geffcken and R. H. Richter. Electric alarm devices. (23/8/23.)
243 063 British Thomson-Houston Co., Ltd., A. P. Young and J. H. Butcher. Electromagnetic instruments for converting oscillating currents into sound, and vice versa. (20/8/24.)
243 065 W. Smith. Crystal and like detectors for wireless reception. (20/8/24.) (Cognate application, 11 885/25, a divided application on 19 771/25.)
243 067 L. V. Petersen. Electric current collectors for the ignition distributors of internal-combustion engines. (21/8/24.)
243 069 R. B. North and A. Massey-Allen. Magneto-electric machines. (21/8/24.)
243 070 Automatic Telephone Manufacturing Co., Ltd., and W. Altken. Automatic or semi-automatic telephone systems. (21/8/24.)
243 080 Hall Telephone Accessories, Ltd. (F. W. Hall). Coin collecting means for telephone service. (23/8/24.)
243 088 Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.) (Western Electric Co., Inc.). Transmission of wave energy for high frequency signalling. (27/8/24.)
243 093 Lancashire Dynamo and Motor Co., Ltd., and R. S. McLeod. Heat exchangers specially applicable for cooling the circulating air of dynamo electric machines and the like. (29/8/24.)
243 102 V. A. Foot. Telephonic apparatus. (6/9/24.)
243 125 British Thomson-Houston Co., Ltd., H. Trencham, H. C. Heath and C. W. Newton. Electric switch gear. (30/9/24.)
223 580 Compagnie Generale de Telegraphie Sans Fil. Application of two-grid valves. (15/10/23.)
243 136 A. Cormond. Electrical switches, circuit breakers, or like appliances. (22/10/24.)
243 137 Radions, Ltd., and H. J. Osborn. Electric lamps, thermionic valves and the like. (25/10/24.)
243 139 Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) (H. R. van Deventer). Conductive element for use in the manufacture of, and improvements in, inductance coils or magnetic cores for transformers, electro-magnets, or other electrical apparatus. (27/10/24.)
243 140 Relay Automatic Telephone Co., Ltd., B. B. Johnson and G. A. Hollings. Automatic telephone systems. (28/10/24.)

Applications for Patents.

August 16th.

20 141 A. Adcock. Distant control of wireless receivers.
20 197 A. Barnay. Telephone systems. (17/8/25, France.)
20 214, 20 215 A. Barnett. Commutating rectifiers for alternating electric currents.
20 185 F. A. Boysen and H. Schnfelder. Generation of electric current by internal-combustion engines.
20 186 H. Charlet. Dynamo-electric machine.
20 170 Cie. des Forges et Aciries de la Marine et d'Homecourt and E. Granat. Differential electric distant control device. (5/10/25, France.)
20 150 H. J. Hinks. Radio receiving apparatus.
20 140 J. R. Holmes. Electric switches.
20 192, 20 193 J. Kremenezky (Firm of), and L. Wimberger. Mercury-vapour rectifiers. (26/8/25, Austria.)
20 194 J. Kremenezky (Firm of), and L. Wimberger. Mercury-vapour rectifiers. (16/7/26, Austria.)
20 171 Metropolitan-Vickers Electric Co., Ltd. Electro-magnetic circuit interrupters, etc. (25/8/25, U.S.)
20 172 Metropolitan-Vickers Electric Co., Ltd. Control systems for dynamo-electric machinery. (25/8/25, U.S.)
20 177 Osterreichische Siemens Schuckertwerke. Systems for automatic regulation of electric generators. (29/8/25, Austria.)
20 179 J. H. T. Roberts. Electron-emitting devices.
20 180 J. H. T. Roberts. Exciting electron emission.
20 131 D. Suchostawer. Automatic telephone exchange.
20 165 A. F. Sykes. Telephonic apparatus.

August 17th.

20 285 E. S. Andrews (Elektro-Automaten). Electric signs.
20 278 British Thomson-Houston Co., Ltd., and F. H. Clough. Protection of overhead electric lines.
20 219 A. G. Long and A. Stradling. Automatic earthing switch.
20 322 S. F. McCord. Loud-speakers.
20 263 J. C. McDonald. Polyphase relay.
20 293 Metropolitan-Vickers Electrical Co., Ltd., and A. E. L. Scanes. Electric insulation-filled casings.
20 286 B. F. Miessner. Electric signal amplifying and repeating systems. (17/8/25, U.S.)
20 284 Reigate Radio Co. and S. H. Rundle. Electric distant control apparatus.
20 320 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Impedance-measuring bridges.
20 305 D. M. Sutherland. Electric insulation board.
20 315 Telefunken Ges. fur drahtlose Telegraphie. Kerr cells, and control means therefor. (18/8/25, Germany.)
20 242 W. A. E. Tyers. Electric terminal.

August 18th.

20 376 R. Atkins, A. E. G. Frearson and Ormond Engineering Co., Ltd. Electric inductance coils, etc.
20 377 R. Atkins, M. R. Magar and Ormond Engineering Co., Ltd. Low frequency transformers.
20 387 A. Blondel and G. T. Guy. Device for electrically coupling motors.
20 371 British Thomson-Houston Co., Ltd. (Allgemeine Elektricitats Ges.). Windings for transformers.
20 360 C. W. Goyder. Stabilisation of high-frequency oscillations.
20 338 A. McKellar. Electric globe holders.
20 386 Marconi's Wireless Telegraph Co., Ltd. Means for regulating, etc., electric motors, etc. (19/8/25, U.S.)
20 339 W. T. Mould and E. Whiteley. Thermionic valve holders, etc.
20 385 Neufeldt und Kuhnke Betriebs ges. Telephone receivers. (19/8/25, Germany.)
20 364 A. Poulain. Electrical advertising, etc., apparatus. (3/9/25, Switzerland.)
20 405 G. de Cairos-Rego. Conversion of electrical impulses into sound, etc. (31/8/25, Australia.)
20 359 F. M. T. Reilly. Loud-speakers.
20 406 Standard Telephones and Cables, Ltd. Methods of reducing noise in telephone circuits. (7/9/25, U.S.)

August 19th.

20 492 Chloride Electrical Storage Co., Ltd., and B. Heap. Electric accumulators.
20 420 H. Clarke and Co. (Manchester), Ltd., and H. Ingham. Choke coils, etc., for wireless receivers.
20 450 G. Hovey. Wireless receiving apparatus.
20 486 W. G. R. Jacob, N. W. McLachlan and W. S. Smith. Cable telegraphy, etc.
20 418 J. H. Laybourne. Hydro-electric power plants.
20 417 L. I. Leslie. Electrically-operated relays, etc.
20 485 N. W. McLachlan and W. S. Smith. Means for supplying electric current to thermionic valves.

August 20th.

20 614 M. Andis. Electrically driven hair clippers. (26/6/26, U.S.)
20 615 M. Andis. Electric motors. (26/6/26, U.S.)
20 564 R. Annan. Radio signalling apparatus.
20 554 R. J. Wainwright Brown. Wireless telegraphy, etc.
20 593 Dunford and Elliott (Sheffield), Ltd., and T. L. Williams. Electric lighting systems for motor cycles.
20 625 R. S. Elven. Telephone jack.
20 594 Igranic Electric Co., Ltd., and G. A. Mower. Radio receiving sets.
20 527 L. I. Leslie. Electric relays, etc.
20 596 M. Liebermann. Electric discharge tube. (21/8/25, Germany.)
20 532 R. Lomax. Electrical fuse and fuse boxes.
20 533 R. Lomax. Electrical service devices for households.
20 551 N. Martin, and J. Sankey and Sons, Ltd. Radiators for cooling alternating current transformers.
20 596 C. H. F. Muller (Firm of). Electric discharge tube. (21/8/25, Germany.)
20 612 Siemens-Schuckertwerke Ges. Means for cleaning electric gas-purifying chambers. (21/8/25, Germany.)
20 580 A. K. Smith and B. Toulmin-Sykes. Voltage regulators for electric generators.
20 548 J. Walker. Electrically heated cooking cabinets.
20 549 J. Walker. Electrically heated cooking ovens.
20 605 G. Weissman. Electric cells. (30/11/25, France.)

August 21st.

20 660 A. E. Beattie. Wireless receiving apparatus.
20 679 British Thomson-Houston Co., Ltd. Thermionic valve circuits.
20 687 General Dry Batteries, Inc. Dry cell. (24/8/25, U.S.)
20 644 A. W. Griffin. Crystal detector.
20 661 K. E. Hartridge. Aerials for wireless telegraphy.
20 662 W. S. Thimblethorpe. Electrical signalling apparatus for vehicles.

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Friday, September 10th-18th.

National Radio Exhibition.—New Hall, Olympia, Kensington. Daily 10.30 a.m. to 10 p.m.
Universal Smoke Abatement Exhibition.—Bingley Hall, Birmingham.

Tuesday, September 14th.

Electrical Contractors' Association (Leicester Branch).—Ordinary meeting Corridor Chambers, Leicester. 2.30 p.m.

Tuesday, September 14th-16th.

Institution of Public Lighting Engineers.—Annual meeting and exhibition, Newcastle-on-Tyne. Papers by Major S. Cook on "Public Lighting from a Motorist's Point of View"; Mr. J. F. Colquhoun on "Improved Lighting of a City"; Mr. R. Beveridge on "Hours of Lighting"; and Mr. J. Christie on "Electric Public Lighting."

Thursday, September 16th.

Electrical Contractors' Association (Liverpool Branch).—Ordinary meeting 6 p.m.

Friday, September 17th.

E.D.A.—E.L.M.A. Autumn Campaign.—Inaugural luncheon, Hotel Cecil, Strand, London.

Friday, September 17th-25th.

Eighth "Model Engineer" Exhibition.—Royal Horticultural Hall, Westminster.

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THE ELECTRICIAN

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The Electrician.

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RAILWAY ELECTRIFICATION.

AN engineer faced with a new project generally begins the work of carrying it out in a mood of either optimism or pessimism. If in the former his enthusiasm is likely to outrun his discretion, and the chastening effect of overcoming the obstacles, which inevitably occur, soon force the disadvantages rather than the advantages into the forefront of his thoughts. When the scheme is over and done with he is therefore likely to remember the nuts that were hard rather than those that were easy to crack; and this may be reflected in the attitude with which in retrospect he regards the whole matter. On the other hand, when he is pessimistic to begin with, his mental and psychological apparatus works the other way and he will probably finish up in a more cheerful mood than that in which he started. Applying this general statement to a particular case we may consider the points of view from which engineers regard the important problem of railway electrification. Some are enthusiastic, some are the reverse; but both these classes have unfortunately generally had little to do with the question in practice. There remains a small third class who have actually carried out railway electrification schemes on a large scale and have had experience with their operation. The attitude of these engineers is important. Of that small class no worthier representative could be found than Dr. E. HUBER-STOCKAR, who until a short time ago was chairman of the Electrification Department of the Swiss Federal Railways. As we pointed out last week, Switzerland has now nearly 750 miles of railway electrified, or a larger proportion of the national system than any other country. His views on both the present and the future are therefore entitled to close attention. These views are given in a report which he presented to Section E of the World Power Conference at Basle. This report will be found in abstract on another page of this issue. After what we have just said, it will come as no surprise if we add that he is not so enthusiastic as those who have watched with misgiving the supineness of our own railway companies in this matter, would have wished. Nevertheless, Dr. HUBER-STOCKAR is, as might be expected, fully aware of both the technical and economic advantages of railway electrification, and it is his sense of justice alone which prevents him becoming a whole-hearted propagandist. His attitude is in fact well summed in the plea for a consideration of a standard method of describing and analysing electric traction equipment and its operation, so that the data on the question which already exists may be collated in a comparative form. This is a most valuable suggestion and we hope means will be found to adopt it. British engineers in particular will find such an analysis a most useful weapon. For the acid test of electrification is its effect on the balance sheet, and though we have no doubt that that test would be successfully applied in many cases in this country, an element of risk is present which must be successfully counteracted.

Dr. HUBER-STOCKAR'S analysis of the possibilities and results actually obtained with electric traction is highly interesting. On the technical side, he says, the relative positions of electric and steam traction are not likely to be altered. Electrification once undertaken has never been regretted, nor has a return ever been made to steam traction. But there is nevertheless a feeling that the economical margin in favour of electrification is not great enough to justify its widespread adoption. Conversion can in fact only be successful if increased traffic follows. But this also applies to all improvements which necessitate a large capital expenditure, and it may well happen that electrification is a less risky improvement than many of the others. The difficulty of course is, as Dr. HUBER-STOCKAR rightly points out, that considering a railway system as a whole traffic may decrease or increase at so slow a rate that the economic results may be unfortunate, especially as every new capital expenditure makes a railway more sensitive to such a decrease or slow increase. This argument does not, it may be added, apply to portions of large systems such as the London suburban lines, where capital expenditure is necessary in order that the growing traffic may be carried at all and where measures for dealing with such growth are already long overdue.

In certain countries electrification may be desirable for what may be called extra-economic reasons. That is, it may be brought about by the need for utilising native water power instead of coal, or for creating new opportunities for industry and trade. It then becomes a political matter. Even so, the basis on which it must be judged is economical, as an unsuccessful investment endangers the credit of a State equally as it does that of an individual.

This is an entirely judicial and much-needed summary of the position. And that being the case, added weight

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is lent to the arguments in favour of electrification with which Dr. HUBER-STOCKAR concludes his report. He does this after a careful analysis of the reasons why the electrification of existing steam lines has been undertaken, dividing these into those due to technical and economical reasons and those which are fundamentally neither, but which are otherwise advantageous. He divides electrification projects into lines electrified for test purposes; lines which pay better when electrically rather than steam operated, such as mountain railways, and lines which could be operated by steam for any length of time without loss, but upon which electrification is undertaken to unify the system or for economic reasons. Such conversions must not however be considered as disadvantageous, as careful extensions in general have beneficial results.

It is axiomatic that electric traction is superior to steam when the following factors are present: dense traffic, expensive coal, cheap electricity, high labour costs, steep gradient, low capital charges. Unfortunately these are all quantitatively indeterminate and may not exert their full effect for some time. In fact, the questions raised by them admit of no general answer, and the only way to decide them is to compare the case under consideration with a similar one where electrification has already taken place. These fortunately exist in large numbers.

This all forms a fundamental reason for the more careful collection of data in order that the work of electrification may be energetically pushed on. For in that field there is no doubt that electricity lags. As Mr. W. S. MURRAY has said, the reform of our transport systems has not kept pace with industrial production, so that while 80 per cent. of the electrical energy produced is used in industry the railway demand is still exceedingly small.

Current Topics.

"E.D.A Expects—."

THE duty is laid on electricity supply undertakings manufacturers, contractors and others who keep electric shops of obtaining without delay a generous supply of copies of that famous booklet, "Electric Lighting in the Home," and of the publicity matter which accompanies it. The first public advertisement announcing the opening of the E.D.A.-E.L.M.A. campaign will appear on Sunday, October 3rd, but even before then the public will have been made aware of its inauguration by the reports of the luncheon which takes place to-day. Early demands for the booklet may therefore be expected, for the chance of obtaining a £2 000 house—and an all-electric one at that—for the expenditure of a little brain fag and a postage stamp does not occur every day. It will be stupid, therefore, for any electrical shopkeeper to neglect to provide himself with copies. To have to say to the eager enquirer, "We haven't got ours yet, ma'am," will not do the campaign any particular good, but it will do the shopkeeper who makes this reply a great deal of harm. There is another reason for early application. We understand that Mr. BEAUCHAMP is at present renting acres and acres of floor space for the storage of booklets. It would be a charity to relieve him of that expense.

Coal and Shop Lighting.

IT is from every point of view desirable that the stoppage in the coal industry should be brought to a conclusion as soon as possible. From the more particular aspect of the electrical industry its continuance cannot fail to have a harmful effect on the success of the "Home Wiring" Campaign. This campaign largely depends on propaganda, one of the most important factors in which is shop window lighting. And in some parts of the country shop window lighting is being restricted, in our opinion unnecessarily, by the regulations issued by the local fuel controllers. The breakdown in the supplies of British coal has given the managers of our electricity supply undertakings much anxiety, but they are still perfectly capable of meeting the demands made upon them and will, we believe, continue to be in that fortunate position. The restrictions are therefore unnecessary. They are also unwise because they are local in their application and are directed against one section of the community alone. There is a further point of great importance, which may affect the good that the campaign can do. Unlike the gas companies, no general steps have been taken by the electricity supply undertakings to raise their prices. But there are exceptions to this rule, and we appeal to those undertakings to hold their hand. The coal strike must be settled before long and it will then be possible without delay to make good the temporary losses that are being suffered. To be able to say that the prices were not raised during the dispute will be an excellent advertisement and any loss incurred thereby might well appear on the appropriate page of the ledger.

London Tube Extensions.

THE opening on Monday of the extension of the City and South London Railway from Clapham to Morden and of the new loopline between Charing Cross and Kennington should do much to improve the traffic facilities in an important section of South London, and it says much for the enterprise of the London Underground Railways that it has been possible to carry out this work under the present difficult conditions and in face of some opposition. The City and South London Railway was, of course, the pioneer tube railway, and its usefulness has been greatly increased by its recent "circumferential" extension and connection with the Hampstead Tube at Camden Town. The lines opened this week mark the conclusion of a burst of post-war development and provide the tube railways companies with over fifty-one miles of track, most of which is of a "tube" character. It has been hinted that with the exception of certain small interconnections, this is to be the end. If that is so, it leaves certain areas of London, notably in the north-west, untouched, areas, too, which are not otherwise blest with modern railway facilities. The problem, like most others at the present time, is in the main financial. Tube railways are costly to construct, and therefore require an enormous traffic to render them profitable. The present capital of the three tube railways proper is nearly £40 000 000, on which a gross revenue of £3 000 000 is earned, but the interconnection which has recently taken place, not to speak of the useful feeders provided by the omnibus service, should tend to improve the position. We therefore hope that stagnation will not set in, but that further extension will be made as traffic demands and occasion renders possible.

Tramways and the Future.

THAT a certain change in viewpoint has taken place is to be deduced from the deliberations at the conference of the Municipal Tramways Association, which took place in Liverpool last week. Since the war two general claims have been made at these gatherings. One that Parliament should step in and relieve the tramway undertakings from some of their financial burdens, and the other that the same body should restrict the activities of the motor 'bus. The opinion now, however, seems to be that Parliament can do little to help those who do not help themselves, and that the motor 'bus might well be used instead of abused. This is much saner. The President, it is true, gave voice to the old complaint about road upkeep and argued that the principles of monopoly must be applied to traffic in our towns, but subsequent speakers mainly took the line that there was room for everybody at least to the extent that the vehicle which provided the best service for a particular set of conditions should be encouraged. There is no doubt, as Mr. MATTINSON said, that competition has been a good thing for the tramways, and future policy is likely amply to confirm this dictum.

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Electricity in Agriculture.

It may be taken as axiomatic that the more a country is able to rely for its nutriment on the foodstuffs which it produces for itself, the sounder its economic position is likely to be. Unfortunately Great Britain cannot attain this ideal, but at the same time there is no doubt that we might become more self-supporting than we are at present. In other countries the position is different, but it is clear that, even in them, those concerned are aware of the necessity of increasing the productivity of the land. This is brought out in the valuable report, of which a summary will be found on another page of this issue, presented by Mr. F. Ringwald to the Sectional World Power Conference at Basle. The subject was " The Application of Electricity to Agriculture," and it is evident from the information submitted by the various delegates that strenuous efforts are being made the world over to increase the use of electricity on the land and that new, and even strange, ways are being discovered for assisting the farmer by electrical means. For instance, in Japan electricity is being used for preparing tea (in the early stages), for silkworm rearing, for rice husking, and for killing the moths which do enormous damage in the rice fields. It is being employed in Germany for sterilising milk as well as for such more obvious purposes as producing artificial rain, ventilating cowsheds, warming hothouses, and preserving fodder. A most important use to which it can be put is for heating water. Hot water is not used to the extent it might be on the farms, because it is difficult to obtain. Electric water heaters, however, form a useful night load, and their use could be encouraged with advantage both to the supply undertaking and the farmer. As the French report points out, the problem is financial rather than technical, and, apart from any other reasons, increasing labour difficulties will lead to a greater use of electricity on the land. It is clear that the prospect is bright. In the meantime much useful propaganda work can be done, while the need for devising new methods of application and perfecting the equipment must not be forgotten.

Public Lighting Problems.

The Conference of the Institution of Public Lighting Engineers, which took place at Newcastle this week, led to a number of interesting points being raised, particularly with regard to statutory obligations to provide public lighting. Mr. Colquhoun, public lighting engineer to Sheffield, mentioned a point that is not generally realised. This is that in Scotland Local Authorities are subject to a statutory requirement to provide adequate public lighting, whereas in England no such provision exists. This is worth noting, for it certainly seems anomalous that these bodies should not be compelled to light their streets properly, though it is compulsory for all obstructions on roadways to be illuminated at night. The problem, however, resolves itself largely into that of framing a definition of what constitutes adequate public lighting. As is well known the interpretations in different cities vary greatly. This is one of the chief difficulties in ensuring proper lighting on arterial roads which pass through areas under separate control. It is also curious to observe that even the period for which public lamps must be kept alight varies according to the caprice of the authorities, though the adoption of the " one hour after sunset to one hour before sunrise " principle is apparently pretty general. The impression formed is that, in the near future, street-lighting must cease to be a parochial matter and become a national obligation, at any rate on important thoroughfares from city to city. It is possible that the Ministry of Transport may ultimately be induced to take action in the matter.

Smoke Abatement.

The Smoke Abatement Conference did useful work last week in considering the part played by the domestic fireplace as a national dirt producer. Some figures given by Mr. E. D. Simon and Miss Marion Fitzgerald showed that kitchen ranges are not being put into a large proportion of houses that are now being built and that, what is more important, in quite a number of them they are being displaced by electric cookers. Dr. Raymond Unwin, chief architect of the Ministry of Health, and Mr. Pointon Taylor, his chief assistant, in fact described electricity as an ideal alternative to coal for cooking, for though it cost more per thermal unit, its great efficiency went far to outbalance this disadvantage. That more remains to be done in this way is evident from Dr. Fishenden's remark that the use of raw coal in the home is actually increasing and it is quite time, as she said, that the problem confronting the association is the production of a satisfactory smokeless substitute for raw coal, which, used in conjunction with electricity or gas, would make feasible the elimination of the domestic smoke nuisance. Mr. A. S. E. Ackerman, for his part, tackled the problem even nearer the source and suggested that much more use should be made of our 500 000 H.P. of water power. Doubtless the new Central Electricity Board will bear this is in mind. The information given at the Conference leaves no doubt in our minds of the necessity of passing the Bill, which is now before Parliament, into law. Though there is no objection to the principles involved there is some opposition to its details, part of which is well founded and part of which is merely factious. We hope this will be overcome, for there is no doubt that a law which would assist to mitigate the smoke nuisance and incidentally to reduce expense and to increase health is worth doing a good deal to obtain.

Wireless and British Railways.

In a letter which we publish in our correspondence columns this week Mr. W. T. Kelly argues that British railway companies are to blame for failing to take advantage of wireless communication for the benefit of their passengers. He refers particularly to the broadcasting of home and foreign market reports, and there is no doubt that business men to whom the earliest information on these subjects is important would welcome such a service. On the other hand, apart from the conservatism of the railway companies, the organisation of a service of this kind would not be without its difficulties. The ether, we are being constantly told, is overcrowded, and to prevent its further congestion it would be necessary to carry out this work as part of the broadcasting programmes. But the broadcasting programme is also crowded and could not in fairness to the very numerous listeners be constantly interrupted for the announcement of market reports. These would have to be given, as they are already by many stations, at fixed times and we are not quite sure that this would meet Mr. Kelly's views. Speaking as a member of the public, moreover, we cannot regard with equanimity the interruption of the present comparative peace of a railway journey in the way suggested. Nevertheless it is desirable that the whole subject should be considered, and we hope that the railways will give it their close attention.

The Trade Returns.

As was the case last month, the serious effect of the coal stoppage on the export trade of the country is reflected in the Board of Trade returns for August. Compared with the same month last year, the imports have increased in value by £9 329 000, of which coal accounted for £7 541 000. The quantity of coal imported amounted to 3 970 442 tons, as against 1 021 tons in August, 1925, and this amount also shows an increase of 1 650 442 tons over that imported in July, 1926. The exports fell by £11 251 000, of which coal was responsible for £3 157 000, cotton goods for £3 810 000, and iron and steel for £3 157 000. Fortunately the electrical exports, although £216 000 less than for the preceding month, showed an increase of nearly £140 000 on August, 1925.

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PARIS SUBURBAN ELECTRIFICATION.

Details of the Cable and Track System—Avoiding Ice Troubles—Third Rail Insulations.

By THEODORE RICH

THE current for the electrified lines of the Western State Railway in the Paris suburban area is supplied from two power stations built for railway traction, lighting and power supply only, one at La Garenne on the north-west, and the other at Meudon in the south, both on the River Seine. The power station and sub-stations will be dealt with later. The high tension cable system operates at 15 000 V with 25 periods, the total length of cables at this pressure is not far short of 200 miles.

The cables are three-core armoured, the most usual sizes being 3 by 150 sq. mm. (0·23 sq. in.,) and 3 by 100 sq. mm. (0·155 sq. in.,) although for the supply of certain outer sub-stations 3 by 75 sq. mm. (0·115 sq. in.) and 3 by 25 sq. mm. (0·038 sq. in.) have been adopted. The high tension cables

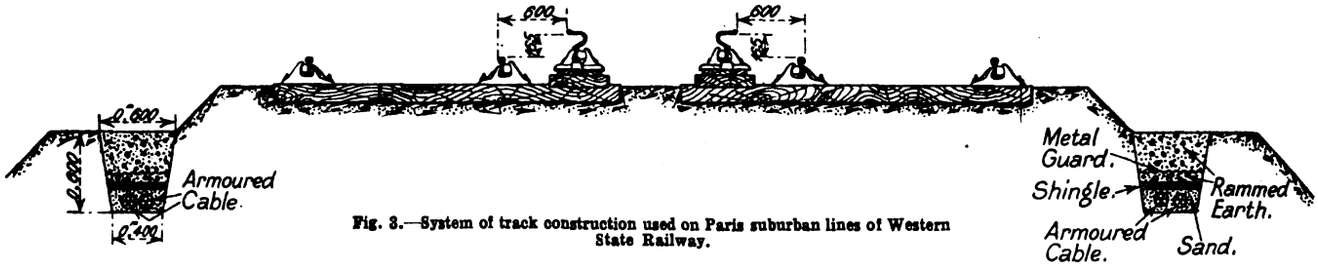

Fig. 3.—System of track construction used on Paris suburban lines of Western State Railway.

are usually placed alongside the track in trenches; they are covered with boarding and after a small space with a layer of expanded metal (Fig. 3). In Paris sheets of expanded metal are frequently used to indicate cables below in the case of conductors under the pavement. Where the tracks are on viaducts or other structures of masonry or steel the cables are placed in armoured concrete pipes, placed where feasible on cement brackets; when passing under the track cast iron pipes are used. Indicating plates showing the presence of cables are fixed to neighbouring walls, sleepers, etc. The general cable lay-out was settled before the war, and it is therefore interesting to compare the system used with the boxed cable system used on the Brighton Railway and the exposed armoured cables on wood or concrete supports used on

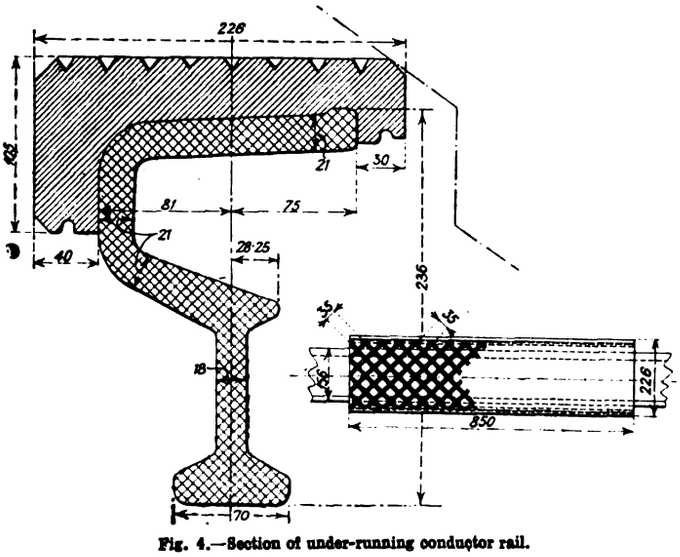

Fig. 4.—Section of under-running conductor rail.

some of the more recent installations at home. The exposed system must be convenient for jointing and maintenance, although when placed close to the track there must be some slight risk of damage in the case of a railway accident.

The third rail system is used with return by the track rails; in order to enable the rails to be used for blocking the signals, an alternating current is adopted with choking coils on the connections between the return feeders and each individual track section.

In order to avoid the troubles from ice, which have at imes given rise to great difficulties in North America, an

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under-running conductor system was adopted, as can be seen from Fig. 4. The conductor rail is rolled to a peculiar section; it weighs 76 kg. per m. or about 153 lb. per yd. One advantage of the under-running contact rail is the ease with which it can be insulated; in places where railway servants have to cross, a slab of cast basalt forms a cap over the rail, it is a good insulator, and, unlike wood, it is imperishable, it is not slippery and it rests by means of its own weight on the rail; it certainly makes a nice looking job. The rail is keyed to a cast iron chair with overhanging lips, the chair resting on a formed block of wood which in turn rests on a wooden slab about 17·7 in. by 10·25 in. by 3·5 in. (Fig. 5), The block and slab are impregnated with paraffin wax. The chair is coachscrewed through the block on to the slab, and this latter is in turn coachscrewed on to an extra long sleeper. These supports are placed at every fifth sleeper 4·50 metres (about 14 ft. 9 in.). There are no third rail porcelain or composition insulators at all, experience since 1900 has shown that these supports of paraffined waxed wood have proved in every way satisfactory; the leakage has been proved by tests to be of a negligible character. The conductor rail is made up in lengths of 13 m. (59 ft.).

At level crossings, switches, or at other points where the conductor rail has to be interrupted, a downward inclined plane is used to guide the under-running contact shoe.

The conductor rail is welded up into sections of about 250 m. by means of an alumino-thermic process. Each

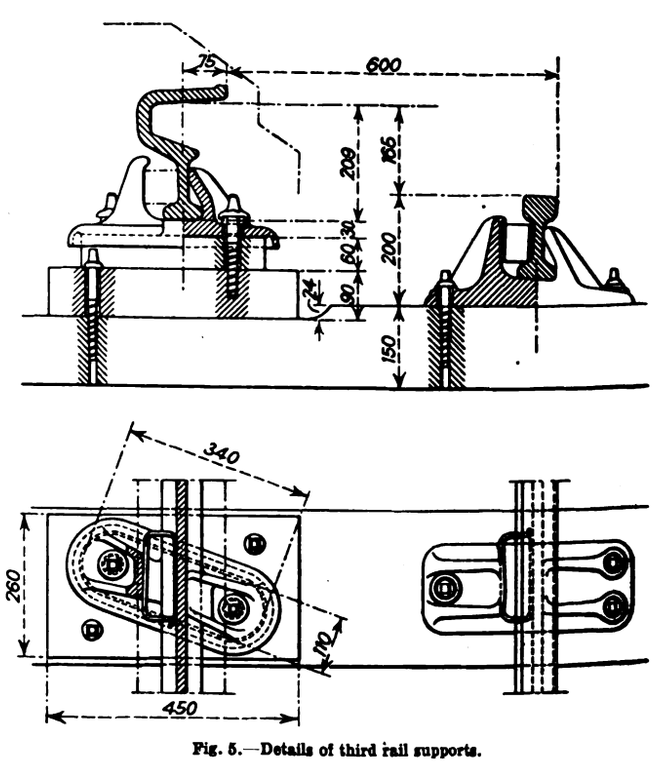

Fig. 5.—Details of third rail supports.

section of conductor rail is connected by means of an expansion joint, Fig. 6, which allows of a movement of 300 mm.

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(11·8 in.) The rail is anchored at about the centre of each section by means of the anchorage shown in Fig. 7.

The Western State Railway was originally built about the time of Louis Phillipe by English engineers, and therefore it happens that double-headed rails and cast iron chairs are used for the running track, instead, however, of the wood keys found on English railways spring steel keys are used.

Lazare Station, which supplies six tracks from which light and power is also taken for the Batignolles and Levallois railway repair shops and the Batignolles goods depot, a subway 2·5 metres (8 ft. 2 in.) wide and about 9 ft. high, with a floor about 18 ft. below track level has been constructed. The traction conductors in the subway are in the form of bars supported on insulators.

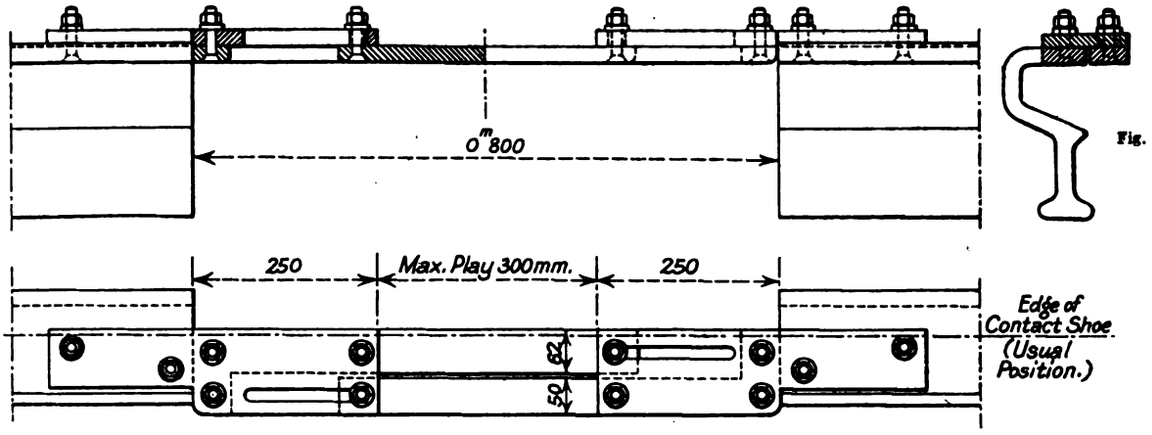

Fig. 4a.

Fig. 6.—Expansion joint used on third rail system.

Double rail bonds are used of the type shown in Fig. 8. Each bond has a copper section of 200 sq. mm. (0·31 sq. in.), giving at each rail length a total section of 800 sq. mm., or about 1·24 sq. in. In France as in Europe generally the rail

The conductor rails are cut up into insulated sections opposite each sub-station by means of a hard wood insulating joint, the connection is made from each conductor rail section to the feeder switches by means of two cables 400 sq. mm.

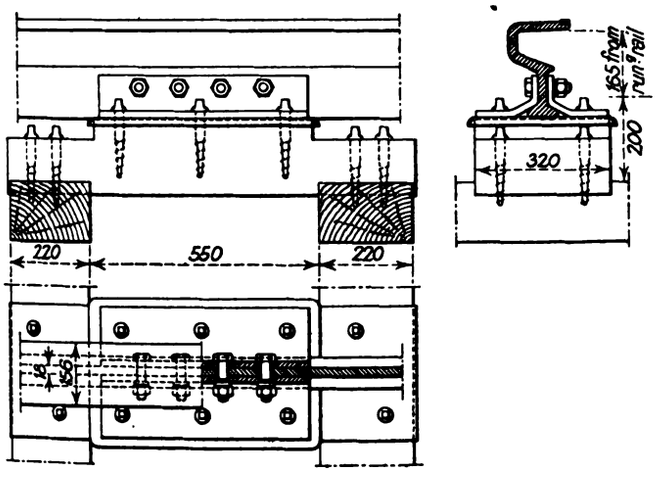

Fig. 7.—Views of anchoring arrangements.

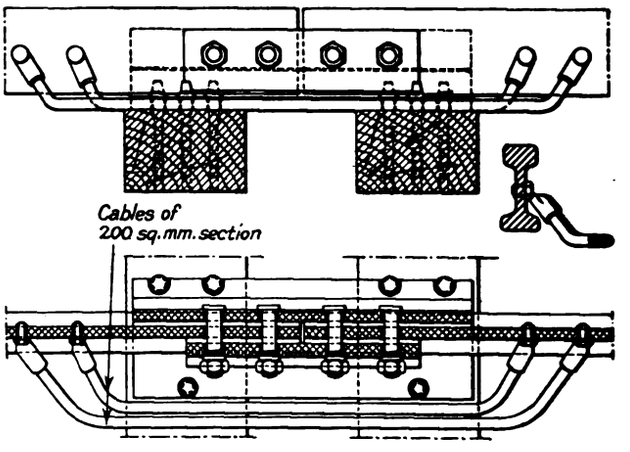

Fig. 8.—Arrangement of rail bonds.

joints are placed opposite one another, in America on the contrary they are usually staggered.

At the important sub-station at Pont Cardinet, outside St.

(0·62 sq. in.) section each, eight 200 sq. mm. cables connect each track section to the negative busbars of the sub-station.

EDUCATION IN ILLUMINATION.

Instructive Lectures for Day Workers.

DURING the past few years the Lighting Service Bureau of the Electrical Lamp Manufacturers' Association has organised a series of successful Illumination Design Courses lasting four consecutive days. Relatively few members of the industry are, however, able to spare so much time for the study of even such an important subject as lighting, and this winter, therefore, a series of lectures on electrical illumination is being given for those who are only free in the evening.

The lectures, of which a list is given below, will be held fortnightly on Monday evenings. Each subject will be dealt with by an expert, both from the theoretical and the practical points of view. In some cases those attending will be asked to design lighting schemes, under the guidance of the lecturer, and after each lecture discussion will be invited. Many new experimental devices and demonstrations have been introduced, and these will be incorporated in the programme.

Those desiring to attend are asked to apply early to the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, London, W.C.2, for a ticket of admission, as the accommodation is limited to 700.

The following is a list of subjects that will be dealt with :— "Lighting Fundamentals and Principles of Light Control"; "Simplified Methods of Designing Illumination Schemes"; "The Art of Home Lighting"; "Electric Lamp Manufacture and Economics of Light Production"; "Light as a Decorative Medium"; "The Lighting of Shops and Stores"; "The Principles of Flood Lighting"; "Possibilities of Colour Lighting"; and "Selling Better Lighting." The opening lecture will be delivered on Monday, October 11th, at 7 p.m.

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ELECTRIFICATION OF RAILWAYS.

Some Fundamental Financial Considerations—Obstacles to Operations on a Large Scale—Conditions where Electric Traction is Superior.

THE various papers on the Electrification of Railways which were presented to the Sectional World Power Conference, which recently concluded at Basle, were made the subject of an interesting general report by Dr. E. Huber-Stockar, who was formerly chairman of the Department for Electrification of the Swiss Federal Railways.

In the course of this report, Dr. Huber-Stockar states that the papers contain not only instructive detailed descriptions of the electrifications that have been carried out and very valuable records of technical and economical practical experience already gathered, but also interesting and suggestive considerations of fundamental questions involved, as well as comparative analyses of electric and steam operation.

Electrification, he continues, is the latest, and in certain respects technically the most difficult and economically the most doubtful application of traction for railway purposes. Electric traction has caught up with steam traction on most technical points, and on many it has even overtaken it, while further improvements may be expected. On the other hand, it is unlikely that any electro-technical novelties will fundamentally change the comparative positions of electric and steam traction, nor that steam locomotives or thermal locomotives of any other kind will be produced that will affect this position.

The number of electrifications that have already been carried out is not small, and it has never been decided to return to steam traction. On the contrary, many electrifications have been extended. But many electrifications on a large scale which have been carried out are, though generally admitted to be technically successful, not generally regarded as economically profitable, or an incitement to further electrifications under similar conditions.

Electrification schemes of this kind, however, are those which provide the most valuable basis for judging the superiority of electric traction over steam traction for the operation of railways generally. The question whether a proposed or existing electrification is going to pay is difficult to answer, and this difficulty is delaying many electrifications. Investigations involving a display of figures and calculations cannot be expected to decide whether or not electrification should be adopted. Electrification involves expenditure, and that expenditure can, as a rule, only be remunerative if the traffic increases. Electrification may be a less risky investment than other equally expensive improvements, but the fact remains that every new capital investment will make the railway economically more sensitive to a decrease in traffic. It is therefore easy to understand why even managers who believe in the benefits of electrical operation have not yet studied it on a large scale.

The Role of the State.

Electrification on a modest scale is not attractive to them because it could not, even if economically satisfactory in itself, materially improve the results of the operation of the railway as a whole. Conservatism of this kind is most pronounced among private railway companies, and, in fact, most electrifications on a large scale which have not been dictated by technical necessities, have been carried out by state owned railways. It would, however, be an error to suppose that state railways are less concerned with the economical success of electrification than private railways, for there may be beneficial effects which justify electrification without being its object, as has been the case in a number of countries, especially in Europe.

The hesitation of many railway companies in the matter of electrification is also due to technical reasons, especially the choice of system, though it is generally admitted that successful electrification depends less on this than on the way the work is carried out. The existence of different systems, both of electrification and of supplying the energy, has a deterrent effect. Comparatively few big railways have been constructed during the last ten or fifteen years, but in parts of the world where railways are needed for future development, electrification on a large scale may be expected, especially as no scrapping of equipment, such as is necessary when steam railways, are electrified will be required.

Dr. Huber-Stockar next deals at considerable length with the various reasons why the electrification of an existing steam railway may be economically or technically necessary, and points out that all railway experts have known for a considerable time that electric traction is superior to steam traction when the following conditions are present: dense traffic, expensive coal, cheap electrical energy, high cost of labour, steep and numerous grades, low interest on the capital required for electrification. A knowledge of these points, however, satisfies no administration which has to undertake the responsibility of electrification.

As regards the first four points, electrical operation will mean an improvement as compared with steam traction after a certain time, but all the factors are quantitatively indeterminate, for they only answer the questions whether the traffic is heavy, the grades numerous and steep, the coal not cheap enough and the electrical energy not too expensive, the savings in wages large, and the capital is not too expensive. These questions cannot be answered in a general way, but there are no cases which cannot be compared with some existing electrification.

Need for Operating Results.

The most effective and valuable aid to promoting electrification is likely to be the spread of a proper understanding of the results obtained with electric operation, both as regards equipment and traffic conditions. The very extensive literature on the subject can only be applied with difficulty owing to the great variety of ways in which the matter is presented, especially as regards the methods of comparing steam with electric traction. A standard method of describing and analysing the equipment of electric traction and its operation should therefore be considered.

Dr. Huber-Stockar finally summarises his report as follows:

(1) The electrification of railways by substituting electric for steam traction is a problem capable of a definite and technically satisfactory solution in every case.

(2) Electric traction has everywhere given satisfaction and is favoured by the staff, passengers and residents in the neighbourhood of the lines.

(3) Cases arise in which electric traction is the only possible solution from a technical and indirectly from an economic point of view.

(4) Conditions for electrification to be an economic success only appear to be present when traffic is heavy and gradients long and steep; favourable factors are cheap electric power and expensive coal and manual labour.

(5) Part of the economic success of an electrification can be sacrificed if the smoke nuisance is very great.

(6) Still further sacrifices may be made when the railways are state-owned according to the national benefit derivable from electric operation; in such cases, however, improvements in economy of working will in future be given first place, at least in the eyes of the railway authorities.

(7) No definite and easily applied rules for determining whether a railway is ready for electrification are available.

(8) Electrification can be promoted by publishing details of installations and working results. These should be comprehensive and exhibit a certain degree of uniformity, particularly as regards the definitions of numerical quantities.

"The Web of Finance."

MR. HUGH P. VOWLES contends that the control of capital and labour alike is passing into the hands of a diminishing number of powerful bankers and financiers and that "a despotism more monstrous than the world has ever known" is coming into being. To support this contention he publishes in "The Web of Finance" the considered statements of leading bankers, financiers, capitalists, economists and politicians who know and of those who are criticising the methods of high finance. Not the least useful portion of the book is a sort of "Who's Who" of those who contribute. Its chief value will be that it will cause more and more people to think about this matter whether they agree with the author's conclusions or not.

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PROGRESS IN PUBLIC LIGHTING.

Institution of Public Lighting Engineers Hold Successful Conference—Conditions in Various Towns—Local Authorities' Responsibilities.

PROGRESS in public lighting was reviewed in a series of papers read at the Third Annual Conference of the Institution of Public Lighting Engineers which was held in Newcastle during this week.

In his Presidential Address Mr. R. Davison expressed the view that the great progress made in other fields of lighting has not been accompanied by similar advances in street lighting. Very little progress has been made since pre-war days. Yet the great increase in motor-traffic called for new standards. It should be realised that in many cases it was possible to improve the lighting and yet to effect savings in cost. The lighting of public highways might well receive more consideration from the Ministry of Transport. When an arterial road passed through areas controlled by different authorities lighting conditions along the route might vary greatly. Mr. Davison submitted that some extension of the activities of the Ministry of Transport in this direction was desirable.

The Financial Side.

In the concluding portion of his address the president referred to conditions in Newcastle, mentioning that the lighting rate was 4·9d. in the pound, which was equivalent to only 0·73d. per head of population per week. It was difficult to believe that many people would not gladly pay double this amount in order to have their streets efficiently lighted.

The question of "Lighting Hours" was discussed by Mr. R. Beveredge. It was pointed out that there was no regulation —similar to that applying to the lighting of vehicles—in regard to public lighting. The schedules for the period during which lamps were lighted varied in each city. The need for some standard practice was emphasised and the technical problems involved discussed in some detail.

Accounts of lighting developments in Sheffield and Liverpool were presented by Mr. J. F. Colquhoun and Mr. Dickinson respectively, the public lighting engineers in these cities. Mr. Colquhoun described his experiences since he took over the lighting in 1924. Many of the fittings were in a stage of disrepair. Some new residential roads were unlighted and a large housing scheme had been initiated without any provision for the public lighting being made. By May, 1926, the number of electric lamps in use had been increased from 287 to 1 015, progress being facilitated by a reduction of 25 per cent. in the rate charged for electric street lighting. Special attention was devoted to tram and bus routes and a letter was quoted from the local representative of the transport workers, expressing appreciation of the improvements made. In some of the most important streets 1 000 W gasfilled lamps on posts 25 ft. high had been installed. As a result of experiments, in which the co-operation of motor-vehicle drivers was enlisted, the opinion was formed that with units 24 ft. high there was little objection to be taken from the standpoint of glare. The estimates for the current financial year represent a lighting rate of 6¾d. per pound or about ½d. per head of population per week. The author, however, submitted tables showing the variation in these quantities in different cities and pointed out that discretion was very necessary in applying this basis of comparison to public lighting.

Maintenance Problems.

In the latter part of the paper an account was given of the system of maintenance adopted in Sheffield. Conditions were difficult by reason of the fact that the large lighting areas had to be controlled from a single centre, but the arrangement now worked much more smoothly than at one time seemed possible. The formation of the Sheffield Illumination Society, for the benefit of staff workers had proved very successful, and had been of considerable benefit in arousing their interest in the work. Mr. Colquhoun also pointed out that whereas in Scotland the provision of adequate public lighting by an authority was enforced by Statute, in England there is no similar statutory provision. He suggested that English boroughs might with advantage assume legal responsibility for sufficient street lighting.

Mr. Harold Dickinson's paper dealt solely with electric street lighting. He recalled that experiments were made with electric lighting as far back as 1896. But it was only in 1896 that a real beginning with Brockie-Pell arc lamps was made. To-day the original installation was not much altered, except for the substitution of gasfilled lamps for arc lamps. From 1922 onwards the mileage of streets lighted electrically had greatly increased. There were now 83⅞ miles of streets so lighted, as compared with 10⅜ in 1922. Gasfilled lamps of 300 W staggered on either side of the road had been introduced on tram routes, but in some of the most important streets 750 W lamps were now used. The arrangements made for lighting arterial roads and roads in new housing estates were also described, and the methods of diminishing public lighting after midnight explained. The average cost of lamps for all classes of lighting amounted to about £7, and the average price of electricity for public lighting worked out to 1·56d. The system of overhead wiring and the problems involved in the maintenance of lamps were also discussed in some detail.

Motor Traffic and Lighting.

Another paper, by Mr. Edward Fryer (Deputy Secretary, the Automobile Association) discussed "Motor Traffic in Relation to Lighting." The author recalled some of the views he had expressed at last year's conference, emphasising the difficulty in securing continuous adequate lighting on highways passing through areas administered by different lighting authorities. Outside the large cities the Lighting Authority was usually too small a unit to deal with the problem adequately and more co-operation between adjacent authorities is desirable in the interests of uniformity. The existing legislation dealing with lighting was mainly permissive. Lighting authorities had no statutory obligation to provide adequate public lighting. It was, however, compulsory for anyone who deposited material on a road, or made holes in it, to fence and light the obstruction during the period from sunset to sunrise. Mr. Fryer discussed the co-operation of the Ministry of Transport in the lighting of highways. It would be unfair to take any portion of the motorist's money for highway illumination unless they could have a guarantee that the lighting would enable the motorist to proceed without powerful headlights. But he suggested that the Ministry might be approached with a view to their conducting experiments to determine the best methods of lighting.

He considered that advances in the design of lighting for private cars went far beyond those effected in public lighting. The methods, consisted of side and tail lights, dipping headlamps and a fog light, and lamps for instrument board inspection and passengers' use, as adopted on all A.A. staff cars, enabled one to drive in safety except in very bad climatic conditions. But such lighting could never take the place of good illumination on the highway.

A New Slide Rule.

A NEW slide rule which is intended to facilitate calculations involving the use of fractional or integral indices or the trigonometrical functions without interfering in any way with its use for ordinary arithmetical work has been devised by Mr. A. J. Anido, 60, Chancery Lane, London, W.C.2. After several weeks' experience with the rule we can confidently recommend it to the attention of electrical engineers as being likely to be useful in their particular work.

The rule is of the usual length, 10 in., with the ordinary four scales on the front face, but, in addition, two uniformly divided scales are provided on the upper and lower edges respectively. These scales give the mantissa of the logarithms of the numbers that are being calculated, one being used for numbers greater than, and the other for numbers less than unity. In the latter case the usual work of subtraction is avoided. Another correlated feature is that by setting the mantissa of the logarithm so obtained on the appropriate uniform scale the antilogarithm can be read off. The uniformly divided scales are also used to give the cosines and sizes of angles which can, it is claimed, be obtained to a higher degree of accuracy than on ordinary rules, owing to the fact that the angles are set on an evenly divided and not on a logarithmic scale, so that the trigonometric scales are much less crowded at their ends. A scale of tangents, similarly arranged to that on an ordinary slide rule, is provided. A large number of conversion factors are marked on the back of the slider, and are used in conjunction with the scales on the front of the rule.

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THE MUNICIPAL TRAMWAYS ASSOCIATION.

Annual Conference in Liverpool—The Ethics and Economics of Motor Bus Competition—Steps Towards the Co-ordination of Traffic Authorities.

THE Municipal Tramways Association held its twenty-fifth annual conference in Liverpool from September 8th to 10th, under the presidency of Mr. P. Priestly (General Manager of the Liverpool Corporation Tramways).

The conference was opened by a civic welcome from Ald. Sir Archibald Salvidge, P.C., K.B.E., who apologised for the absence of the Lord Mayor, and expressed the hope that the visit of the Association to the city would prove of mutual advantage. He added that in an effort to solve the traffic problem in Liverpool there was being constructed the largest tunnel in the world—not in length, but in width and dimensions—connecting the Lancashire and Cheshire sides of the Mersey. It would connect with the new road which was being constructed right through Lancashire and Yorkshire, and would thus link up, through the Mersey tunnel, Cheshire and the north of England.

The President then delivered his presidential address, in the course of which he remarked that the Association represented by far the largest passenger transport agency in the country. The number of passengers carried by tramways in Great Britain in 1925 was 4 620 501 521, while the total number carried by all the railways was 1 743 318 314. A little reflection clearly showed that the interests of every local authority, as well as of the commercial community, were directly bound up with this great question.

Referring to the effect upon the present high rate of local taxation of transferring to the rates the annual cost of the upkeep of the roadway now termed "the tramways permanent way," but which actually, he pointed out, formed part of the common highway, Mr. Priestly observed that the upkeep last year for this portion of the roadway was £2 168 000—a direct impost upon the users of tramways. If the annual demand for current at present made by tramway undertakings ceased, he said, the price of electricity for industrial and domestic purposes would have to be increased. Last year, it was interesting to note, 707 000 000 kWh, costing over £3 221 000, were used for operating tramways in Great Britain.

Expensive and Slow Procedure.

At their last conference, continued Mr. Priestly, the Association expressed its resentment at the restrictions and the expensive procedure, with the delay necessitated by that procedure, imposed upon local authorities anxious to keep abreast of the times by providing motor-bus services in conjunction with their tramway services. He referred in some detail to the unsuccessful efforts of the Association to secure legislation which would confer upon the Ministry of Transport powers to deal cheaply and expeditiously with applications from local authorities to operate motor-buses, and ensure that local authorities in their respective areas should receive at least equal opportunities with private individuals or companies interested in road passenger conveyance. It was common ground that the efficient organisation and adequate provision of transport facilities vitally affected housing and health, as well as the development of new residential and industrial districts. It was no less true that the redundant provision of such facilities entailed waste of every kind. The conditions in the London area, which were probably unexampled in the world, were a distinct warning to the rest of the country. It had been found necessary to declare a large number of streets "restricted streets" and to end competition, not only by enacting that no more vehicles should ply for hire in such streets, but also by removing or restricting some of the vehicles operating over them. This was a clear admission that passenger transport service in our large cities was outside the scope of competition and that the principles of monopoly must be applied to it.

Relations with Employees.

In a concluding reference to the general strike, Mr. Priestly observed that the relations between tramway authorities and their employees were undermined by the action of employees in treating the national agreement as a scrap of paper. If agreements were to be treated so lightly they would have to consider seriously whether it was not futile to enter into national agreements of this character.

Medals and prizes awarded for the best papers in an essay competition organised during the past year were next presented. The awards were as follows:—

Mr. A. H. BOGGIS (a clerical assistant in the L.C.C. Tramways Department), first place for a paper on "Legal Burdens on Tramways." (Silver medal and £15.)

Mr. J. W. GUNNING (Time-table Clerk in the Liverpool Corporation Tramways Department), awarded a prize for his paper on "Traffic." (Silver medal and £15.)

Mr. A. C. BAKER (son of Mr. Alfred Baker, of Birmingham, and Chief Engineer to the Birmingham Corporation Tramways), for the best paper on "Organisation of a Rolling Stock Department." (Silver medal and £15.)

Mr. W. T. RICHARDS (Rolling Stock Superintendent of the Rotherham Corporation Tramways Department), awarded a special silver medal for a paper on "Inter-Running Arrangements with Other Authorities." (It was not intended to give a prize for this subject, but the paper was of such outstanding merit that the adjudicators thought it was worth a silver medal.)

Mr. E. W. EDMONDS (Senior Technical Assistant, L.C.C. Tramways Department), awarded the prize for a paper on "Organisation of a Traffic Department of a Street Tramway System." (Silver medal.)

Mr. STANLEY DAWSON (Overhead Line Clerk, Rotherham Corporation Tramways Department), awarded the prize for a paper on "Overhead Line Equipment." (Silver medal.)

A paper on "Public Policy in Relation to Tramways and Motor Omnibuses" was then read by Councillor Major John Fitzgerald Jones, M.C.

There was no evidence, the author said, to indicate that the phenomenal growth of passenger traffic on our streets and highways was likely to be interrupted. Conversely, the aggressive development on the part of privately owned 'bus companies in or about areas operated by municipalities, with their statutory limitations, was occasioning deep concern on financial and social grounds, and was giving rise to problems with which Parliament alone could properly deal. He suggested that, unless legislation was speedily introduced to correlate and regulate all passenger road service, the country would reap a bitter harvest of financial loss, economic waste, and indifferent service. Their efforts should not be directed so much to insensate opposition to private enterprise as to the equalisation of the burdens and opportunities and to participation and co-operation in a co-ordinated service which would yield a maximum of benefit to the rider with a minimum of disturbance.

Control by Legislation.

It was perfectly obvious, Major Jones went on, that no measure of agreement would ever be attained voluntarily between rival undertakings, and, if the difficulties of the moment were to be met, legislative energy must be directed to devising a scheme in which these separate interests should become active participants in a great co-ordinated national service. The present system of national control in the production and distribution of electrical energy by municipal and private undertakings indicated their line of procedure.

On the question of employment, Major Jones suggested that employees should only be appointed on probation after physical and educational tests conducted by an independent authority. The introduction of such a system, he said, would attract the right sort of servant and allow the management to make impartial staff selections free from the demoralising influence of outside pressure, which was usually of a political character.

A long discussion took place on this paper. This, however, dealt almost entirely with two points, and can, therefore, be very shortly summarised.

General objections were expressed to the establishment of National and District Boards to deal with tramway matters, as suggested by the author, Ald. Fred Smith (Liverpool), stating that it was a cardinal error to rely on Parliament to deal with the complicated question of the traffc in our various towns and cities, while Ald. A. G. Ellerway (Birmingham) said that District Boards would lead to considerable delay. He also said that if there were equalisation of burdens, municipal enterprise had nothing whatever to fear from private enterprise.

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Ald. Smith also emphasised that the points to be aimed at should be to pay off the whole of the debt, and to deal with any extensions that were required out of the traffic for the time being. If they continued to borrow money, they must expect fresh opposition.

Ald. R. Waring (St. Helens) also disagreed with the author's advocacy of Parliamentary responsibility for the proper conduct and co-relation of all passenger transport services, and was supported in this view by Councillor Thickett who said that if municipal enterprise had a fair field and no favour, it could run private enterprise off the streets in no time. On the other hand, general approval was expressed of the idea of setting up Advisory Area Boards to secure harmonious relationships between the various undertakings in the same area.

A System of Czardom.

The other point dealt with was the "system of Czardom" implied in Major Jones' suggestions with regard to dealings with the employees. The Lord Mayor of Birmingham refused to believe that public authorities were in any sense corrupt as had been suggested.

In the afternoon, a Paper on "Road Passenger Transport" was read by Mr. Alfred Baker, general manager of the Birmingham Corporation Tramways.

Mr. Baker said that the slogan of "Scrap trams" was invented and fostered by people interested in other methods of traction. Until traffic thoroughfares could be widened, much could be done to improve congestion by having by-pass roads and one-way traffic roads, and a gyratory method of traffic and proper and sufficient indications on the outskirts of large towns directing traffic how to by-pass central areas. Private operators should have imposed upon them the same obligations with regard to fares, services, and cheap fares for working classes, as were imposed on municipal statutory undertakings.

The speaker declared that undoubtedly the future development of passenger road transport lay with double decker six-wheel motor 'buses having a carrying capacity of 65 to 70 passengers. There was no doubt that the six-wheeled bus possessed many advantages over the four-wheeled type. He would be a bold man who would prophesy the future of road passenger transport; one could only judge by the portents of the times. There was, in his opinion, no public service vehicle at the present time that could deal with the great density of traffic of large towns and cities so cheaply or expeditiously as the tramcar. At the same time, it must be stated that beyond a few extensions of existing tramways no new tramways were likely to be constructed.

No Substitute for the Tram.

In the course of discussion, Mr. J. K. Bruce (L.C.C Tramways) said that it would be difficult to substitute anything for the tram completely without adding to the traffic congestion. The financial side had also to be considered. If trams were scrapped, the redemption and interest charges alone would amount to £1 000 000 per annum.

Mr. E. S. Rayner (Hull) called attention to the fact that the tram did not damage the roadway so much as the motor 'bus and carried more passengers per vehicle. Co-ordination was badly required, and that should be the duty of a central authority.

Mr. H. Mattinson (Manchester) suggested that motor 'bus competition would be a good thing for the tramways which had tended to become lax under the influence of the possession of a monopoly.

Ald. J. Walkden (Wigan) spoke in favour of trolley 'buses, while Councillor Thickett (Walsall) considered they were doomed.

On Thursday, a whole day excursion was made to Llandudno and the Menai Straits, on the invitation of the Liverpool Tramways Committee. The technical deliberations were resumed on Friday, when a Paper on "Motor Omnibus Competition in Glasgow" was read by Bailie R. Laing (Glasgow).

He gave a detailed account of the operation of the Glasgow tramways, and referred especially to the competition of privately owned motor 'buses, of which there were 600 wearing the surface of the roads, causing congestion and contributing very little to the rates.

Not only Glasgow, but nearly all municipalities had to consider how they could best meet motor-'bus competition by bringing their tramway system thoroughly up-to-date. He was not yet satisfied that a tramcar could not be made which would hold its own with a motor-'bus. The first thing to be done was to increase the speed of the tramcar, and to see that the speed of the motor-'bus was kept within reasonable limits.

The motor-'bus and the tramcar each had its own sphere of work, and he would not advocate the scrapping of the tramways until he was satisfied by a fair test that the motor 'bus was the better vehicle. An alteration in the scale of fares in Glasgow had checked the competition of the 'bus, and there was no doubt that the tramcar could operate for mass transportation at a cheaper rate than any 'bus. With cheap fares, accelerated service, and up-to-date equipment, the tramcar was still pre-eminent in the transport field.

In the course of the discussion, Ald. T. Woffenden (Huddersfield) said that all private motor-'buses should be made to conform to the same conditions as tramways in regard to fares and time tables.

Councillor J. Sutcliffe (Burnley) expressed the view that if tramways could not be run to beat the motor-'bus, then they ought to go, while Mr. R. S. Pilcher (Edinburgh) said more ought to be said about the disadvantages of tramways and less of its advantages. Speed might be the key to the situation.

At the annual general meeting, which was held in the afternoon, Mr. R. L. Horsfield, general manager of the Cardiff Corporation Tramways, was elected President, and next year's Conference will be held in Cardiff.

The report of the Council was adopted, and the Council was instructed to proceed again with the Bill which was lost in Parliament by a narrow majority this year. A resolution was also passed changing the name of the Association to "The Municipal Tramways and Transport Association."

REVIEW.

High Tension Line Practice Materials and Methods.

By E. V. PANNELL. (London: Constable and Co.) Pp. 277. 22s. 6d. net.

This book will be of great assistance to the transmission line engineer, whether he be engaged in the design or with the construction of high tension lines. As stated by the author in his introduction, no attempt is made to treat of the electrical problems, and the book is actually what it is described to be, a treatise on the mechanical principles involved in designing and constructing power transmission lines.

The book is of great value, coming as it does at a time when, in this country, the construction and operation of 66 000 V lines on steel supports has already begun and will shortly be common practice, whilst still higher voltages are already being contemplated.

The materials sections—viz., conductors, insulators and supports—cover rather more than half the book, the remainder being devoted to design of lines, construction and economics. The book is above all one of practice and not theory, and we are told not how work may be done, but are given actual details as to which has been done and which materials have been used to overcome the various difficulties on many lines, and particulars given as to why certain methods tried on earlier lines have been found unsatisfactory, and the methods and materials which have been devised and used to cope with and remedy these earlier faults. Naturally, the greater number of the lines referred to are American lines, but examples and details are also given of lines and practice in Sweden, Italy, Germany and Japan. One of the merits of the book is that it gives so much information concerning the use of longer spans, both as regards composite conductors, insulators and supports. Up to the present, in this country, long spans have rarely been used, and only when such spans could not be avoided, and whilst we are unlikely to use exceptionally long spans, ranging from 4 000 ft. to 5 000 ft., such as the five longest spans described in the book, there is little doubt that the use of steel supports will shortly become more general, which in itself will be to our national advantage, and that instead of our transmission lines being limited to spans of round 360 ft., we shall endeavour to plot the line routes so as to facilitate the use of spans varying from 500 ft. to 800 ft.

The author, in his book, gives particulars of over twenty supply companies using such spans, together with the designs of the various supports used, with their measurements, weight, loads, tests and foundations.

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ELECTRICITY IN AGRICULTURE.

The Position in Various Countries—Some Novel Applications—Problems Awaiting Solution.

At the Sectional Meeting of the World Power Conference at Basle, nine papers were presented on the subject of "The Application of Electricity to Agriculture." These were commented upon by Mr. F. Ringwald in a general report, of which we give an account below.

Mr. Ringwald, in course of a summary of the papers, shows that in America the first application of electricity to agriculture was in connection with the irrigation of farms, and it was not until 1920 that this position began to change. At that time 452 000, or 7 per cent. of the total farms, had gas or electric light, while to-day certainly 10 per cent. of the farms employ electricity for lighting and power purposes. In California, about 80 per cent. of total electricity produced is used for pumping purposes.

The consumption per farm is, however, only about 400 kWh per annum, and the realisation that the employment of electricity is still insufficient to justify expensive transmission lines has led to the formation of a National Committee for promoting the employment of electricity in agriculture. This backwardness in a country which has made such progress in technical matters is ascribed to the enormous distances which separate the farms and the power stations from which they must obtain their supply.

German Conditions.

In Germany, on the other hand, it appears that more than 90 per cent. of the farms have an electricity supply, and that during 1925 these consumed about 1 030 million kWh, the maximum load during the threshing period being 400 000 kW. The total annual consumption of energy per head of those engaged in agriculture is 50 kWh, which is about the same as that in Switzerland, though the total annual consumption in the latter country is nearly three times as great. Indeed on an acreage basis the consumption of electricity in Germany is higher than that in Switzerland. Electricity plays a chief part in the cultivation of grain, for the load from domestic heaters, hot water storage boilers, potato boilers and silage plants is of far less importance than the motor load, though these are just the applications which would provide a welcome night load.

Special reference in the German Paper is made to propaganda work and tariff policy, and it is suggested that some of the more influential farmers in a district might be financially assisted by the supply company so as to provide a living advertisement. A fundamental requirement for an agricultural tariff is that it should be simple and easy to understand. It should not require many meters. Though it is true that a two-rate tariff with a low working charge comes nearest to theoretical perfection, opinion in Switzerland and Norway shows in favour of a flat rate tariff. The same report suggests that secondary distribution should be carried out at 220 or 380 V, and some pertinent remarks are made regarding the design of the equipment and on the subject of power factor improvement. Applications to which it is suggested more attention should be paid are electric milking, artificial rain plants and electric rotary tillers, the ventilation of cow sheds, warming of hot-houses, forcing frames and fowl houses and incubators, hot water boilers, seed steepers and fodder preservation.

Rice and Tea.

In Japan, as in the United States, the irrigation and drainage of the rice fields form the chief part of the electric load, while electricity is also largely used for rice husking, silkworm rearing and killing moths. Electrical incubators do not appear to have given entire satisfaction for economical reasons, except in the case of silk worms, where they offer considerable advantages. Electricity has also played a large part in the production of tea, the quality being greatly improved, the cost of production reduced, and mass production methods made possible.

The English report by Mr. R. Borlase Matthews deals mainly with the question of ploughing in which he gives some useful information.

The French report shows very clearly the growing recognition of the great services that electricity can perform for agriculture, and points out that great attention is being paid to electric ploughing in France. Irrigation is of importance in Central France, and French agriculturalists are also turning their attention to electroculture by the silent discharge method. Mr. Borlase Matthews's system of artificial drying of crops is regarded with great interest. With reference to the economic aspect, the French report mentions that 42 per cent. of the entire area of France is under cultivation, that more than 10 million hectares await electrification, and furthermore the shortage of agricultural labour promises a great future for the rational application of electricity. The problem of electrification in France is financial rather than technical, but the State has given considerable assistance, and the country should soon be able to boast of an extensive agricultural electrification.

The Swiss report leaves the impression that that country occupies a leading place in the diversity of applications of electricity, especially as regards dairy farming, cider manufacture, fodder and fruit preservation, and fruit desiccation. On the other hand, it is interesting to notice that it has been almost impossible to induce the Swiss farmer to adopt electric milking. This seems to be mainly due to humanitarian reasons, but as labour charges increase and the number of capable milkers decrease it seems likely that the farmers will be forced to turn to machine milking as the only satisfactory solution.

In Norway, the annual consumption of electricity is about 450 kWh per farmer. This is mainly due to the kilowatt year tariff. The energy is used for very similar purposes to those described in the other papers, though special mention may be made of the heating of drinking water for cattle, and of the electric heating of forcing frames, which has given very successful results.

Economic Benefits Derivable.

While the various papers that have been summarised give a fairly clear idea of the progress of electrification in the various countries, Mr. Ringwald is of opinion that special attention should be drawn to the problems which still await solution, and he therefore puts forward the following suggestions for discussion :—

There is no doubt from every point of view that the introduction of electricity into agriculture brings economic benefits. Nevertheless the question, how far the burden of initial outlay on the installation and the power charges can be increased so that the farmer can still work more economically with electricity than with other sources of power. In Switzerland the annual cost of electricity plus initial outlay is about 0·2 per cent. of the total production costs of agriculture. As long as it continues to be possible to assist agriculture by labour saving or by increasing production there is a prospect of the annual load rising to many times its present value. This question requires systematic investigation in each country.

Electric milking with modern equipment can be warmly recommended to all farmers possessing more than ten milk cows. The writer of this report has caused exhaustive physiological and bacteriological researches to be made with the object of determining whether the injuries to the teats and udders so often feared by farmers and veterinary surgeons ever occurred, and also whether machine milking is superior to hand milking from the hygienic point of view. Numerous experiments extending over many weeks have shown that with hand milking the average number of bacteria in the milk was 152 842 per cub. cm. and only about 34 000 with electric milking, i.e., about four and a half times as little. Moreover, of those remaining a much larger number were indifferent bacteria. Experiments made at Liebefeld, near Berne, showed only 1 000 bacteria with carefully cleaned machines, whereas with ordinary hand milking the number was 6 377, i.e., a ratio of 1 : 6. When electric milking is adopted, however, male labour should be excluded and women chosen as attendants for the milking machines. Cheap male labour may be retained for cleaning and feeding the animals.

When working in association with cheese-making establishments the following procedure is to be recommended. The cow-sheds are equipped with no more than the minimum number of air pipes ; the air and pulsation pumps are mounted on a truck together with the milk churn. This truck is brought every day to the sheds, the electrical and air lines joined up, and the churn connected to the suction appliance. When the

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milking is completed the milk is immediately taken to the cheese dairy. Such an arrangement possesses the following advantages: One installation may serve several farmers. Each farm requires fewer hands. The farmer is saved the trouble of transporting the milk to the dairy; and expert milkers are ensured. The objection that this series milking means a change in the milking times can at once be answered by the fact that the cows are entirely indifferent whether they are milked at three or half-past as long as the time is the same every day.

Dairy Heating.

In many countries attempts have rightly been made to introduce electric heating into dairies. Nor should the use of refrigerators be forgotten in this connection. They are more applicable and provide a better and more economical load for the supply undertakings than electric heaters. Supply undertakings should devote their attention primarily to the promotion of electric milking, since the energy for this is sold at power rates without increasing the maximum demand of the farm, and the demand is maintained during 1 000 hours in the year.

Milk contains various kinds of microbes, some of which are undesirable if the milk is for human consumption, while others are inimical to the making of cheese. It has already been established that ultra-violet rays are capable of reducing these injurious microbes either by photo-chemical or vibrational means. Tests carried out by the author have shown that if thin layers of milk are exposed to the rays the number of living bacillæ per cub. cm. can be reduced from 1 000 to 10. Experiments on the effect of the rays on other foodstuffs besides milk have been made, and in the case of drinking water with partial success. This complicated question requires thorough investigation.

The preservation of fodder must continue to be one of the most important subjects, and it ought soon to be possible to solve this problem, particularly in districts where the climate is very variable in the early part of the year. The questions of wet silage and artificial drying of hay are of first importance. The efficiencies of the equipment hitherto used have been so low as to be economically impossible. The food value of artificially-dried hay is nearly 20 per cent. greater than the naturally-dried product. If it were possible to save only a third of the hay crop in Switzerland from rot by adopting artificial drying, the monetary saving in remedial means would be about thirty million francs. What would be the figures for countries with much larger areas under cultivation? Rational methods of silage would enable the work on the farm to be distributed to better advantage in place of the short periods of heavy overwork necessary under the old system. With regard to the silage of green fodder attempts must be made to discover a method which prevents the increase of butyric-acid forming microbes.

Electro-Culture.

The subject of electro-culture is one which requires clearing up as soon as possible. A careful study of the results obtained in the different countries shows that none are sufficiently consistent to be of use in deciding on the best system. In England the use of high tension direct-current which is applied to a wire network suspended over the plants and passes into the ground through the intervening air appears to have attained a certain degree of success, and it seems as though the English climate (damp and salt-laden air) is particularly favourable for this system. From the French report it would appear that high frequency currents were of more utility than high tension direct-current, whereas the tests carried out in Germany and Switzerland have given absolutely negative results. No better conclusion is to be drawn from the use of the Christofleau system using atmospheric electricity. On the contrary, the exposure of plants to ordinary electric light in nurseries has given most remarkable results. The use of electric lighting in fields has not produced anything like the same apparent advantage. It is assumed that the light has a photo-synthetic effect, the light waves supplying energy to the plants where it is used in the formation of sugary or starchy substances from carbon dioxide (CO_2).

While on the subject of electro-culture the method described by Alberto Pirovano of Vaprio d'Adda should be mentioned. He employs an electric field to treat the pollen of the flowers, and is thus able to bring about an arbitrary change in the germ cells of different plants. By this means he is able to create varieties of plants such as poppies, melons, pumpkins, cucumbers, grapes, etc., which are far more productive than the ordinary kinds. The writer can confirm the truth of this.

Finally, mention should be made to the treatment of young poultry with ultra-violet rays, the success of which has received scientific confirmation in America. Experiments have also been made in Europe with apparently good results.

The Japanese report points out very clearly that the extermination of moths by means of electric light is essential owing to the enormous damage done by the grubs in the rice fields. When one considers the trouble caused by insects in our own vineyards and orchards, and especially on the farms by the spreading of disease to men, animals and plants, it will be obvious that energetic measures are necessary. Greater attention should therefore be paid to this subject.

Electric traction on the land as a substitute for horses and petrol tractors should also be made a subject for discussion. America is well known to have considerable experience in this field, and some opinions on the matter would be welcomed.

Accident prevention demands careful attention. Farmers and farm labourers are constitutionally inclined to tackle faults in equipment themselves. In remote districts the farm labourers must be given sufficient instruction to enable them to carry out small repairs. It is important to insist that the power be cut off at the proper place before starting such work. In those districts in which an electrician is readily available the farm labourers should be dissuaded from carrying out repairs themselves, or else they must receive proper instruction.

In order to further the above questions the formation of study committees in the various countries is indicated. If necessary an international committee should be created in order to promote the exchange of ideas between countries. We must remember that it is necessary that a large amount of capital should be invested in agriculture, and that the present application of electricity in this field does not represent a very favourable load. Every fresh application improves the conditions, however.

There is no doubt that electricity is capable of rendering far greater services to mankind than appears to be the case to-day. The favourable progress of electrification depends, however, on close co-operation between investigators, farmers, supply undertakings and economists. May we be successful in reaching the distant goal.

SHOCK TEST OF INSULATORS.

New Impulse Method Free from Undefinable Factors.

IN a recent issue of "Elektrotechnik und Maschinenbau," Dr. G. Benischke deals with the subject of the shock testing of electrical equipment. There are a great variety of test arrangements which consisted of combinations of switches, condensers and spark gaps. Test results with them were far from uniform, however, and data obtained were not comparable. Literary controversies arose among those using different testing methods. It seems that these differences were due to complex connections with too many variable factors, which were hard to define and often impossible to reproduce by others. The writer therefore suggests a new, exceedingly simple impulse method, free from any undefinable factors. He provides a high-voltage testing transformer, a condenser and a spark gap, but introduces as novelty between the transformer and the condenser a synchronously revolving double-pole, double-throw switch. This makes the charging and the discharging of the condenser two absolutely distinct and totally independent functions; that is, while the condenser is being charged the gap and the tested apparatus are completely disconnected from it, and while it is being discharged the transformer is disconnected from the condenser. In the second part of the paper the writer attempts to give an explanation of what happens in an insulator when it is shock tested. From his own experiences, and from the results obtained by others, the author concludes that a shock test is really not an electric test, but that it resembles more closely a mechanical test, which releases latent stresses in the porcelain. The frequent shattering of insulators under shock tests bears this opinion out. The 60-cycle high-potential test, on the other hand, is a real electrical test, readily disclosing electrically weak spots in the insulator. The author maintains that shock testing of insulators should be called "electrostriction," which is an electro-mechanical phenomenon introduced first by Faraday and very little known as yet.

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THERMAL *v.* HYDRAULIC POWER.

The Economic Relations between Electrical Energy Produced by the Two Methods. Conditions under which the Two can Work Together Advantageously.

AT the Basle Sectional Meeting of the World Power Conference twelve Papers on "The Economic Relationship between Electrical Energy produced Hydraulically and Thermally" were presented by authors from the various countries. These Papers were summarised in a report presented by Mr. A. Nizzola, of which we give an account below.

Mr. Nizzola began by pointing out that the two methods of generation were in competition, but that the Committee of the Conference had not been guided by this point of view, but had all along kept the benefits of combinations in view, and that it is from this standpoint that the matter is considered.

He went on to say that in view of the importance of the ever-increasing tendency towards the interconnection of supply areas on the one hand and of generating stations on the other, through the intermediary of extra-high-tension networks, the possibilities of future development may affect the economic relations between thermo-electric and hydro-electric energy to an extent not at present realised.

Italy, for instance, is a country with a rapidly increasing population, and as a consequence is being forced by necessity to become more and more industrialised. Thus there is a continually growing demand for power where the available water power is strictly limited. Moreover, the power available can be exploited more economically than hitherto by the erection of large steam stations for covering the seasonal deficiencies in water power which occur in summer in Southern Italy and in winter in Northern Italy. Should the time come, however, when Italy is under necessity of supplementing her water power by thermal power all the year round, she will be faced with the question of how to obtain this energy.

Fuel *v.* Energy Transmission.

If the energy is only required at certain seasons it is cheaper to transport the fuel than to transmit the energy in the form of electricity, since the lines would have a bad load factor. When energy is required all the year round, however, the question does not admit of an immediate answer. Calculation generally shows the advantage to lie with railway transport, but in certain circumstances a transmission line will prove the cheaper way. This will be the case when the necessary lines are already in existence and serving other purposes, so that a new line need not be built. A calculation will then emphasise the advantages of a transmission line when certain conditions are fulfilled, namely, that the fuel in question is cheap but not easily transported, and that the existing lines can be used either wholly or in part to transmit energy in the opposite direction to the normal, since this will mean a reduction instead of an increase in the loading as a result of their additional duty.

If the position of Italy is considered from this point of view this last condition may actually present itself. The chief fuel supplies as far as pit coal is concerned are obtained from England and Belgium by ship and from Germany and France by rail. The last two countries also possess supplies of fuels which are much cheaper than the high-class export coal. These fuels could be used on the spot to generate energy at a very cheap rate. It is true that such generating stations and the proposed supply areas in Italy are separated by considerable distances, and also that part of the route lies through a foreign country, namely, Switzerland. The distance does not, however, represent an insurmountable obstacle, neither does the inclusion of a third country, as long as steps are taken to ensure that some advantage accrues to the latter.

The principal centres of hydro-electric power in Switzerland are situated in the south in the semi-circle formed by the Alps, and in the north on the rivers Aar and Rhine. A state-owned h. t. network connecting the power stations and centres of consumption is already in existence. The flow of energy is, in the main, from south to north, and, as the supply exceeds the demand, the surplus energy is exported to France and Germany. The flow of energy is thus maintained in a northerly direction. Similar conditions prevail with the German stations on the Rhine, their energy being of necessity transmitted northwards. It will be obvious from the above that the existing lines could sustain a considerable flow of energy from north to south and that the lines for the most part would not be required to carry more load, but less. This is equivalent in practice to a considerable decrease in the distance separating the cheap power sources of France and Germany from the supply areas of Northern Italy.

If this conclusion can be formed under present-day conditions, the continued development of water power in Switzerland and on the Rhine will only serve to intensify its truth. Take for example the water power in the Grisons district. This is expected to yield over half a million kilowatts and several thousand million kilowatt-hours per annum. Utilisation at the power station is out of the question, and to find a market in Switzerland the power must be transmitted northwards, then along the Rhine to Sargans and thence through Ziegelbrücke to Zurich, Basle and the adjacent districts. The transmission of this energy is expected to require construction of at least five lines each of six conductors. The construction of the first line for which the Grisons Power Co. are trying to obtain sanction is already meeting with considerable opposition. The extent to which animosity is likely to be aroused when the ten triple-lines are actually in existence can be easily imagined. Grisons cannot be asked to give up the development of its water power, so that a kind of triple-alliance of the kind suggested between Italy, Switzerland and Germany or France might assist in the solution of the problem. It is even conceivable that a single line, serving more as an *equaliser* than as an actual transmitter of energy would fulfil all requirements. Such a line would theoretically allow energy to flow northward from the Grisons water power stations and southward from the German lignite or French pit-head stations simultaneously, and the Grisons power stations with their ample storage would be able to assist the line in its capacity as an *equaliser*. These flows of energy in opposite directions neutralise one another either wholly or in part, and the line actually transmits only the difference between the two, the direction being either northwards or southwards according to existing circumstances. It will be seen from this example that the crossing of Switzerland by lines to the German or French supplier and to the Italian consumer will give rise to practically no capital outlay or energy losses, and Switzerland will be able to derive benefit from it.

Continuing, Mr. Nizzola remarked that a survey of the reports received and considerations arising from the study of them led to the establishment of the following general *guiding principles* as being the main factors affecting the economic relations between thermal and hydraulic electric power production.

A considerable difference between the two methods of power production arises from the entirely different apportionment of capital and expenditure. Water power stations generally involve a much larger outlay than thermal stations, but on the other hand, thermal stations have very much higher actual running costs.

Capital Costs of Water Power.

Consequently the fixed charges on the production of energy in hydro-electric plants, such as interest, depreciation and liquidation of the plant cost, are of chief importance, while the increase of expenditure due to increasing load has practically no effect financially. In thermally operated power stations the exact reverse holds; excluding the circumstances in which the consumption time is very small indeed, the actual running costs easily exceed the fixed charges.

When the possibility exists of employing either one or other method of power production:

(*a*) Hydro-electric production will appear uneconomic and will be rejected, if, for all consumption times met with in practice, the energy costs more than with thermal production. Generally, however, this is not so, and the total cost of producing hydro-electric energy will be still more favourable as long as the consumption time keeps above a certain critical value. The power requirements of a district can always be divided into two parts, one with a consumption time greater than the critical value and the other less, and because of this, better economy is offered by combining the two methods of power production.

(*b*) On the other hand thermal production will appear uneconomic and will therefore generally be rejected if water power is available in sufficient quantity and will allow under existing conditions of consumption time and utilisation of cheaper energy production than with a thermally operated station. Such conditions seldom arise, usually only in a few areas possessing particularly favourable water power resources.

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Thermally operated stations usually have the advantage of being able to conform readily to the immediate requirements. Hydro-electric plants, on the other hand, are dependent on a variable flow of water, the variations of which do not correspond to variations in energy requirements.

It is obvious, therefore, that the supply of any district exclusively with hydro-electric power leads generally to unavoidable losses owing to surplus water running to waste. It is from this characteristic of hydro-electric stations that the great advantages generally occurring from a combination of the two methods of power production are made most evident. The greater the saving of otherwise lost water power brought about by such combination, the greater is the scope remaining for thermally produced power before its allowable limit of total cost is reached.

It also follows that if only large schemes are considered, hydraulic and thermal plants will be combined with a view to the thermal supplementing the hydraulic, rather than *vice versa*.

In all circumstances the main transmission lines play an important part in the economic relationship between thermal and hydraulic energy. These connecting lines perform the twofold duty of combining in extensive areas both the various producing and the various supply characteristics. From the varying demands existing in individual and definite parts of the supply area an average demand is obtained which is much more constant, and the varying sources of power are combined to produce a steady average output. The economy of extending transmission lines in this way is at once evident, although it has its limits. The ratio of the installed capacity to the sum of the loads of individual consumers is reduced, and there is also an increase in the consumption time which further reduces the cost of production.

When various hydraulic and thermal sources of energy are interconnected, the fitting of the production of each separate source into the load diagram usually follows fairly readily.

Future Possibilities.

Mention should be made of a matter with which several of the reports dealt, namely, the future possibilities of considerable technical and economic improvements in thermal power production. It may be taken for granted that the transformation from natural to electrical energy through the agency of thermal energy leaves far more room for increases in efficiency than does the transformation with water power, and also that the total costs of production, which are only indirectly dependent upon the efficiency, allow of much greater reductions with thermal plant than with hydraulic plant. In the utilisation of fuels there appear considerable prospects of being able to produce chemical products and electrical power simultaneously, and in addition to this, with modern methods of production of energy, to make use of the waste heat liberated. As opposed to this, water power does not present any obvious possibilities of reduction of total cost, with the exception of that held out by the progressive paying off of the initial plant cost. In the majority of countries also, a reduction of the interest on borrowed capital might have a favourable effect on hydro-electric power development.

These circumstances are calculated to induce countries still having available water power at their disposal to utilise their remaining resources as soon as possible, provided that the new water power plants are still an economic proposition. In any case it is possible that in the future these power stations will prove economical, simply by the normal and progressive writing off of capital; meanwhile it is to be expected that the obtaining of fuels, whether due to gradual exhaustion of suitable resources or to increase of wages, will become very much more costly.

The interconnecting lines will not come to an end at the frontier; their continual extension will lead to the increasing importance of the exchange of electrical energy between neighbouring countries. By this means it will be possible to arrange matters so that very large distances can be easily covered, if lines are already in existence which transmit power in the opposite direction. It will also be within the bounds of economic possibility to interconnect the sources of energy supply of countries not adjacent to one another, especially if the sources of energy supply in the intervening foreign country are also suitable for interchange. The economic relationship between the thermal and hydraulic production of energy thus presents an ever-increasing perspective, and opens up the widest prospects for the future.

ELECTRICITY SUPPLY.

The Interchange of Energy Between Countries—The Present Position.

SIX papers on the "Exchange of Electrical Energy Between Countries," were presented at the World Power Conference at Basle. These are dealt with in a report presented by Prof. Landry of Lausanne, which we summarise below.

In this report, it is pointed out that the exchange of electrical energy between countries is still in the earliest stages of its development, and with the exception of the most recent efforts, is restricted almost entirely to countries with superfluous water power who supply other countries with no water power, or in which the production of energy is restricted to expensive hydro-electric schemes owing to the lack of suitable fuel. The more recent schemes are particularly commendable, because they have the effect of giving the international exchange of electrical energy a wider basis, and a much greater range than it has hitherto possessed, so that there is a combined utilisation of the various sources of electricity regardless of the limits imposed by political boundaries.

Superfluous Swiss Power.

Switzerland is a country possessing superfluous water power in spite of the fact that it is very highly electrified, so that it is undoubtedly an exporting country. During 1925, in fact, it exported about 650 million kWh, or approximately 20 per cent. of the total energy produced. Of this, about 46 per cent. was taken by France.

Canada has supplied altogether about 14·2 thousand million kWh to the United States during the period 1911–1926, or about 35 per cent. of the total energy produced by the exporting companies.

Though the statistical data concerning the international exchange of energy is very scanty, it appears that Canada with a population of 9 000 000, exports annually about 155 kWh per head, as compared with 900 kWh consumed, while Switzerland, with a population of 4 000 000, exports about 166 kWh out of every 700 produced.

Dealing with the advantages of and necessity for exchange, Prof. Landry remarks that it is certainly no longer necessary to point out the advantages of interconnection of power stations and supply systems in one and the same country, and that to make it possible to embrace all the sources of energy in any one country, care must be taken that the natural auxiliary resources are distributed in such a way that a steady production of energy is ensured.

As it is in the interests of every individual country to utilise the resources within its boundary as completely and rationally as possible, it is equally in the interests of every country to pay attention to economy, and this leads to the second necessary step of international interconnection being taken in order that there may be exchange in both directions. For these reasons, it seems certain that the number of international connecting lines will be increased as the need arises, and it is to be hoped that the many difficulties in the way on international exchange which are not economical in character will gradually disappear.

Exchange Difficulties.

The fact remains that there are at present numerous difficulties in the way of energy exchange, both small and great. Some of these are due to the laws governing international trade which have been analysed and discussed by Dr. Trümpy. Another difficulty is that relating to price, and comparisons are often made between the prices for energy in exporting countries, and those which the foreign purchaser has to pay. These comparisons appear to take no account of the fact that there can be no fixed price per kWh, as this varies with the season, day, hour, method of production and utilisation, superfluity or the reverse of the power resources, possibility of equalisation, security of supply, natural or legal obstacles preventing the conclusion of agreements, the position of power stations, local demand, importance of the supply, and others.

Prof. Landry also reviews the legislation which at present exists in the various countries with regard to the export of power. This exhibits on the one hand broad-mindedness, and on the other hand, growing conservatism or even open enmity. Considering the matter broadly, the hope is expressed that the former policy will obtain the upper hand, and it is hoped that the World Power Conference will take its share in attaining this end.

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THE WORLD POWER CONFERENCE AT BASLE.

The Utilisation of Water Power in Connection with Inland Navigation. Need for an Observational Survey.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.I.C.E., M.I.E.E., F.R.A.S.

JUST as a big Conference finds it impracticable to deal with all the Papers in detail, so similarly there is insufficient space in the columns of THE ELECTRICIAN to cover every point raised at the meetings of the World Power Conference in Basle. Further, much of the matter presented was of more interest to the civil engineer than to the electrical engineer. This especially applies to the Papers on Water Power and Inland Navigation. Still there were many features of interest to both, and accordingly attention is drawn to the following items of more particular moment. Those who are more interested in some of the details can obtain proofs of the Papers from the World Power Conference secretary, or await the publication in volume form.

Navigation v. Power.

Generally the Papers indicated that at any rate in Europe it was intended to take the fullest advantage of all possible sources of water for the dual purposes of navigation and electric power supply. This increasing use of waterways on the Continent gives rise to serious consideration as to the practice in England, where inland navigation has become almost a dead-letter. A curious factor has arisen in conjunction with each waterway, in that generally it has to be decided as to whether it has to be constructed primarily for the production of electric power or for navigation. The cost of the locks, sluices, etc., is then debited to the interest most concerned. Hence, though practical experience indicates that it is not a commercial proposition to install electric power plants with a head of less than 9 ft., the fact that the navigation ought to bear many of the charges makes it possible to generate electricity at a low figure, since such a number of the hydraulic work overhead charges can be neglected. An example of economical power production from low heads on a navigation route is that of the River Seine, which is now in hand.

Naturally where the conflicting interests of navigation and power generation exist special difficulties arise. Power stations generally wish to maintain a high level on the weir at all times. A navigation system, on the other hand, calls for partial interruptions. The general conclusions arrived at were that the water level should be kept as constant as possible. To this end it was considered that the power stations should supply into as large networks as possible as consistent a load as is feasible. It further seems that a regular operation of the power station obviates many of the troubles otherwise caused to both navigation and power generation by the formation of ice. It was the general consensus of opinion that power stations should not use dams as accumulating basins. On the Paris–Rouen scheme, water hitherto only used for navigation is expected to provide 214 million kWh per annum. This represents a very welcome addition to France's sources of power. It is also an example of an instance where it would not have paid to develop the river for power supply purposes only. Further, this power could not be used except in conjunction with existing plants. It is noteworthy that the horse-power output varies according to the season of the year from 9 400 to 69 000. Other interesting developments of a similar nature that were described at the Conference were new waterways for Poland with a somewhat similar output to that of the Seine. Then there was the Soroksar 35 mile stretch of the Danube, which will provide an annual supply of 6·8 million kWh.

Coal Mines and Waterways.

The coal mines of Campeine in Belgium are to be developed by means of a waterway. Utilisation of the water power here will mean an annual output of 70 million kWh. In Holland the Limburg coal district is being connected with the Belgium industrial district on the one hand, and with the Waal and thereby the Rhine on the other. This canal is 21 miles long and has a fall of 80 ft. and is expected to produce 57 million kWh per annum. In all these schemes the production of power is treated as secondary to navigation, hence the whole of the capital costs of the weirs, canals, etc., is thrown on to the navigation portions of the scheme.

Such interference with natural conditions, as the converting of waterways for power and/or navigation purposes, gives rise to many new troubles, not the least of which is the deposit of considerable quantities of solid matter in places where they cause obstructions to navigation. These deposits are obviated to a certain extent by deflecting portions of the water at various points along the canal. The difficulty increases where the canals have not a free inlet from the original sources of water supply, such as the river. When a weir overflow is utilised to feed the canal the trouble with deposits of solid matter increases. Previously this unwanted solid matter was removed by dredging. This is now, however, realised to be uneconomical, hence the adoption of deflecting water regulation works.

The general conclusion arrived at, at the Conference, was that a general observation survey should be organised to collect data as to the experience of various waterways in connection with the movement of solid matter.

Another matter that received its due meed of attention was speed of flow in navigable canals also used for power production. German practice favours a speed of flow not exceeding 0·70 m. per sec., though generally it was considered that this question as to the permissible speed of flow is by no means settled.

Many of the recent Continental waterways are being constructed for the passage of 2 000 ton barges. It is of interest to note that these vessels are 330 ft. long, 38 ft. wide and have a draught of 9 ft.

The employment of tugs to haul barges has its effect upon the construction of the canals. Experience indicates that tunnel screw tugs have not been very satisfactory on canals of restricted depth, as they appear to be greatly affected by fluctuation in depth, which naturally varies with the cargo and the quantity of the bunkers. So far, paddle tugs are greatly superior. It is, however, anticipated that the tug of the future will be one with quadruple screws, driven by a simple four-stroke Diesel engine for capacities up to 1 500 H.P. Above this power it seems likely that the steam turbine will be pre-eminent. The new development for fast passenger vessels and other high speed craft is a new type of partially submerged propellor.

A British Paper.

There was one British paper in this section which dealt with calculation formulæ in hydraulics. Mr. Parry recommends dropping all formulæ for the value c in the Chezy equation, $v = c\sqrt{rs}$, and using in place thereof a number of experimentally obtained curves having as abcissa the logarithms of the well-known Reynolds parameter $\frac{vd}{\nu}$, and as ordinates the values $\frac{rsg}{v^2}$. (It is naturally assumed that the movement of the water in regular channels, principally tubes, is uniform.) The author points out that these graphs are applicable in general equally to liquids as to gases, at all temperatures and for all consistencies.

Mr. Parry proposes that a definition be given of the expression "specific roughness" $\frac{r^1}{r}$ as the ratio of the size of asperities to the diameter or to the hydraulic radius of the channel. Obviously, this size would have to be understood as another parameter in the group of curves mentioned above.

Dr. A. Strickler drew attention in his Paper to investigations which have led him to recommend the very simple formula

$$v = k \sqrt[6]{r}\ \sqrt{rs} = kr^{2/3}s^{\frac{1}{2}}$$

which can be employed with sufficient accuracy in practical hydraulics. The coefficient k is a characteristic for the absolute roughness of the wall and is not dependent upon any other unit contained in the equation. It has been exactly ascertained for all degrees of roughness met with in practice.

In the report No. 16 of the Federal Water Board, quoted in the Swiss report, Dr. Strickler also discussed the question of "relative roughness" (which is identical with the specific roughness proposed by Mr. Parry). His further investigations have resulted in showing that if this latter unit is introduced into the Chezy equation, it runs as follows (with the meter and second as units):

$$v = 21{\cdot}1 \sqrt[6]{\frac{r}{r^1}}\ \sqrt{rs},$$

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where $\frac{r}{r_1}$ represents the reciprocal value of the specific roughness.

This formula does not take the viscosity into consideration, which is, however, of no importance in practical hydraulics, i.e., where the channels have not very small dimensions.

The use of the very simple formula

$$v = kr^{2}/_{3}\, s^{\frac{1}{2}}, \text{ or } c = k\sqrt[6]{r}$$

has of recent years become very popular everywhere in Switzerland, notably in calculations of damming effects of weirs.

Unnecessary Duplication.

Mr. E. Payot, whose report we summarised on p. 290 of last week's ELECTRICIAN, laid considerable stress on the point that at present too much experimental work in connection with hydro-electric matters was being duplicated. He therefore considered that as these experiments had to be made they should be carried out systematically and experiences interchanged between various countries, with a view to obtaining the results as soon as possible. Time was of very great importance to the world, apart from the fact that it was uneconomical to repeat experiments on questions that had already been investigated and cleared up.

When this subject was being dealt with a very interesting cinematograph film was shown of the huge Kaplan turbine recently installed at Lilla Edit in Sweden. This is probably the largest turbine which has ever been tested in a thoroughly scientific manner. The film showed what a large number of testing instruments were necessary, coupled with a big staff of testing engineers. This particular turbine deals with 200 tons of water per sec. If the water requirements of a Kaplan turbine are represented by the figure 100, the equivalent figure for a propellor turbine would be 129, and for a Francis turbine 162.

From the foregoing account of the proceedings in this particular group of the Conference, and from M. Payot's report, it will be appreciated that the water power engineer still has many difficulties to overcome. These difficulties are complicated by the apparently universal decision to develop power from all forms of water supply, whether spasmodic or regular, whether of reasonable head or of apparently uneconomical head.

Standard Cable Sockets.

The specification dealing with standard electric cable solder ing sockets was originally issued by the British Engineering Standards Association in 1921, and has now been published in a revised form, which makes better provision for sockets for use with either paper-insulated or rubber-insulated cables. The revised specification is otherwise very similar to the old edition, with the exception that a few additional sizes are included in the list of cast lug sockets and tubular lug sockets. A certain number of these sizes are marked as primary sizes and are recommended for adoption wherever possible, the remaining sizes being marked as secondary sizes and are intended to be used only in cases where it is not immediately convenient to employ primary sizes. In this way it is hoped to be able at some future time to reduce the number of standard sizes to the present number of primary sizes, thus considerably simplifying the keeping of stocks. Each size of lug socket is obtainable in three types, according to the angle of inclination of the palm of the socket.

Copies of this publication (No. 91–1926) can be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, price 1s. 2d., post free.

Books Received.

"Die Fernsprechanlagen mit Wähler-Betrieb. By Dr. Ing. F. Lubberger. (Munchen: R. Oldenbourg.) Pp. xiii. + 277. M.11.

"Pitman's Electrical Educator." Part 24. Edited by J. A. Fleming, F.R.S. (London: Sir Isaac Pitman and Sons.) 1s. 3d. net.

"Pitman's Electrical Educator." Part 25. Edited by J. A. Fleming, F.R.S. (London: Sir Isaac Pitman and Sons.) 1s. 3d. net.

"The Atmospheric Nitrogen Industry." By Dr. Bruno Waeser. Vols. I and II. (London: J. and A. Churchill.) Pp. 746. 42s. net.

"Science Abstracts." Secs. A and B. August 25th, No. 334, Part 8, Vol. 29. Issued by the Institution of Electrical Engineers. (London: E. and F. N. Spon.) Single numbers, 3s.; annual subscription, 30s., or 50s. for both sections.

CORRESPONDENCE.

POWER STATION OPERATION.

[TO THE EDITOR.]

SIR,—Were it not for the fact that in his review of the above book, Dr. S. P. Smith specifically quotes from one of my brief replies reprinted therein, it might be considered an impertinence for one of several contributors to join issue with him, especially as the selection of the reprinted questions and answers has been by the publishers. Having, however, perused the P.S.O. section in "The Electrical Times" with the keenest critical interest from its very inception, I feel that Dr. Smith's review does not do the present volume the justice it deserves, and while, perhaps, it cannot be said that he "damns it with faint praise," it is evident that he is altogether out of touch with the requirements of those to whom principally the work is addressed.

There is no need for me to dwell upon your reviewer's comments upon my reply on p. 34 of the volume, and it is only desirable for me to point out that had I specifically referred *only* to the raising of the pressure *alone* at one station, then his remarks would have been correct. As I did not do so, the charge of "looseness of expression" can hardly be substantiated in this particular instance, but, instead one might justly be excused for suggesting that a certain amount of loose thinking had been indulged in in the composition of the review; were this so it would be inexcusable in the work of an engineer of Dr. Smith's attainments.

Surely Dr. Smith's review is contradictory when in one place, he says "practically all the information demanded and supplied here is the subject matter of any modern text book of electrical engineering," while in others that "the book . . . . has been the means of bringing together no inconsiderable amount of sound advice based upon accumulated experience." "The questions asked and answered . . . . most of them are of an essentially practical nature." It has been my experience that with *very* few exceptions, modern electrical engineering text books emphatically do not deal at all extensively with practical problems of the kind forming the bulk of "Power Station Operation," and this has always been a subject of complaint from operating engineers. If Dr. Smith can give me a really representative list of text books dealing with all the practical features that continually arise in the operation of electrical plant alone, I should be profoundly indebted to him and *if* he can do this, I should imagine that most operating electrical engineers would rise up and call him blessed. I fear, however, that I am suggesting the impossible! I fancy that the publisher of "Power Station Operation" possesses a very considerable amount of documentary evidence to prove that modern text books do not supply the much sought after practical information, and in fact the very existence and sustained success of the P.S.O. section in "The Electrical Times" carries with it its own proof of my contention.—I am,

London, S.E. S. AUSTEN STIGANT.
September 9th.

WIRELESS AND BRITISH RAILWAYS.

[TO THE EDITOR.]

SIR,—It seems a pity that the resourcefulness of our wireless inventors and manufacturers is not given the encouragement with which wireless is fostered in European countries.

Almost simultaneously with the opening of our first National Radio Exhibition at Olympia, for example, when close upon two hundred exhibitors (a record number) are showing hundreds of intriguing devices, I read that the German railways have arranged for the home and foreign market reports and quotations to be picked up at fixed receiving stations and telephoned to catch express trains for the benefit of the trades concerned.

One would like to imagine that any British railway would be as quick to apply the progress of science for the benefit of its patrons.—I am, etc.,

W. T. KELLY, M.P.

House of Commons,
September 9th.

We regret that in our list of British official delegates to the World Power Conference, Mr. E. J. Fottrell was shown as representing the Commonwealth of Australia when, in fact, he was representing the National Gas Council of Great Britain and Ireland.

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NEWS IN BRIEF.

Electric Heaters for Cows—Doughnuts made by Electricity—Preesall's Poultry Lighting Load—Electric Burglar Alarm Factory Burgled.

DURING the Warrington Civic Week the Corporation's electricity works will be open for public inspection.

A clerk of works is required to superintend the carrying out of an electricity distribution scheme for Mold U.D.C.

A national scheme for the unification of electricity supply on similar lines to that proposed for this country is being discussed in Japan.

A new rural party line telephone service is being organised between Omagh and Mountjoy. This is one of the first services of its kind in Northern Ireland.

A new telephone exchange in Garfield Road, Twickenham, was opened last Saturday. About 400 Richmond subscribers were transferred to the new exchange, and within the next few months a further 500 transfers will take place.

Egyptian Telephone Scheme.

Towards the cost of linking up Cairo and Alexandria by means of a subterranean telephone cable, the Egyptian Government has already voted a sum of £52 000. The total expenditure of £250 000 is to be spread over several years.

In New Jersey cows have been made to give more milk in winter by the installation of electric pumps fitted with electric heating appliances whereby the temperature of the drinking water is raised. A farmer with 17 cows reported an increase of 435 lb. of milk a week as a result of this treatment.

Attention is called by the Board of Trade to the necessity for maintaining in satisfactory condition the electrical installations on oil carrying ships. It is pointed out that ordinary portable lamps, such as pocket torches, and lamps attached to cables are unsuitable for use in dangerous spaces.

The English Electric Co.'s Social and Athletic Association held its third annual fruit, flower and vegetable show recently in the mess rooms at the company's Stafford works. There were about 230 exhibits, and the prizes were distributed by Mrs. Hardie, wife of Col. C. Hardie, the general manager.

A new electrical machine for making doughnuts turns out 5 000 doughnuts an hour, according to the Pennsylvania Public Service Information Committee. The buns are cut, fried, turned, lifted out and carried to the point of delivery by automatic machinery driven by a ½ H.P. electric motor.

On the suggestion of the Mayor of Burnley, a sub-committee has been appointed to consider the desirability of purchasing a machine for removing nails and pieces of metal from the streets. A picture of an electrical device used for this purpose was exclusively published in THE ELECTRICIAN of January 15th last.

The opening meeting of the session of the Radio Society of Great Britain will be held at the Institution of Electrical Engineers at 6 p.m. on December 22nd, when Dr. W. H. Eccles, F.R.S., will open a discussion on "The Relative Values of Long and Short Wave Transmission Communication, and their Future Possibilities."

Two Cable Ships Sail.

Two cable ships have sailed almost simultaneously on laying expeditions. The Telegraph Construction and Maintenance Co.'s "Dominia" left last Friday to lay the second Pacific cable connecting Bamfield and Fanning Island, and the "Faraday" (Siemens Brothers and Co.) sailed on Sunday to lay the cable between Fanning Island and Suva, Fiji.

During the next 20 years, £13 000 000 per annum will be spent on the development of the hydro-electric resources of Eastern Canada, according to an estimate of the Dominion Water Power Branch. Development of new projects in 1925 increased Canada's total power installation to 8 099 192 kWh, placing the Dominion second among the nations of the world in the amount of developed energy.

At Moorfields Hospital (London) during the past year, 100 persons have undergone treatment by artificial ultra-violet rays for the cure of blindness. The treatment has restored sight to diseased eyes, and additional lamps are to be installed so as to enable the waiting patients to be dealt with. The Secretary of the Hospital wishes it to be understood, however, that the treatment is still in the experimental stage, and no claim is made that it is a panacea for blindness.

A general assistant is wanted in Newark Corporation's electricity department.

Thame (Oxon) Guardians have decided to instal electric light at their institution.

Beryllium is, states Mr. V. L. Eardley-Wilmot, adaptable for special uses in electrical and physical apparatus.

The Great Northern Telegraph Co. announces that normal telegraph communication with Tokyo has been restored.

A French company undertakes electric ploughing at from 100 to 200 fr. per acre, according to the nature of the ground.

At a new electrical laboratory at Stanford University, California, experiments will be made using voltages up to 2 000 000.

It is reported that the Toyko Electric Light Co. is financing further hydro-electric developments by the Kanto Hydro Electric Co.

With some 1 500 000 telephones—three times as many as London—New York City has had to issue its new directory in two volumes.

Halifax Electricity Department has been holding an electrical exhibition at which each stall represented an electrically equipped room.

It is reported from Toronto that the Meighen Government has refused the application of private interests for the right to develop electric power in the Ottawa river.

Owing to competition the Tokyo Electric Light Co., is relinquishing its practice of shutting down on two Sundays in each month for inspection and repair work.

The Post Office has adopted an amplification device for the aid of partially deaf persons using the telephone. The cost of the apparatus, including maintenance, is 25s. per quarter.

Russia's Electrical Requirements.

Arrangements are reported to have been made under the credit scheme guaranteed by the Reichstag for the Russian Government to buy over £3 000 000 worth of electrical plant from German firms.

The eighth annual dinner of the E.P.E.A. (Southern Division) will be held at the Hotel Cecil, London, on October 2nd, at 5.30 p.m. for 6 p.m. Tickets (7s. 6d.) can be had from Mr. P. Gordon Hieatt, 80, Long Lane, Croydon.

The laying of the Western Union Telegraph Co.'s new permalloy cable between England and New York was completed on September 5th when the final splice in the Bay Roberts-New York section was made. It is hoped to start working over the cable within a few weeks.

Technical and engineering assistants in the (*a*) generation and (*b*) transmission and transforming sections and an administrative assistant are required by the West Midland Joint Electricity Authority. Particulars from Mr. H. F. Carpenter, Phœnix Buildings, Dudley Road, Wolverhampton.

Poultry farmers in the Knott End and Preesall (Lancs) district intend, after the expiration of "summer time," to have electric light switched on automatically in their hen coops and sheds some time before dawn. Energy will be supplied on specially low terms by Preesall Council.

It is reported from Paris (by the British United Press) that burglars have broken into the factory of M. Righetti, who makes electric burglar alarms, and stolen twelve complete alarm systems. Mr. Righetti has told the police that he has always been too busy to make a burglar alarm for his own factory.

Striking decorative electrical illumination schemes are being prepared for Blackpool's "autumn illuminations." There will be nearly four miles of coloured lights along the promenade. Altogether the Corporation display will utilise some 200 000 lamps, and traders are expected to increase this figure materially.

As accommodation at the Third Conference of the Association of Special Libraries and Information Bureaux, to be held at Balliol College, Oxford, from September 24th to 27th is strictly limited, those wishing to attend should communicate at once with the Secretary of the Association at 38, Bloomsbury Square, London, W.C.1.

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THE NATIONAL RADIO EXHIBITION.

Further Review of the Principal Exhibits at Olympia—Some Novel Components and Accessories—New Valves and Batteries.

IN our issue of last week particulars were given of a number of the most important exhibits at the National Radio Exhibition at Olympia, London, which remains open until to-morrow (Saturday). Below we give further details of lines of which more will be heard during the coming season.

Multi-valve sets in great variety are shown by Peter Curtis, Ltd. Most of these models have self-contained loud speakers and revolving frame aerials, and are built into cabinets of pleasing appearance. They also show a combined cabinet loud speaker and frame aerial which forms a handsome piece of furniture.

Coils so constructed that the centres are always in alignment when two or more are used, are among the features of the Finston Manufacturing Co.'s display, which also includes a micro vernier dial for coarse and fine tuning, a bakelite valve holder, and a range of filament resistances.

The "Polar" cam vernier dial coil holder shown by the Radio Communication Co. indicates the movement of the adjustable coil on a special dial engraved on the front end plate, so that different stations can be logged with accuracy, and the oscillation point noted. The main drive of this coil holder is through a cam giving a 2½ to 1 reduction over the full sweep of the coil. This enables the complete range of adjustment to be covered at a sufficiently slow speed without the tedious operation of rotating the knob through several revolutions. At any desired point a fine vernier movement of 12 to 1 can be brought into operation. Another interesting component is the "Polar" cam vernier variable (compensated square law) condenser, the outstanding features of which are a large (American type) knob and dial, and pigtail connections from moving vanes to terminal.

Large Capacity Units.

The new "Super-radio" battery, here shown by Siemens Brothers and Co. for the first time, comprises a battery of extra large capacity units designed to give economical and long service for a h.t. dry battery. The exceptional insulation provided between the individual cells is a noteworthy feature. The firm's complete receiving sets and accessories are also on view.

An expensive-looking new l.f. transformer seen on the stand of Lissen, Ltd., is offered at a very low price, and its performance is claimed to be of a distinctly high order. Some of the many ways in which the "Lissenola" loud speaking unit can be used are demonstrated. Several Mansbridge type condensers made in special cases illustrate another branch of the firm's activity. Simplicity of operation is noticeable in the "Gambrell Baby-Grand" receiver, for either a.c. or d.c. lighting mains, presented by Gambrell Bros., Ltd.

Universal in application, the "Norbex" crystal detector, a new line shown by R. F. Graham and Co., has micrometer adjustment, revolving crystals, and rocking arm. It can be made to take the place of a detector valve, and is suitable for panel mounting. A handsome four-valve floor cabinet receiver incorporating a solid carved wood loud speaker is an interesting feature of this firm's display.

Ebonite sheets, each side of which has a different finish, are shown by the St. Helens Cable and Rubber Co., Ltd. The range includes sheets with one side mahogany and the other side black, or a mahogany and oak combination may be had. Another novel ebonite sheet is of sandwich design and embodies two-coloured marbled ebonite as outsides with a black ebonite inside, in the following outside shades—green and black, cream and black, oak, old ivory.

Developments in the "Dragon" range of loud speakers made by Alfred Graham and Co. include a new chocolate crystalline finish in certain of the horn-type models, and the incorporation of a high efficiency light-weight receiver unit and oxidised copper base. Another modification is the increased diameter of the sound conduits to accommodate the greater output. Improvements are also to be noted in the "swan-neck" models and in the cabinet type "Radiolux" series, which resemble closely in appearance the familiar English bracket clock.

Existing types of "Six-Sixty" valves, shown by the Electron Co., Ltd., are supplemented by a new series employing the new duo-triangular method of filament suspension.

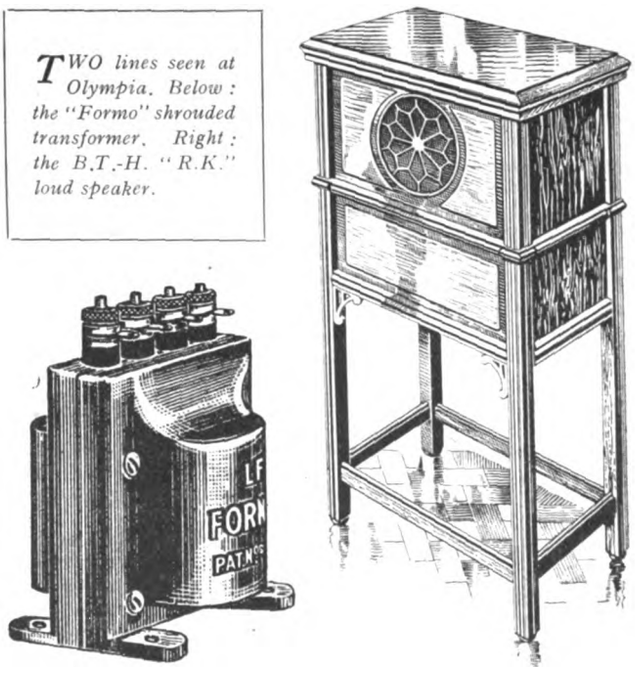
A loud speaker concealed in a framed picture is a novelty shown by J. W. See and Sons. Not only is the sound-producing instrument entirely hidden, but when it is properly hung there is nothing to indicate that it is anything more than a framed picture. Various types of frame are available, and purchasers can choose from a selection of etchings, oil paintings or water colours, or alternatively, can have a portrait of their own mounted and framed in this way.

Chief among the new products of Brandes, Ltd. is the "Ellipticon," a cone loud-speaker fitted in an attractive cabinet finished in dark walnut. The magnets in the cone unit are very large. There is no diaphragm, but a small armature provided is said to react to the faintest impulse, and to give faithful reproduction of extremely high and low tones.

A. J. Stevens and Co. (1914) Ltd., have a fine range of receivers designed to harmonise with any furnishing scheme, and including several bureau models with enclosed batteries, and some self-contained table instruments of pleasing design. On all models the insertion of the loud speaker jack at once connects all batteries, and automatically disconnects when drawn out.

Station Indicators.

Among a group of new "Gecophone" sets, shown by the General Electric Co., Ltd., is a new three-valve model embodying a particularly sensitive circuit. No plug-in coils or other interchangeable units are required, the change over from high to low wave-lengths being controlled by a switch on the panel. The usual dials have been dispensed with, and are replaced by one station indicator in the centre of the panel. This indicator rotates through a friction-driven reduction mechanism. The setting of each station, when obtained, is recorded on the indicator. Another novel set—also a three-valve model, and known as the "Here and There" set—has very simple controls, and has special provision for the reception of alternative programmes from the local station and Daventry respectively. The set incorporates two tuning circuits which are adjusted to the required stations, after which it is only necessary to turn the control switch to receive from one or the other. The "Gecophone" slow motion, straight line frequency condensers are new components. The 30 to 1 ratio slow motion device is interchangeable with the standard 12 to 1 gearing fitted to the company's square law type condensers, and is available for those who require an even slower movement than the standard.



TWO lines seen at Olympia. Below: the "Formo" shrouded transformer. Right: the B.T.-H. "R.K." loud speaker.

(To be concluded.)

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"WIRING THE HOMES OF BRITAIN."

Big Demand for "Better Home Lighting" Competition Booklets—Only Fourteen Days Left to Prepare for Big Business.

SUFFICIENT time has now elapsed for every member of the electrical trade to have digested the contents of the very full plan of the E.D.A.-E.L.M.A. "Better Home Lighting Campaign," and judging by the intense activity that has prevailed at 15, Savoy Street—the Campaign Headquarters—the response has been good.

The special staff at E.D.A. headquarters packing "ammunition" for the "Better Home Lighting" Campaign.

Applications for competition booklets are arriving in great numbers by each post, and the special staff of packers seen in the above picture is being kept busy satisfying the requirements of traders in all parts of the country.

It should be emphasised that however great the demand may be, the headquarters organisation can be expanded at very short notice, and that no one should hesitate to apply *at once* for his campaign requirements.

The great aim of all concerned should be to accomplish the entire distribution of booklets, posters, etc., to the trade during September. Not only will this free the headquarters staff for the active prosecution of the campaign, but it will also ensure that when the public side of the campaign has started nobody who calls at an electrical shop for a competition booklet will be turned away.

Every electrical establishment maintaining relations with the general public will be visited by numbers of people who will ask for a copy of the booklet, and it will be useless to tell them that stocks have run out, and that further supplies will be available in a few days. People who are met in this way will either go elsewhere for their booklets or else lose interest in the proposition.

The Vital Step.

The vital booklet, it may be repeated, is E.D.A. publication No. 1 002. This contains the ballot form for the £2 000 electric house competition, and is supplied to the trade by the Electrical Development Association, 15, Savoy Street, Strand, London, W.C.2, at the very modest price of £4 10s. per thousand copies.

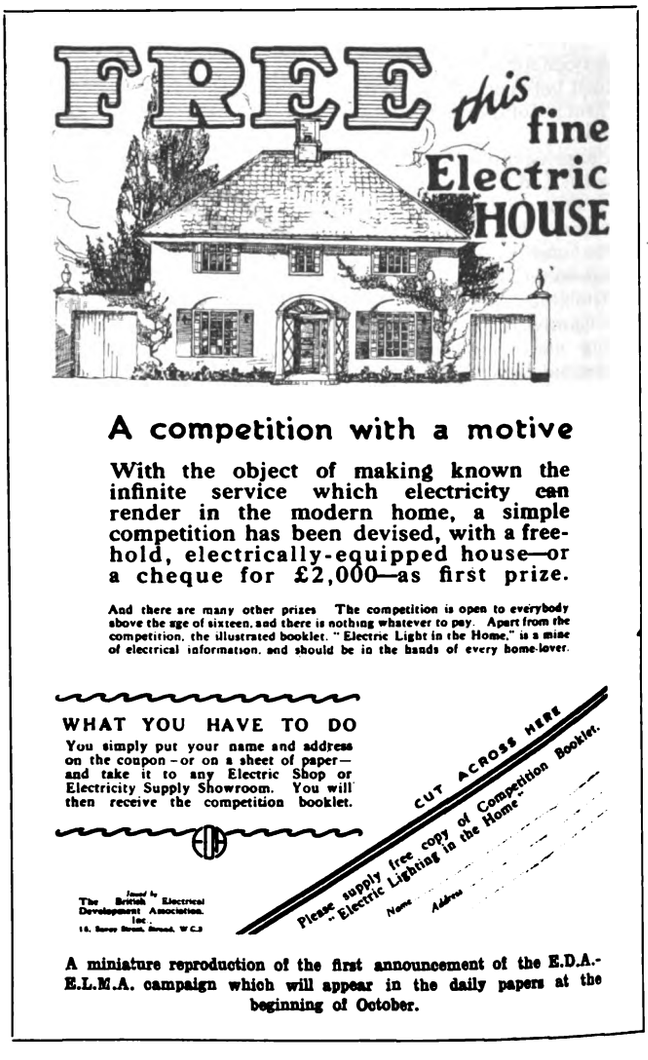
Thus, by a simple arithmetical exercise it will be seen that each booklet costs the electrical retailer 1·08d. For this trifling outlay he gets someone to come into his shop and leave his or her name and address for the book. Judging by the expenses usually entailed in the compilation of "live" mailing lists the expenditure named is more than justified on this score alone. But there can be very few traders who, having got into direct touch with people who are manifestly interested in what electricity can do for them in the home, will allow all those people to go away without selling some of them something.

The amount of extra business that each individual trader does in this way is of course entirely dependent upon his selling ability, but there is no doubt that no comparable chance has ever been offered to the electrical trade in the past. The present opportunity is literally a golden one, and much too good to lose. Yet there is only a fortnight left in which to make every preparation.

Electrical firms who issue their own house magazines will probably wish to refer in forthcoming issues to the Better Home Lighting Campaign; those responsible for the production of such periodicals can obtain full particulars from the E.D.A.

Preparations are actively proceeding in the Manchester district for the national campaign, writes the Manchester correspondent of THE ELECTRICIAN. The Manchester District Officer is Mr. R. C. Hawkins, of 4, Fountain Street, Manchester, and the district under his charge is a very wide one, including the whole of Lancashire, Cheshire, Westmorland, North Wales and the Isle of Man. All the preliminary ground work has been completed, and the trade literature has been distributed. Manufacturers' salesmen are being initiated into all the details of the campaign, and a mass meeting of the trade is to be held in the Milton Hall, Deansgate, Manchester, at 6 p.m. on September 24th, when it is hoped that a large gathering will meet to officially launch the effort in the Manchester area. Mr. W. E. Bush, of E.L.M.A., will be among the speakers. Meetings of this kind are being organised in other centres and electrical men are asked to co-operate in making them a real success.

Incidentally, the new Electric Lighting Service Bureau under the charge of Mr. R. C. Hawkins is now rapidly approaching completion. The demonstration rooms are centrally situated at 4, Fountain Street, Manchester, and will, it is hoped, be ready for use during the Manchester Civic Week, which is to be held from October 2nd to 9th. An official announcement will, however, be made later.


FREE this fine Electric HOUSE
A competition with a motive
With the object of making known the infinite service which electricity can render in the modern home, a simple competition has been devised, with a freehold, electrically-equipped house—or a cheque for £2,000—as first prize.
And there are many other prizes. The competition is open to everybody above the age of sixteen, and there is nothing whatever to pay. Apart from the competition, the illustrated booklet, "Electric Light in the Home," is a mine of electrical information, and should be in the hands of every home-lover.
WHAT YOU HAVE TO DO
You simply put your name and address on the coupon—or on a sheet of paper—and take it to any Electric Shop or Electricity Supply Showroom. You will then receive the competition booklet.
CUT ACROSS HERE
Please supply free copy of Competition Booklet, "Electric Lighting in the Home."
Name
Address
Issued by The British Electrical Development Association, Ltd., 15, Savoy Street, Strand, W.C.2

A miniature reproduction of the first announcement of the E.D.A.-E.L.M.A. campaign which will appear in the daily papers at the beginning of October.

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WILLESDEN'S SHOWROOM.

Electricity Demonstration Rooms Opened by Electricity Department.

WILLESDEN Urban District Council has not until recently adopted the policy of advertising its electricity undertaking, other than by good service, because many roads have been without cables; but all extensions of recent years have been designed upon a definite plan, and there is now a series of small sub-stations covering almost the whole of the district, so that demands can be dealt with in the least expensive manner. Consequently, it has now been decided to "push" the undertaking by various means. With this object an assisted wiring scheme—at present only for owner-occupiers of houses—was authorised by the Council in April last. The Council obtains offers for the installation work from three contractors, usually those nearest the job, and the most suitable offer is accepted.

Another departure which is expected to assist greatly in increasing the load is the opening of a well-stocked showroom adjoining the Salusbury Road transformer station, which receives its supply from the Taylor's Lane station of the North Metropolitan Electric Power Supply Co.

On the occasion of the opening, on September 9th, Dr. G. W. R. Skene, chairman of the Council, and Councillor W. A. Hill, chairman of the Electricity Committee and vice-chairman of the Council, entertained a large number of visitors, who appeared to be highly interested in the many labour-saving appliances exhibited. These included an Eco-Dry cabinet for drying linen, etc., supplied by the Economic Dryer Co., a Magnet washer and wringer, and a Grand home electric ironing machine, several Tricity cookers, a Bastian storage geyser, an enclosed radiator with a towel rail, a Genii Vectis (Nobbs' patent) water heater, and a good collection of other radiators, fires, kettles, irons, toasters, hair dryers, etc., while specimens of the Henley and Callender conduit wiring systems were also shown.

About 100 cookers have already been connected to the Council's system, and it is expected that a much more rapid rate of connection will result from the publicity which will be secured by the new showroom and the advertisements which are now affixed to the Council's electric vehicles, and on its own property in various parts of the district. The Council's charges for energy are 4½d. per kWh for lighting and 1d. for power, heating and cooking, and special combined domestic tariffs are also available. It is hoped to raise the per capita consumption of electricity in Willesden from 100 to 500 kWh per annum within the next two or three years.

Adjoining the new showroom is the Bijou Café, in which all the baking is done by electricity; and, as the proprietor invites inspection of the bakery, this also should act as a strong recommendation of the Council's electricity service.

Technical Colleges.

Prospectuses and Calendars of Use to Prospective Electrical Students.

THE following literature has come to hand:—

Calendar of Brighton Technical College, containing particulars of the final examination in engineering (for B.Sc. degree), the engineering diploma course, electrical engineering courses, etc. A prospectus of evening classes, which opened on September 13th, is issued separately. The electrical engineering course prepares for the National Certificates issued by the Institution of Electrical Engineers in conjunction with the Board of Education.

The prospectus of the University of London Faculty of Engineering gives particulars of the terms, fees, etc., of special courses in electrical engineering, electrical technology and design, electrical communications (telegraphy, telephony, wireless, etc.).

The programme of the City and Guilds of London Institute, Department of Technology, is a bulky book, published by John Murray (London) and sold at 3s. 6d. net. Telegraphy, telephony, radio-communication, electrical installation work, electrical engineering, and electro-metallurgy are amongst the subjects taught.

The Calendar of the Royal Technical College, Glasgow, for 1926-7 is also an imposing volume—consisting of over 400 pages. Particulars are given of courses in electrical engineering, and of a scheme for the training of engineers with the co-operation of employers.

THE NATIONAL REGISTER.

Eighteen More Contractors Added to Roll by Executive Committee.

AT the September meeting of the Executive Committee of the National Register of Electrical Installation Contractors, held at 1, Lincoln's Inn Fields, London, twenty-nine applications from electrical contractors for admission to the Register were considered. Of these applications, 18 were accepted and 11 declined and withdrawn, thus bringing the total strength of the Register, exclusive of duplicated entries, up to 948.

Owing to the holiday season there has been no meeting of the Executive since July and although it was hoped that a larger number of applications than usual would have come before the September meeting, the total applications actually received numbered four less than those put forward in July.

Although the percentage of unsuitable applications is still rather high, it shows a reduction when compared with the July figures. Contractors who are not thoroughly acquainted with the qualifications required for Registration should apply in the first place to Mr. T. Trimnell, the secretary, for details, as much delay can be saved by making this simple inquiry.

Qualifications for Registration.

Actually, the only essential qualifications amount to the maintenance of a proper standard of work, and the payment of an annual fee of £1, and there can be no electrical contractor of repute who is unable to satisfy the requirements of the Registration authority. Those who may have been waiting to see how the scheme would work in actual practice have had ample opportunities of judging its advantages for themselves, and a few words with any existing registered contractor will confirm the view that registration is indispensable, and worth far more than the small fee payable for the privilege.

As things are at the moment there seems little doubt that there will be over a thousand registered contractors by the end of the year. How much in excess of that figure the total will be depends to a great extent on the existing registered contractors, who, for the good of the movement generally, and for their own personal good in particular, should do their best to add at least one new member to the Register before December.

Duty of Registered Contractors.

It needs no deep mathematical knowledge to appreciate that just one new convert obtained by each contractor now on the Register will double its membership, placing the total strength in the neighbourhood of two thousand instead of one. Such an achievement is well worth the small personal effort required, and will greatly enhance the status and influence of the registration movement as a whole.

The list of contractors whose applications for registration were accepted by the Executive Committee at the September meeting is given below, the names being arranged in alphabetical order:—Burgess and Garfield, 550, Coventry Road, Small Heath, Birmingham; Brees, V. R., 9, Derby Street, Macclesfield; Finnigan and Pollock, 47, North Bridge Street, Sunderland; Gordon Hughes Electrical Co., 163, Moor Street, Birmingham; Gunner, H. G., The Electric Stores, Springhill, Birmingham; Harrison and Searle, Ltd., 85, Edmund Street, Birmingham; Hodgson and Coley, Barmoor Garage, West Ryton; Holland Beachey and Co., 21, Park Street, Thame, Oxon; Jamison, Oswald and H., 35, Wellington Place, Belfast; Johnson, D., 71, King Street, Wallasey; Lambton and Hobster, 75, Prescot Street, Liverpool; Lilleker Bros., Ltd., Doncaster Gate, Rotherham; Logie, Ashmole and Co., Ltd., 154, New Street, Burton-on-Trent; Owen and Palmer, Faraday House, High Street, Bangor, North Wales; Petts, B., 54, King's Road, St. Leonards-on-Sea; Smethurst and Co. (London), Ltd., 72, Duke Street, London, W.1.; Wares, A. J., Ltd., Enterprise House, South Shields; Wright, A. Blackburn, 105, Morehampton Road, Donnybrook, Dublin.

The Oxford Wireless Telephony Co., Ltd., 22 and 29, Queen Street, Oxford, has issued a neat booklet on the Oxford wireless apparatus. It contains details and illustrations of the Oxford portable set, the Oxford radiophone de luxe, the Oxford 'Varisty four, the Oxford D.E. three-valve, two-valve and one-valve sets, the Oxford hospital set and the Oxford l.f. intervalve transformer. A list of 109 hospitals and institutions equipped with Oxford apparatus during the past 12 months is given on a separate sheet.

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BUSINESS ITEMS.

Changes of Address, Representatives, and other Developments.

D. MASON and Son have opened an "Exide" service depot at Wokingham, Berks.

The Alton Battery Co., Ltd., has appointed Mr. W. R. Hall to act as its representative for Lancashire, Cheshire and North Wales. Mr. Hall's headquarters are at 37a, Victoria Buildings, Manchester.

The annual "Exide Week" is being held this year from September 20th to 25th. Special efforts will be made by means of large-scale national advertising to sell more "Exide" batteries, and traders co-operating in the scheme will participate in a window-dressing competition in which the prizes total £100. An attractive range of posters, showcards, window strips, etc., is available for retailers' use.

Another view at the Smoke Abatement Exhibition at Birmingham.

We are informed by the Midgley Car Lighting Co., Ltd., that a new company has been formed and will trade under the title of M. C. L. and Repetition, Ltd., and that Mr. A. H. Midgley will continue as electrical engineer to the new company. The business of George H. Alexander Repetition, Ltd., has been acquired by M. C. L. and Repetition, Ltd., and Mr. J. W. Steer, who has long been associated with the Alexander firm, will be general manager of the new concern. The principal staff of both concerns is retained. The new works, which are at present being extended, are situated at Langley, Birmingham.

West Ham Exhibition.

Borough Council's Interesting Electrical Display at Stratford Town Hall.

WEST HAM Electricity Department is holding an electrical exhibition at the Town Hall, Stratford, during the present week. The exhibition, which was inaugurated by the Mayor (Councillor J. T. Husband) on Monday, is open daily from 2.30 p.m., and will close at 9.30, p.m. to-morrow (Saturday).

Amongst the exhibits are an "Artofex" portable electric oven and other electrically driven machines for bakeries; Belling electric fires and domestic appliances; "Inventum" fires, vacuum cleaners, lighting fittings, etc., shown by Drake and Gorham Wholesale, Ltd.; a Jackson cooker and a Jackson "Perco-Wash" electric clothes-boiler; "Magnet" (G.E.C.) cooking and heating and other domestic appliances; "Supastone" lighting glassware, shown by the Wholesale Fittings Co.; the Standard washing machine, ironing machine, vacuum sweeper, etc., made by Standard Telephones and Cables, Ltd., Berry's "Magicoal" fires; Hotpoint-Falco cookers, the Hotpoint-Maytag Gyrafoam electric washing machine, the Hotpoint-Utenco electric ironer, the Hotpoint Premier-Duplex vacuum cleaner, and other Hotpoint specialities; and "Cosmos" (Metro-Vick) domestic appliances. The West Ham Electricity Department is running an Information Bureau at the Exhibition, and takes the opportunity to call attention in the catalogue to the domestic tariff under which the charge is 1d. per kWh for all purposes plus a fixed charge according to the number of lamps installed, but without extra charge for meter rent. There were nearly 1 000 visitors to the exhibition on the opening day.

OVERSEAS TRADE.

Exports of British Electrical Goods Again Show Improvement.

EXPORTS of electrical machinery, apparatus and material from this country in August were valued at £1 404 324, an increase of £138 154 over August of last year, but they showed a diminution of £216 120 compared with July of this year. The exports of the same classes of goods for the eight expired months of this year are less than those of the corresponding months of last year, by £762 249.

Electrical imports for the month of August amounted to £365 574, a decrease of £27 553 compared with July, 1925, and the electrical goods imported during the past eight months, valued at £2 984 535, compare with £3 388 434 in the same period of last year; decrease £403 899.

Dealing with individual classes of goods, imports of telegraph and telephone instruments decreased by £13 884, glow lamps by £11 297, and electrical instruments, other than telegraph and telephone, by £10 909, while exports increased in the case of electric wires and cable with insulation other than rubber, by £103 464, telegraph and telephone wires and cables, other than submarine, by £22 614; and telegraph and telephone instruments by £76 059.

Imports Still Decreasing.

	Month of August.		Eight Months.	
Imports.	1925. £	1926. £	1925. £	1926 £
Electrical Machinery	106 132	76 846	740 970	753 982
Electric Wires and Cables, Insulated—				
Rubber insulated (not being Telegraph or Telephone Wires or Cables)	17 144	13 260	133 419	132 253
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	22 534	31 404	232 335	242 878
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	14 851	6 093	121 773	99 196
Submarine Telegraph and Telephone Cables	—	—	—	5 500
Telegraph and Telephone Instruments and Apparatus (except wireless valves)	43 624	29 740	562 532	281 341
Carbons, Electric	8 785	15 574	60 040	61 051
Electric Lamps and parts thereof—				
Electric Glow Lamps	41 852	30 555	293 665	185 358
Arc Lamps and Electric Searchlights	401	54	3 343	2 223
Parts thereof (except Carbon Rods)	237	296	3 547	2 961
Batteries and Accumulators (including parts)	56 052	57 672	320 461	310 108
Electrical Instruments (other than telegraphic and telephonic) Commercial (including ammeters, voltmeters, etc.), House Service Meters, and Scientific	28 356	17 447	182 493	147 440
Switchboards, other than Telegraph and Telephone	3	439	803	918
Electrical Goods and Apparatus, all other Sorts	89 533	86 194	733 053	759 326
Total of Electrical Goods and Apparatus	430 404	365 574	3 388 434	2 984 535

Exports Improving.

	Month of August.		Eight Months.	
Exports.	1925. £	1926. £	1925. £	1926. £
Electrical Machinery—				
Railway and Traction Motors	54 719	31 602	394 060	295 114
Other Motors and Generators	180 111	171 561	1 464 753	1 350 056
All other Sorts	253 576	259 159	2 096 451	2 085 819
Electric Wires and Cables, Insulated—				
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	103 167	112 055	902 248	987 486
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	52 654	156 118	809 474	1 038 506
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	40 987	63 601	485 330	506 716
Submarine Telegraph and Telephone Cables	39 730	5 104	1 101 716	123 807
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	220 516	296 575	1 956 834	2 022 659
Carbons, Electric	4 693	949	20 128	10 635
Electric Lamps and Parts—				
Electric Glow Lamps	50 484	39 933	323 857	319 141
Arc Lamps and Electric Searchlights	457	619	9 010	3 911
Parts thereof (except Carbon Rods)	279	108	2 910	3 227
Batteries and Accumulators (including Parts)	83 984	74 282	680 976	631 453
Electrical Instruments (other than Telegraphic and Telephonic): Commercial (including Ammeters, Voltmeters, etc.), House Service Meters and Scientific	34 759	42 367	230 331	261 782
Switchboards, other than Telegraph and Telephone	5 933	2 542	59 179	46 257
Electrical Goods and Apparatus, all other Sorts	140 121	147 659	1 199 032	1 290 471
Total of Electrical Goods and Apparatus	1 266 170	1 404 324	11 739 289	10 977 040

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

MR. R. H. Schofield, sales manager of Ferranti, Ltd., is making another business tour of the U.S.A.

Mr. A. B. Cousins, A.M.I.E.E., was married at Cyfarthfa Church, Merthyr Tydfil, to Miss Grace Edwards, youngest daughter of the late Rev. T. J. Edwards.

Mr. Howard D. Rogers, an electrical engineer, of Pangbourne, was commended by the Reading magistrates last week for going to the assistance of the police in a brawl. He received minor injuries.

Shoreditch (London) Borough Council is recommended to increase the salary of Mr. W. S. Clark, chief clerk and accountant of the Electricity Supply Department, from £650 to £700 per annum, rising to £800 by two annual increments of £50.

THE ELECTRICIAN understands that Mr. A. C. Cramb, borough electrical engineer of Croydon, is to be the next president of the Institution of Public Lighting Engineers. He will preside at next year's Conference to be held at Brighton.

Mr. W. J. Liberty, public lighting superintendent of the City of London, and hon. secretary of the Institution of Public Lighting Engineers, has been co-opted a member of the Council of the National "Safety First" Council and of the Public Safety Committee.

Mr. Harold Thomas Gambrell, of Gambrell Brothers, Ltd., radio manufacturers, was married at Leatherhead on September 4th to Miss C. L. Mould, only daughter of Mr. Stephen Mould, of Moulds, Ltd. From the staff of Gambrell Bros., Ltd., the bridegroom received a dinner service.

The late Mr. Charles Paxton Markham (chairman of the Staveley Coal and Iron Co. and the Parkgate Iron and Steel Co.), who, it will be remembered, gave a prize of £1 000 not long before his death to the inventor of an electric battery locomotive suitable for use in mines, left estate of the gross value of £611 305; net personalty £515 883.

Shoreditch (London) Borough Council is recommended to confirm, as from December 19th next, the appointment of Mr. W. Weekes as borough electrical engineer, which position he has occupied, on probation, since the retirement of Mr. C. Newton Russell in December, 1925, and that his salary be £1 000 per annum, rising by annual increments of £50 to £1 250 per annum.

Obituary.

The following deaths have been announced :—

Ald. THOMAS HARRISON, who had for several years been Vice-Chairman of Sunderland Electricity Committee.

Mr. FREDERICK ANDREW, in his 68th year. He was for 41 years—until his retirement a year ago—with W. T. Henley's Telegraph Works Co., Ltd., at North Woolwich, where he was latterly principal foreman. He was a Freemason and a Past Master of the Henley Lodge.

Points of View.

Interesting Pronouncements on a Variety of Topical Electrical Subjects.

ELECTRICITY is an ideal alternative to coal for cooking.—*Dr. Raymond Unwin.*

* * *

You can't afford to make a mistake with an underground railway.—*Lord Ashfield.*

* * *

If we are to speed up transportation we must get off the streets, and the "tube" is probably the best method.—*Lt.-Col. Moore-Brabazon.*

* * *

The slogan "Scrap the trams" is simply propaganda invented and fostered by people interested in other methods of traction.—*Mr. Alfred Baker.*

* * *

Despite unfair conditions, tramways are unsurpassed for the cheap conveyance of great masses of population in industrial areas.—*Mr. P. Priestly.*

* * *

An enterprising financial group is needed to start a new company which would supply both gas and electricity, and then we should have an efficient combination and a great saving of coal.—*Mr. A. S. E. Ackermann.*

FORTY YEARS AGO.

A Few Random Pickings from "The Electrician" of September 17th, 1886.

SOME idea of the progress made by the electrical industry in the last forty years may be gathered from the following items culled from THE ELECTRICIAN of September 17th, 1886 :—

Proposals for a Canada to Australia cable were discussed in the House of Commons.

* * *

American power companies were considering the desirability of hiring out motors.

* * *

An arc lamp, devised by Dr. Ohmart, was said to burn only 1 in. of carbon per 100 hours.

* * *

Prof. Elihu Thomson first drew attention to the possibility of using electricity for welding.

* * *

The Woodhouse and Rawson Co. had just acquired the manufacturing rights for the Scharnweber arc lamp.

* * *

Experiments on the treatment of secondary batteries were described by Messrs. Bernard Drake and J. Marshall Gorham.

* * *

A member of THE ELECTRICIAN staff made the passage from Dover to Calais and back on the electric launch, "Volta." The electrical equipment was designed by Mr. Reckenzaun.

* * *

During the week ended September 10th the new electric tramway at Blackpool carried 44 306 passengers. The cost of fuel was £4 16s. 3d. and total working expenses were £45 16s. 2d.

* * *

We described as "mammoth" a "Brush" dynamo weighing nearly 10 tons. The machine was designed to "absorb 355 horse-power, to run at 410 revolutions, and to give 3 000 amperes with 83 volts."

The Electricity Bill.

Amendments Suggested by Newcastle and Gateshead Chamber of Commerce.

THE General Purposes and Electricity Committees of the Newcastle and Gateshead Chamber of Commerce have adopted resolutions expressing their opinion that the Electricity Board which is to be formed under the Government's Electricity Bill, when it becomes law, should be constituted on the lines described by the Prime Minister in a speech in January last, i.e., the majority of the members should be elected by those whom the undertakings are designed to serve; that the control of generation should be left in the hands of the owners of the selected stations; that supplies of electricity taken by the Board from selected stations should be paid for at agreed prices; and that the executive decisions of the Board should, wherever possible, be carried out by existing undertakings.

Shannon Power Scheme.

Not to be Utilised by Germans as an Aid to Peaceful Penetration.

THE Limerick correspondent of the "Liverpool Daily Post and Mercury" gives an interesting account of an interview with Mr. J. Prendergast, the resident engineer who is supervising, on behalf of the Irish Free State Government, the construction work of the Shannon power scheme. After giving some particulars of the work which has to be done, including the excavation of 6 million cub. metres of earth and about 1 million of rock and the placing of two million cub. metres of concrete, the correspondent states that much of the 20 000 tons of machinery assembled for the works is being driven electrically by the plant in the temporary power station. Dealing with the workers, he states that there are 300 skilled Germans, 500 skilled Irishmen, 100 Irishmen and Germans on the clerical staff and 1 600 unskilled labourers. Many of the Germans live in their own separate compound with their wives and children. It is stated that when the scheme is completed the Germans will be required to return to their own country.

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IN LIGHTER VEIN.

Illuminating Hints for Progressive Electrical Contractor Advertisers.

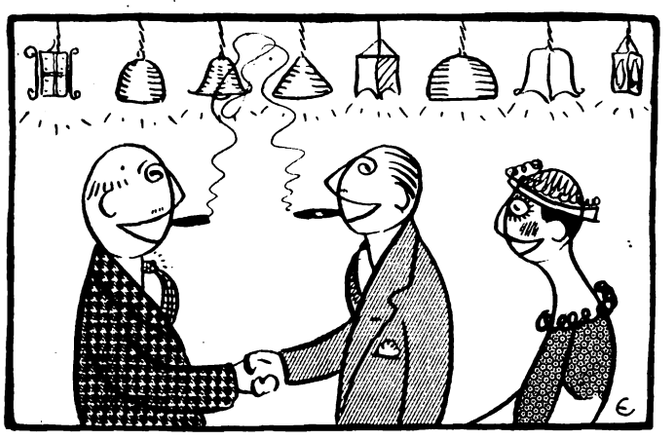
OUR recent comment on the advertisement of electrical equipment has raised such interest that our Special Commissioner, working in series with our tame Copy Writer, has undertaken a wide investigation of the subject.

* * *

They have been given a very kind reception by advertising men, and a full report of their findings will be found in the Blue Book, obtainable from H.M. Waste Paper Office (Salvage Department). Early application for copies should be made as incineration will take place on September 30th, and heavy penalties are inflicted for reprinting.

* * *

Their first call was on a well-known house of furnishers where the proprietor explained the wonderful influence of his particular method. Afterwards they visited other firms, and finally prepared their report, most of which is written in highly-flavoured technical language, too heavy for this column; it has, therefore, been fired for future reference. Practical suggestions were included in the report, and one is submitted below. It was written under the influence of a magnetic personality, which may have induced a parallel line of thought, particularly in a new field, and a tolerance of ".005" should be allowed.



MR. CONTRACTOR: I WANT YOU TO BE HAPPY TOO.

MR. CONTRACTOR: Yes, I want you to be happy, too. That's why I'm here.

MR. NOMAN: Well, Mr. Contractor, we have chosen fittings and accessories to the value of £1 2s. 11½d.; but my wife is a bit nervous lest we should be unable to finish paying, and lose the lot.

MR. CONTRACTOR: Quite impossible under my new system. Here is my guarantee sealed in Black and White. If you find that you cannot pay, we can no doubt arrange a subsidy.

MR. NOMAN: That's good. Now, would 5s. down and 1s. a month afterwards be enough?

MR. CONTRACTOR: Splendid! We will arrange to deliver the goods by aeroplane at once.

MR. NOMAN: Another point that is troubling us, Mr. Contractor. We have got fittings now; but there are no wires for them to fit on to. Will there be any extra charge?

MR. CONTRACTOR: That's all right. Our men will do the wiring, and connect up; the job will be completed by the time you are home. No extra charge; not a penny!

MR. NOMAN: Thank you, Mr. Contractor; thank you! I don't suppose we qualify for the Insurance Scheme?

MR. CONTRACTOR: Certainly, certainly! We give you a free Fire, Life and Death Policy on the Rook and Blue Moon Insurance Co., and pay for your children's education. Further, we realise that these payments will leave you a little short, Mr. Noman, so we arrange for 50 Gold Flake to be delivered to you each week until the contract is completed, and we also pay the first quarter's bill for current.

MR. NOMAN: Thank you again, Mr. Contractor. Nothing could be fairer; we are delighted.

MR. CONTRACTOR: I am pleased you have called. You will find my private electric car outside; it will take you wherever you wish to go; and, remember, if a fuse blows or anything goes wrong, our telephone number is 0012 Strapping. We do all repairs free of charge. *Good* afternoon.

THE BAIRD TELEVISOR.

Original Apparatus Now on View at the South Kensington Museum.

MR. J. L. Baird's original "Televisor" apparatus, by which wireless transmission of outlines by reflected light was first effected in 1925, has been placed in the Science Museum, South Kensington, London, where it is now on view.

The first demonstration of true television—*i.e.*, the transmission of living human faces, with light, shade and detail was given on January 27th, 1926, by means of Mr. Baird's improved apparatus, which is to be seen until to-morrow (Saturday) at the National Radio Exhibition, and details of which are at present withheld.

Street Lighting.

Successful Experiments at Preston with Centrally-suspended Electric Lamps.

PRESTON Corporation's experiment in the use of centrally-suspended electric lamps for street lighting is said to have proved very satisfactory. On the arterial road to the Ribbleston crossing, where this system has been adopted, it is stated that visibility is good, in clear weather, to a distance of 700 yd., and the footways and the fronts of houses are more evenly illuminated than they would be by alternate lamps on either side. The new lamps are of 400 c.p., and similar lamps are to be used in the same manner from Ribbleston to the Isolation Hospital. At certain crossings four-way danger lights have been placed for warning the drivers of vehicles. About 250 street lamps have been converted from gas to electricity, and the number is to be increased to 500 by March next, and subsequently to at least 1 000.

Brazing Solder.

British Engineering Standards Association Issues New Specification for Two Grades.

THE British Engineering Standards Association has now issued a Specification (No. 263-1926) covering two grades of brazing solder. The copper contents for the two grades range from 53 to 55 per cent., and from 49 to 51 per cent. respectively, maximum limits being specified for the tin, antimony, arsenic, bismuth, iron and lead permitted in the alloy. A table is included as an appendix to the Specification giving a range of grain sizes of granular solder to which it is recommended that the material be ordered.

Copies of this publication may be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, price 1s. 2d. post free.

Insulating Varnishes.

Tests with New Time-Saving Method for Baking in Ozonised Air.

A SAVING of about 50 per cent. in the time required for the drying of insulating varnishes is claimed for a process in which ozonised air is used, and which is described in a paper by Messrs. L. A. Spence and P. B. Cochran, read before the American Electro-Chemical Society. Tests showed that the quality of the insulation produced by baking in ozonised air under the proper conditions was equally as good as, and for some applications better than, the films produced by the slower process of baking in air.

Work in Prospect.

CROYDON.—Block of nine shops and dwellings, High Street. Particulars, the borough engineer.

HEMSWORTH (YORKS).—Hotel, Barnsley Road. Particulars, Garside and Pennington, Pontefract.

MELBOURN.—Housing scheme. Particulars, Mr. C. W. Smith, 4, Regent Street, Cambridge.

NEWTON ABBOT.—Pottery works, Newton Road, for Mr. Thomas Lemon.

READING.—Re-erection of Caversham Park Oratory School. Particulars, the head master, Rev. E. Pereira.

SALFORD.—Public library, Seedley. Particulars, the Town Clerk.

SOUTH KIRKBY (YORKS).—Mission Hall, Middle Lane (£7 000). Particulars, Mr. Alfred Gelder.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given.

INDIA STORE DEPARTMENT, September 17th.—One 5-ton travelling electric jib crane. Specification and form of tender (5s.) from the Director-General, Branch No. 14, Belvedere Road, Lambeth, London, S.E.1.

INDIA STORE DEPARTMENT, September 17th.—(1) Two-colour and (2) single-colour litho printing machines with motors, and (3) vertical cross-tube boilers (100 lb. pressure). Specifications (5s.) each from the Director-General, Belvedere Road, Lambeth, London, S.E.1.

NORTHERN IRELAND MINISTRY OF FINANCE, September 17th.—Supply and delivery at H.M. Prison, Armagh, of (1) accumulators, and (2) switchboard and booster. Forms of tender, etc., can be obtained at the Prison or from the Offices of the Ministry, 15, Donegall Square West, Belfast.

HALIFAX CORPORATION, September 18th.—Wiring 58 houses in Nursery Lane. Particulars from the Borough Engineer; deposit £2 2s.

BELFAST MENTAL HOSPITAL, September 20th.—Six months' supply of electrical fittings. Tender forms from Mr. James Harper, secretary to the Committee of Management, Saintfield Road, Belfast.

BRIGHTON GUARDIANS, September 20th.—Supply of electrical fittings. Tender forms from the clerk, Mr. H. Burfield, Prince's Street, Brighton.

ISLINGTON (LONDON) GUARDIANS, September 20th.—Electrical supplies for six months. Forms of tender from the clerk, Mr. Albert King, Guardians' Offices, St. John's Road, Upper Holloway, N.19. Apply personally or send stamped brief-size envelope.

ATHERTON URBAN DISTRICT COUNCIL, September 21st.—Supply of 1 000 yards of 1 in. l.t. concentric, paper insulated, lead sheathed, steel tape armoured cable, suitable for 660 V. Tenders to the Clerk of the Council.

BIRMINGHAM CORPORATION, September 21st. Supply, delivery and erection of plant for refuse disposal and salvage works. Specifications from the Superintendent, Salvage Department, 161, Corporation Street, Birmingham; deposit £1 1s.

HALIFAX GUARDIANS, September 21st.—Supply of electrical fittings for six months. Tender forms from the clerk, Mr. A. T. Longbotham, Carlton Street, Halifax.

WARRINGTON GUARDIANS, September 21st.—Electrical supplies for six months. Tender forms from the clerk, Mr. Arthur Bottomley, Museum Street, Warrington.

BATTERSEA (LONDON) BOROUGH COUNCIL, September 22nd.—(1) E.h.t. and l.t., d.c. switchgear for 1 000 kW motor-converter, and outgoing d.c. feeder switchboard, for Nine Elms sub-station; (2) works power switchboard for Lombard Road generating station. Specifications, etc., from the Electrical Engineer, Electricity Works, Lombard Road, Battersea, S.W.11.

CROYDON GUARDIANS, September 23rd.—Six months' supply of electrical fittings and appliances. Forms of tender from the Clerk, Union Offices, Mayday Road, Thornton Heath. Send stamped addressed envelope.

DUNDEE CORPORATION, September 24th.—Supply of 2-core, 3-core, and 4-core l.t., paper insulated, lead covered and double steel tape armoured cable suitable for 660 V. Specifications, etc., from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

MERSEY RAILWAY CO., September 24th.—Supply of electrical sundries (tender form No. 10) and metallic and carbon filament lamps and fittings (form 13). Forms from Mr. J. Shaw, general manager and secretary, Central Station, Birkenhead.

MANCHESTER GUARDIANS, September 25th.—Supply of electric light cable required at the Bootle Hall Infirmary, Charlestown Road, Blackley, Manchester. Specification, etc., from Mr. E. Hargreaves, superintendent of works, Union Offices, All Saints', Manchester.

NEWPORT (MON) CORPORATION, September 25th.—Motor converter and switchgear. Specification (L7) from Mr. A. Nichols Moore, Borough Electrical and Tramways Engineer, Town Hall, Newport; deposit £3 3s.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, September 29th.—(a) Extra high-pressure and low pressure switchgear (Contract No. 24); transformer switch and distribution kiosk (No. 27), and ironclad switch unit (No. 28). Specification, etc., from Mr. R. W. Willis, electrical engineer and manager, 37, High Street, Cheadle, Cheshire; deposit £1 1s.

INDIA STORE DEPARTMENT, October 1st.—Two 125 kVA 3 300 V crude oil engine alternator sets, with water-cooling plant, switchboard, etc., and transformers for Cauvery Metur project. Specifications (5s.) from the Director-General, Branch No. 36, Belvedere Road, Lambeth, London, S.E.1.

PORTSMOUTH TRAMWAYS COMMITTEE, October 1st.—Six months' supply of insulating materials, lamps and motor windings (section Q) and overhead line materials (section R). Specification, etc., from the General Manager and Engineer, Guildhall, Portsmouth.

An attractive window display of B.T.-H. wireless equipment at the Leatherhead shop of Messrs. Buchanan and Curwen.

SOUTHEND CORPORATION, October 4th.—Supply of 2 500 pairs of fuse boxes and 1 250 troughs. Particulars from Mr. R. Birkett, borough electrical engineer and manager.

MANCHESTER CORPORATION, October 8th.—Two 25 000 kVA three-phase transformers and one 1 250 kVA three-phase transformer (specification B.49); and one 100-ton electrically operated crane (specification B.50) for Barton power station. Specifications (deposit £2 2s. for each) from Mr. H. C. Lamb, Electricity Dept., Town Hall, Manchester.

DUBLIN BOROUGH COMMISSIONERS, October 18th.—Supply and erection of four water-tube boilers, with stokers, economisers, feed pumps and accessories, for the Electric Supply Department. Specification from the City Electrical Engineer, Fleet Street, Dublin; deposit £5 5s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

JOHANNESBURG COUNCIL, September 18th.—Underwriters' wire. (Reference B.X. 2 766.) Supply of 6 600 V truck-type ironclad switchgear panels. (Reference B.X. 2 767.)

SYDNEY CITY COUNCIL, September 20th.—One h.t. d.c. Kenetron valve testing set for underground cables. (Reference B.X. 2 748.)

SYDNEY CITY COUNCIL, September 20th.—Supply of 33 000 V insulators. Specification (No. 1 048) from the Constructional Engineer, Electricity Dept., Town Hall, Sydney.

POSTS AND TELEGRAPH DEPARTMENT, MELBOURNE, September 21st.—Switchboard keys and parts. (Schedule 26/720.) (Reference B.X. 2 699.)

JOHANNESBURG COUNCIL, September 23rd.—Switchboard-type overload relays. (Reference B.X. 2 809.)

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AUCKLAND ELECTRIC POWER BOARD, September 27th.—One 14-ton electrically-operated crane. (Reference A.X. 3 415.)

AUCKLAND ELECTRIC POWER BOARD, September 28th.—Supply of pilot cable, joint boxes and dividing boxes. Specifications from Preece, Cardew, and Rider, 8, Queen Anne's Gate, Westminster, S.W.1; deposit £2.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 28th.—Three motor-driven low lift pumps with control apparatus, for Taieri drainage scheme. (Reference A.X. 3 274.)

NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMWAYS (CHIEF ELECTRICAL ENGINEERS' BRANCH), September 29th.—One drag link ash conveyor. (Reference A.X. 3 432.)

VICTORIAN GOVERNMENT RAILWAYS, September 29th.—Two motor driven disc grinding machines and necessary equipment. (Reference A.X. 3 433.)

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, October 4th.—Pole oil switches. (Reference B.X. 2 795.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 5th.—Supply of one four-motor overhead travelling crane and runway for the Waikaremoana Electric Power Development, Section 30. (Reference A.X. 3 517.)

POSTS AND TELEGRAPH DEPARTMENT, MELBOURNE, October 5th.—Switchboard cords. (Schedule No. 115.) (Reference B.X. 2 747.)

PRETORIA MUNICIPAL COUNCIL, October 7th.—Transformer and switchgear for abattoir sub-station. (Reference B.X. 2 851.)

AUCKLAND ELECTRIC POWER BOARD, October 11th.—Ironclad switchgear and single phase transformers. (Reference B.X. 2 793.)

NEW PLYMOUTH (N.Z.) HARBOUR BOARD, October 16th.—Supply, delivery and erection of 30 cwt. portal electric horizontal luffing jib crane, fittings and accessories. (Reference A.X. 3 458.)

SYDNEY COUNCIL, October 18th.—Two 100 ton electrically-operated overhead travelling cranes. (Contract 1 033.) (Reference A.X. 3 467.)

CHRISTCHURCH (N.Z.) DRAINAGE BOARD, October 19th.—Supply and erection of three sets of electrical centrifugal pumping plants. (Contract 26 329.) (Reference A.X. 3 215.*)

VICTORIAN GOVERNMENT RAILWAYS, October 20th.—Supply and delivery of rail motor equipment. (Contract No. 39 614.) (Reference A.X. 3 449.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Telephone plugs and sleeves. (Schedule C.120.) (Reference B.X. 2 799.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Lamps, lamp caps, and lamp sockets. (Schedule C.124.) (Reference B.X. 2 800.)

SYDNEY ELECTRICITY DEPARTMENT, November 1st.—Supply, delivery, erection, setting to work, testing and maintenance at Bunnerong power station of boiler feed pumps. (Reference A.X. 3 470.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Supply of 110 000 V transformers for Waikaremoana power scheme (section 17). (Reference B.X. 2 744.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Indoor control gear and switchgear for Waikaremoana electric power development (section 14). (Reference B.X. 2 675.)

VICTORIAN RAILWAY COMMISSIONERS, November 3rd.—Supply of 77 miles of seven-strand h.d. copper cable.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone transformers. (Reference B.X. 2 797.)

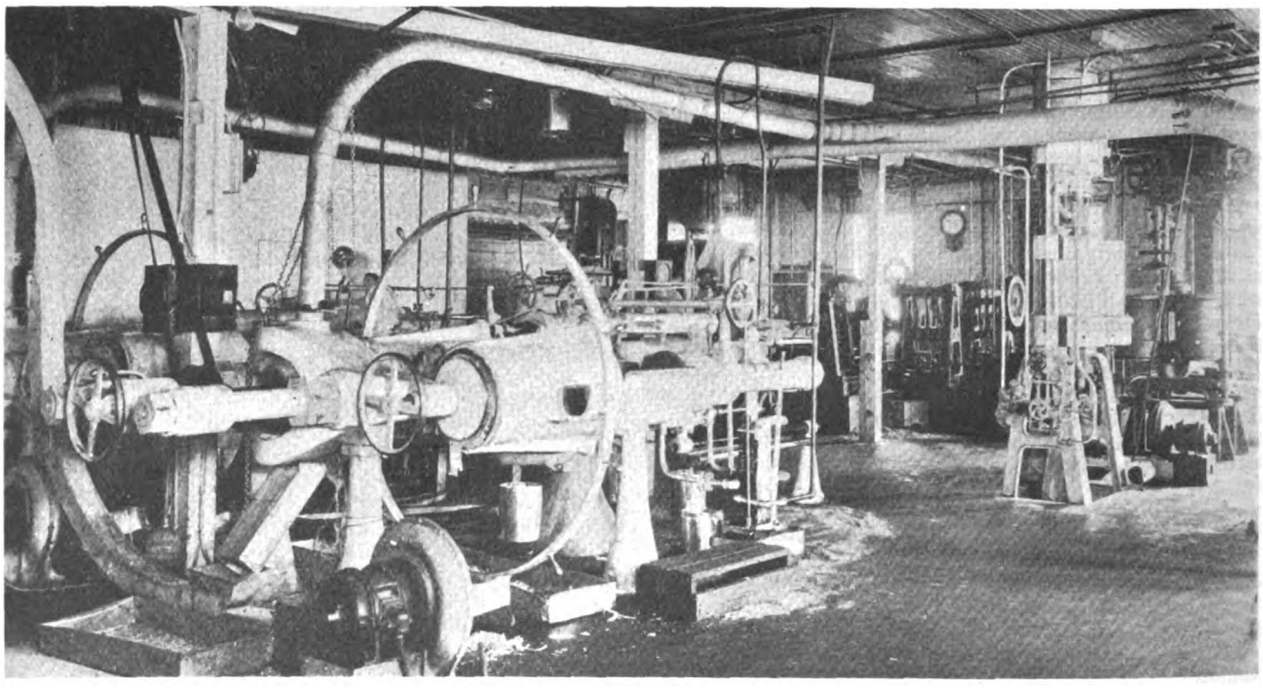
POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE November 9th.—Telephone protective apparatus. (Reference B.X. 840.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, November 10th.—Supply and erection of steam turbine-driven centrifugal boiler-feed pump. (Contract No. 770.) (Reference A.X. 3 534.) November 10th.—Supply and erection of motor-driven centrifugal boiler-feed pump. (Contract No. 771.) (Reference A.X. 3 536.)

SYDNEY CITY COUNCIL, November 15th.—Supply of 33 000 V cable and pilot cable. Specification (No. 1 047) from the Constructional Engineer, Electricity Dept., Town Hall, Sydney.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 16th.—Supply of timing clocks for indicating the duration of telephone trunk line calls. (Reference B.X. 2 827.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 23rd.—Lightning arresters and transformers. (Reference B.X. 2 792.)



MAKING MACARONI BY ELECTRICITY.

THIS electrically-operated plant is used for the manufacture of macaroni or spaghetti. Each machine has its own motor, of which there are 80, and the output is 150 000 packages a day. The product is never touched by hand, and all operations, whether carrying or blowing, are performed electrically. Electric fans play an important part in the drying process.

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SOUTHLAND ELECTRIC POWER BOARD, INVERCARGILL, N.Z. December 1st.—Supply of a 3 000 H.P. horizontal Francis turbine and 2 350 kW generator. (Reference B.X. 2 822.)

VICTORIAN RAILWAY COMMISSIONERS, December 1st.—Rotary converter or rectifier set, with switching equipment for its automatic operation.

STATE ELECTRICITY WORKS, MONTEVIDEO, December 6th.—Diesel-electric generating sets.

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 1st.—Supply and erection, at site of Seru pumping and power station, of four Diesel engine alternator groups, three pumps and accessories. Specification (10s. 6d.) form Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1.

Tenders Accepted.

NELSON CORPORATION.—J. Levett, electric wiring of 50 houses on Hodge House Estate.

DOVER CORPORATION.—British Electric Transformer Co., Ltd., e.h.t. voltage regulator, £1 013.

STIRLINGSHIRE COUNTY COUNCIL.—Lockhart and M'Nab, electric light installation, Bannockburn Hospital.

POST OFFICE STORES DEPARTMENT.- Metro-Vick Supplies Ltd., 12 months' supply of Cosmos gasfilled lamps.

TICEHURST GUARDIANS.—Electric light installation at the Institution, Flimwell. Particulars from the Clerk.

PAISLEY SAVINGS BANK.—Goudie Bros., electrical work in connection with the erection of the bank in Moss Street.

RETFORD CORPORATION.—Visco Engineering Co., Ltd., water-cooling tower, for the electricity works, £607 2s. 6d.

DUBLIN CITY COMMISSIONERS.—Bromsgrove Guild, Ltd., three standard electric lamps, £244 5s. (recommended).

EASTBOURNE GUARDIANS.—Medical Supply Association, Ltd., X-ray apparatus and mercury vapour lamp, £331 7s. 7d.

GLASGOW CORPORATION.—Edmiston, Brown and Co., Ltd., complete electrical installation of the new Kelvin Hall, Glasgow.

SALFORD CORPORATION.—W. T. Glover and Co., 1 850 yd. 0·1 sq. in. e.h.t. three-core cable (for pressures up to 6 600 V), £852 15s.

DUBLIN CITY COMMISSIONERS.—Siemens-Schuckert (Ireland), Ltd., storage battery, for Crooksling Sanatorium, £527 15s.

DONCASTER CORPORATION.—Hall and Stenson, electric light wiring of 238 houses on Warmsworth Road (South) site, £1 081 15s.

GEO. THOMPSON AND CO., LTD. (ABERDEEN LINE).—British Thomson-Houston Co., Ltd., supply of incandescent lamps until the end of the current year.

SOUTHERN RAILWAY.—Metro-Vick Supplies, Ltd., Cosmos gasfilled, vacuum m.f. traction, train lighting, c.t., automobile and flash light lamps for six months.

DEWSBURY CORPORATION.—W. T. Henley's Telegraph Works Co., Ltd., supply of feeder cable from the electricity works to the market place, £815 15s.

GEORGE THOMPSON AND CO., LTD. (ABERDEEN LINE).—Siemens and English Electric Lamp Co., Ltd., Siemens' electric lamps (all types) for steamers.

EDMONTON URBAN DISTRICT COUNCIL.—T. Smith and Sons, electric grab crane for detritus tanks, £955; Electric Control, Ltd., control panels for pump motors.

GENERAL POST OFFICE.—General Electric Co., Ltd., twelve months' supply of Osram metal filament, vacuum and gasfilled lamps, and Robertson carbon filament lamps.

BRADFORD CORPORATION.—Horstmann Gear Co., Ltd., Newbridge time switches, in connection with the conversion of several miles of streets from gas to electric lighting.

WEST HARTLEPOOL CORPORATION.—Richard Garrett and Sons, Ltd., 12 Garrett low loading line electric trolley 'buses, and overhead equipment. The contract amounts to about £25 000.

LANARKSHIRE EDUCATION COMMITTEE.—Stephen Harvey, electric light installation at new secondary school, Wishaw, £1 024 18s. 6d. The Council's works department tendered at £1 047 0s. 9d.

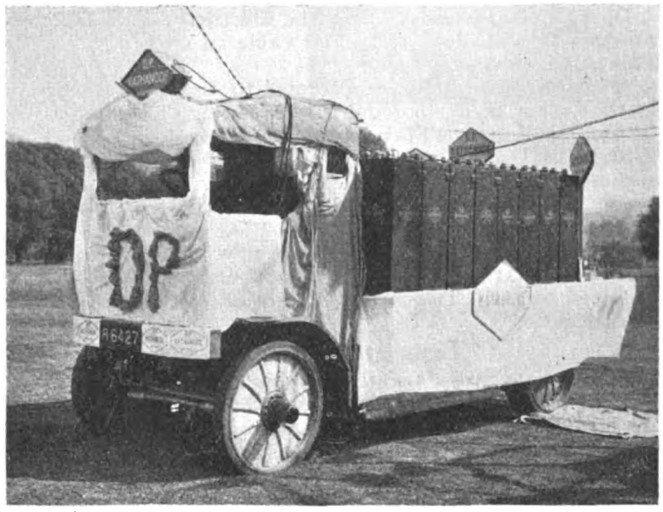
GENERAL POST OFFICE.—British Thomson-Houston Co., Ltd., 12 months' supply of Mazda gasfilled and vacuum lamps. Siemens and English Electric Lamp Co., Ltd., vacuum lamps for 12 months.

SOUTHERN RAILWAY.—General Electric Co., Ltd., six months' supply of Osram metal filament, vacuum and gasfilled lamps (including train lighting lamps) and Robertson carbon filament lamps.

CHALMERS HOSPITAL, BANFF.—James Beveridge and Sons, electric light installation, £501 10s. (accepted with a proviso that a larger gas engine than that stipulated in the offer shall be supplied at a price to be approved).

DUMFRIES AND GALLOWAY JOINT SANATORIUM BOARD.—A. Baird and Sons, Ltd., electric power cables and lighting installation, £904 10s. 3d.; J. Kilpatrick and Sons, Ltd., boiler-house and power station equipment, £2 526.

BEDWAS URBAN DISTRICT COUNCIL.—W. T. Henley's Telegraph Works Co., Ltd., supply and erection of overhead transmission lines and supplying and laying underground cables, £2 664: Ferguson Pailin Ltd., high and low tension switchgear, etc., £881 17s.



To light the fair ground at the Eakewell Carnival, in aid of the hospitals, the D.P. Battery Co. employed this electric vehicle. Two separate circuits, one at 110 V and one at 50 V, were supplied. In the former case additional "Kathanode" cells were coupled to those on the lorry, and for the 50 V supply a separate battery was used.

MANCHESTER CORPORATION.—Macintosh Cable Co., Ltd., Standard Telephones and Cables, Ltd., and Johnson and Phillips, Ltd., cable; Richard Johnson and Nephew, Ltd., copper trolley wire; T. Bolton and Sons, Ltd., cadmium copper trolley wire; Forest City Electric Co., Ltd., Collins' automatic points.

LONDON COUNTY COUNCIL.—Smethurst and Co. (London), Ltd., electric light wiring and fitting of blocks Nos. 9 and 10 of dwellings on 3rd section of East Hill (Wandsworth) estate, £2 076 1s. 6d.; also tendered: Electrical Installations, Ltd., £2 091 2s. 8d.; L. G. Tate and Co., Ltd., £2 134 6s.; H. J. Cash and Co., Ltd., £2 169; A. Hawkins and Sons, £2 172; A. Dean and Co., Ltd., £2 232 14s. 6d.; Heath-Pritchard, Ltd., £2 246; T. Clarke and Co., Ltd., £2 317; Commercial Telephone and Electrical Co., Ltd., £2 348 17s. 9d.

IRISH FREE STATE POSTS AND TELEGRAPHS DEPARTMENT.—Standard Telephones and Cables, Ltd., automatic telephone equipment, telephone coils, and relays; Hayward Co., dry cells, General Electric Co., Ltd., porous and dry cells; Siemens Bros. and Co., Ltd., telephone bell sets, sack type porous cells; Telephone Manufacturing Co., Ltd., switchboards, telephone indicators, jacks and strip connection; International Electric Co., Ltd., telephone bell sets and jacks; Peel-Conner Telephone Works, telephone bell sets; Phœnix Telephone and Electric Works, Ltd., telephone jacks; Ericsson Telephones, Ltd., telephone jacks and switchboards; Cable Accessories Co., Ltd., tumbler switches.

METROPOLITAN ASYLUMS BOARD.—L. G. Tate and Co., Ltd., re-wiring electric lighting circuits, etc., at Princess Mary's Hospital for Children, £675 (recommended). Also tendered: Philpot and Son, £704 15s.; Alpha Manufacturing and Electrical Co., £806 1s. 6d.; Toy and Winslow, £845; A. F. Dunkley, £850; Anderson, Angell and Co., £889; Collins' Electrical, Ltd., £912; T. Clarke and Co., Ltd., £929; H. Pratt, Ltd., £949 15s.; P. M. Braidwood, £1 136; C. Mortlock, Ltd., £1 223 7s.; Douglas Electric Lighting and Power Co., £1 230 10s.; Electrical Contracts and Maintenance Co. (1925), Ltd., £1 438; G. P. East, £2 620. L. G. Tate and Co., Ltd., re-wiring electric light installation in chapel at Grove Park Hospital, £105 (recommended). Other tenders: Toy and Winslow, £125; Buchanan and Curwen, £127; V. G. Middleton and Co., Ltd., £183; Read and Partners, Ltd., £184; T. Clarke and Co., Ltd., £215.

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ELECTRICITY SUPPLY.

Proposed Loan for Bradford Extensions—A Remarkable Cooker and Wiring Scheme—Southport's New Agreement with Birkdale Co.

WIGAN T.C. is increasing its charges for electricity for lighting, heating and power by 10 per cent. as from October 1st.

The Lurgan electric lighting scheme is making good progress, and the supply is expected to be available by next month.

Owing to the high cost of coal, Darwen Corporation Electricity Committee has decided to make an all-round increase of 10 per cent. in charges.

Dover T.C. has received from the Electricity Commissioners sanction to a loan of £6 400 for cable to connect with the Folkestone electricity works.

A local company has been formed to distribute electricity in the village of Barlborough (Derbyshire). The supply will be obtained from the Staveley Coal and Iron Co.

Skegness U.D.C. has instructed the surveyor to prepare a scheme for the generation of electricity at the pumping station for supplying power and light for the new Piazza and bathing pool.

Several shops in Helensburgh are now lighted electrically, and the effect is considered much superior to that hitherto obtained by gas. The current is supplied by the Clyde Valley Electrical Co.

Tests at Nottingham.

Nottingham Street Lighting Committee has decided to test the relative cost and illuminating power of gas and electricity on two equal sections of the Wollaton Park estate, including the housing area.

Bradford Estimates Sub-Committee has approved the proposal of the Electricity Committee to apply to the Electricity Commissioners for sanction to a loan of £77 800 for new plant for the Valley Road power station.

Ald. Higham, chairman of Accrington Electricity Committee, announces that the undertaking is doing very well. The bulk of the increased cost through the coal dispute will be chargeable to the large power users.

Weymouth T.C. has made the following increases in the charges for electricity: Lighting, from 7d. to 8d.; heating and power, from 2d. to 3d.; cooking and contract, from 1½d. to 2½d.; and public lighting from 3½d. to 4½d.

Torquay Corporation has decided to instal coal-handling plant at the electricity works, at a cost of over £20 000. The present consumption of coal is 15 000 tons per annum, and the haulage and unloading of the fuel costs £2 795.

Coventry Electricity Committee has decided to notify bulk consumers of the Corporation's decision to purchase foreign coal and the consequent probable increase of the price of electricity, so that consumers may curtail their demands for electricity if they so desire.

Chichester T.C. has decided to increase the charges for electricity by 10 per cent. for the quarters ending December and March next, to cover the increased cost of coal. Application is to be made for a loan of £7 000 for the development of a supply of electricity to Lavant.

Lindfield P.C. decided last week to raise no objection to an application by the Hayward's Heath and District Electric Supply Co. for permission to erect overhead mains from Scrase Bridge to the foot of Black Hill and thence underground mains along High Street to a point north of Lindfield Church.

Coal Shortage.

Winchester was recently on the verge of having its electricity supply stopped by the exhaustion of the coal supply. Two consignments, each of 800 tons, have, however, been secured in time to avert a shut-down, but these, which include British, American and Continental coal, have cost 50s. a ton.

Overhead electric cables are being erected from Radcliffe through Rossendale Valley to the new super-station at Padiham, belonging to the Lancs Electric Power Co. The Padiham station is on larger dimensions than was originally contemplated, and it is being linked up with the Accrington cables.

Bacup Electricity Department has submitted to the Waterworks and Baths Committee terms for a supply of electricity for the proposed pumping station at Cowpe reservoir. The Electricity Department offer to bear part of the interest and sinking fund charges on the cost of laying the cable from Waterbarn to the reservoir.

Saddleworth U.D.C. has decided to electrify the street lamps in Upper Mill from Wade Lock to Saddleworth Station. Should this innovation prove successful members are agreed that the remainder of the lamps throughout Saddleworth where cables are laid should likewise be electrified.

At a cost of £1 400, two new steam-driven generating sets have been installed at Primrose Bank Poor Law Institution, Burnley, to replace old ones which have been in use 24 years. The engines have been made by Belliss and Morcom, and the generators by the Metropolitan-Vickers Electrical Co. The capacity of the two engines is 200 H.P.

Thame Chamber of Commerce has considered the position of poles erected in the town for the purpose of bringing an electricity supply from Aylesbury, and has decided to communicate with the Highways Committee of the U.D.C., it being contended that some of the poles are erected in places where danger might be created by their presence.

Bradford Electricity Committee has approved a supply of electricity to 91 new houses, 57 existing shops, a large bakery, two chapels, two schools, a vicarage and a large block of offices. Four miles of mains are to be laid for the purposes of this supply.—The Committee has considered the question of increasing its charges for energy, but has not, so far, decided to take any action in the matter.

Sunderland Electricity Committee has decided that it cannot recommend any further works to provide employment during the coming winter for men out of work. During the last two and a half years the Department has carried out schemes costing £330 000.

Ripon R.D.C. recently received an intimation from Electrical Distribution of Yorkshire, Ltd., that the company was applying for an Order to supply electricity in the rural area, and the Council decided not to oppose the application. The Council, however, has now been informed that Ripon City Council is also applying for authority to supply in the same area, and the support of the R.D.C. to that application is asked.

Barrow and the Commissioners.

Barrow-in-Furness T.C. recently discussed the refusal of the Electricity Commissioners to grant powers for the Backbarrow Falls electricity scheme. It was decided that the Electricity Sub-Committee should continue to operate and that the Commissioners should be asked if the scheme was a sound one from the engineering and financial points of view, and if the reply was in the affirmative that the Council should do everything in its power to get the scheme approved.

Shoreditch (London) Housing Committee report that the committee has had under consideration the question of the installation of electric cooking apparatus at Provost Dwellings, which are the property of the Borough Council. Applications have been received from 29 of the 35 tenants of those dwellings for an electric cooking supply, and the Lighting Committee is prepared to give that service at a charge of 1½d. per kWh, including hire and maintenance of electric cookers and kettles, providing the Housing Committee will bear the cost of the necessary wiring, which is estimated at about £2 15s. per flat. The committee has resolved to bear the cost of the necessary wiring subject to the Lighting Committee installing and maintaining at the cost of the Electricity Department the necessary apparatus.

Southport Electricity Committee has completed the agreement with the Birkdale Electric Supply Co., Ltd., providing for the new terms of bulk supply by the Corporation to the company. The company undertakes to take from the Corporation all current necessary for the company's requirements in excess of that produced by its present plant, and will not during the period stipulated in the agreement make or apply for permission to make any extension to its own generating station, but nothing in the agreement is to be deemed to preclude the company from maintaining or renewing its existing plant. The company has applied for the Corporation's consent to change its system of supply from direct to 50-cycle alternating three-wire supply, and consent has been granted, subject to a provision that, unless otherwise agreed, the company will, at its own expense, carry out the necessary alterations to consumers' existing apparatus, or pay to each consumer injuriously affected by the alteration such sum as may be agreed upon or determined by arbitration.

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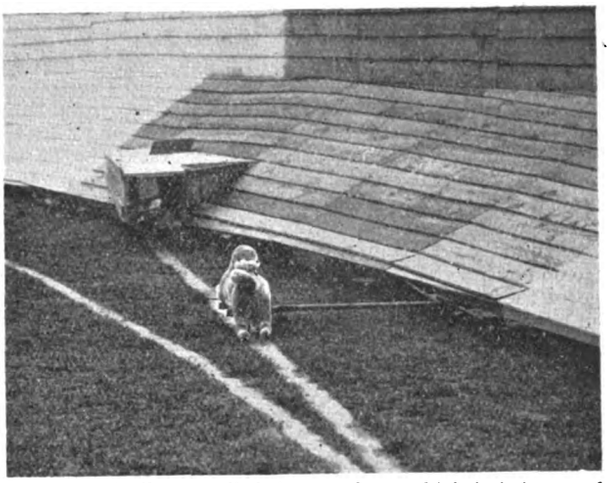
NEWS IN PICTURES

Mr. F. Andrew, whose death is announced, was for 41 years employed at the North Woolwich works of W. T. Henley's Telegraph Works Co., Ltd. (p. 333).

Sir Hugo Hirst, chairman of the General Electric Co., Ltd., who has accepted the presidency of the Electrical Trades Commercial Travellers' Association for the forthcoming year.

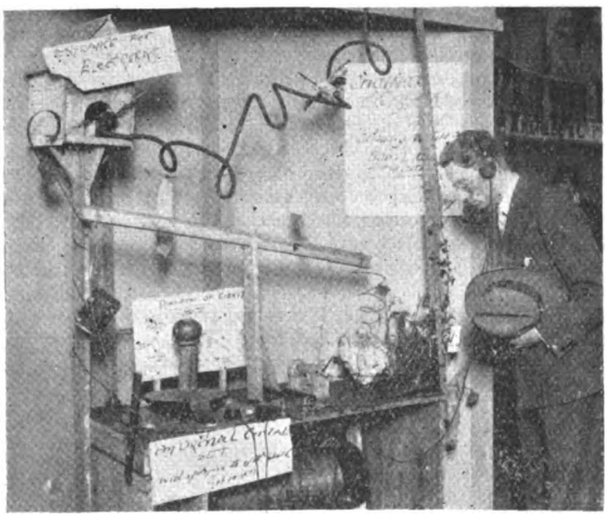
Mr. P. Priestly, general manager of the Liverpool tramways, presided at the annual conference of the Municipal Tramways Association at Liverpool.

A view inside the spacious car sheds which will house rolling stock used on the new "Underground" extension to Morden, which was opened to the public on Monday.



The electrically-propelled dummy hare which is being used with success for greyhound racing in Manchester, where large crowds attend every "meeting."

Competitors in a mixed foursome arranged by the A.T.M. Co.'s Golf Club. The winners were Mrs. Passmore and Mr. J. Williams, whose net score was 76½.



With apologies to Heath Robinson, this crystal set is being exhibited—not at Olympia but at a big London store. A piece of coal acts as a crystal, and old tins are freely employed.

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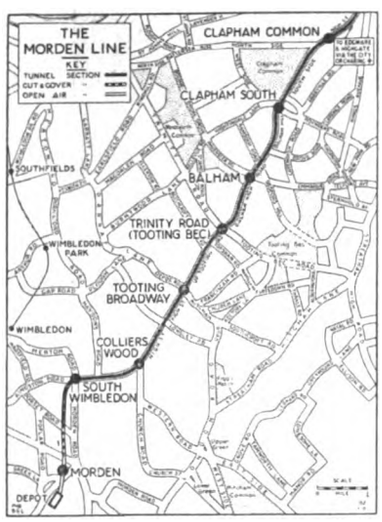
ELECTRIC TRACTION.

The Opening of the New "Underground" Extension to Morden.

ON Monday the two concluding instalments of the comprehensive scheme of improvements carried out on the City and South London Railway and the Hampstead Tube—the Morden extension and the Kennington loop—were opened, the first train being driven over the new line by Lt.-Col. Moore-Brabazon, Parliamentary Secretary to the Ministry of Transport. The Morden extension projects the City Railway from Clapham Common to North Morden through Balham, Tooting and Merton; and the Kennington loop extends the Hampstead Tube from Charing Cross to the Kennington station of the City Railway, *via* Waterloo.



Map showing the districts served by the Morden extension.

At Kennington a second physical connection has been made between the two lines, which now assume the form of a circular railway and serve the city and west central districts and a considerable tract of the Surrey side, and throw off branches to Morden, on the southern confines of the metropolis, and to Edgware and Highgate on the north. At various points the conjoined lines have interchange facilities with the other sections of the Underground system.

These extended lines now form the longest Tube railway in the world. The distance between the northern and southern terminals is 21½ miles, the total length of double track of the lines as a whole is 29 miles, and the tunnels are the longest railway tunnels in existence. These two extensions have cost £4 750 000 out of the £9 900 000 which is the total cost of the whole of the post-war reconstructions and extensions undertaken by this organisation.

Signalling on the Morden extension is done from two cabins, and with the exception of those controlled from Tooting Broadway all signals between Clapham and Morden work automatically. With the exception of the points at the entrance to the depot, the whole of the signalling at Morden is worked from the cabin at the station. The points at the depot entrance are worked from a six-lever frame operated by the shunter. Movements to or from the depot are protected by electrical interlocking between the ground frame and the power frame. Both the Tooting and Morden cabins are provided with the latest type power frames and safety devices, including an electrical lock on the point gear which prevents the points being wrongfully operated.

Current for operating the Morden extension is obtained from the County of London Electric Supply Co., being received at a switch house at Colliers' Wood, and thence transmitted to a sub-station at South Wimbledon, and also, through the latter, to another new (automatic) sub-station at Balham. Energy for the Kennington loop is supplied by the "Underground" power station at Chelsea through a new sub-station of the remote-controlled type in Westminster Bridge Road, the machinery being operated from the sub-station at Charing Cross.

In the car sheds at Morden overhead trolley wires are provided and the cables suspended from them to adaptor terminals; cars can thus be moved over the respective pits by electrical means.

At a meeting of Newport (Mon.) T.C. last week, a proposal that the Tramways Committee should consider the salary of the manager of the tramways (Mr. N. J. Young) was rejected by a large majority.

York Corporation is applying to the Ministry of Transport to continue the present Order fixing the fares at 2d. for every complete tramcar journey, except in the case of workmen's fares, which are one penny in the evening.

WIRELESS NEWS.

Operation of the New Radio Manufacturers' Association.

AS announced in THE ELECTRICIAN last week, the two radio manufacturers' organisations have adjusted their differences and have amalgamated into one body for manufacturers only, under the title of the Radio Manufacturers' Association, with headquarters at Astor House, Aldwych, London, W.C.2. The N.A.R.M.A.T. has ceased to function, and is now being wound up by the trustees.

For the time being the Radio Manufacturers' Association is being run by an interim council comprising an equal number of members of the old N.A.R.M.A.T. and the old S.R.M., but a meeting will shortly be called to elect officials and a committee to function for the first year.

Dealing in foreign-made goods is restricted, and members are allowed entire freedom to fix their own retail prices and discounts. If desired, members can arrange for the protection of their prices and discounts.

The "stop list" will still function, and no member may trade with firms on this list, subject to a proviso relating to existing contracts, under penalty of being himself placed on the list. No one will, however, be put on the "stop list" without first being invited to answer the allegations made, and being given the opportunity of so doing.

Indian Broadcasting.

Additional particulars regarding the Indian Broadcasting Co., Ltd., have now been published. The fee for receiving licences is to be R.10 (15s.), and 80 p.c. of the receipts for licences will be paid to the company for five years from the beginning of broadcasting; the company will also receive 10 p.c. of the import value of all wireless receiving apparatus and accessories brought into the country. No limitation is to be placed on the company's profits for the first five years, but, thereafter, the Government may reduce the licence fees or the proportion of the fees payable to the company or restrict the company's maximum dividend to 15 per cent. The authorised capital is R. 1 500 000; 60 000 ordinary shares have been issued, and 2 500 have been reserved for importers of wireless apparatus.

A Radio Retailer's Plaint.

A remarkable example of the extreme demand for "service" made on radio retailers is related by a Lincolnshire wireless trader.

A customer inquired the price of a crystal set, and the cost of installation. The price was given, and a set chosen, after being tested on the trader's aerial. A member of the trader's staff called at the customer's house to decide on the position of the aerial, and when he called later with the set and accessories, he was told that the lady had changed her mind. The trader endeavoured to secure a reversal of the decision, but the lady was highly indignant, and the matter was allowed to drop. A week later the reason for her action was made clear, for it was found that a relative had installed for her a home-made set.

The sequel to this story is still more interesting. "A few months afterwards," states this long-suffering retailer, "I am asked if I will buy the secondhand home-made set, as it is not satisfactory—not as part purchase of a better set, but so that the inquirer can buy a better one elsewhere, presumably at the nearest city!"

Wireless News in Brief.

The Ulster Wireless Traders' Association's second annual exhibition was held recently at the Ulster Hall, Belfast.

Mr. Herbert Hoover, the United States Secretary of Commerce, predicts that a new law for Government regulation, control, and administration of radio will be in full operation by the end of the coming winter session of Congress. In the meantime the Department of Commerce is continuing limited control of radio through the Bureau of Navigation.

It is announced that the technical preparations for the rearrangement of European broadcasting wavelengths require more time than was originally supposed, and the application of the new scheme, which was previously announced to come into operation on September 15th, has been postponed until October 15th. All broadcasting stations are to be equipped with a calibrated electrical indicator, and whenever a station departs from the wavelength allocated to it, warning will be given by means of a luminous signal.

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COMPANY NEWS.

Little Activity in Electrical Share Market—Few Changes in Quotations—Stronger Supply Position Maintained.

THERE has been little activity in the electrical share market during the past week, and there are few changes in quotations. Newcastle-upon-Tyne Electric Supply Co. ordinary have again experienced a slight drop, probably in consequence of the postponement of the question of paying an interim dividend, due to the Coal Strike. Brompton and Kensington ordinary, City of London preference, and London Electric ordinary, have maintained last week's figures, although quoted ex div. Westminster Electric Supply ordinary also maintain the rise of a sixteenth which took place last week. Underground Electric Railways ordinary still stand at the increased figure of 3¾ recorded in our last issue, Metropolitan Railway consolidated ordinary have dropped a further point, to 62. British Insulated ordinary have risen a sixteenth.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
	Electricity Supply.				
10	Brompton & Kensington Ord.	31/3*	31/3	45/-	24/-
4	Central Elec. Supp. 4% Deb..	90	90	100	67
15	Charing Cross Elec. Ord. (£1)..	44/4½	44/4½	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	49/4½	49/4½	52/6	20/3
6	,, ,, 6% C.P. ..	22/6*	22/6	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	59/4½	59/4½	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	13½	13½	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	32/-*	32/-	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	36/10½	36/10½	41/6	8/-
4½	,, ,, 4½% C.P...	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/3	21/7½	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	22/6	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord (£5) ..	16½	16½	15½	3½
15	W'minster Elec. Sup. Ord. (£1)	43/9	43/9	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
	,, ,, 6% C.P...	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	139½	139½	123	24
6	,, ,, 6% Pf. Stk.	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69*	69	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	78½	78½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	50½	50½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	78½	78½	89	65
4	Lon. Un. Trams. 1st Deb. ..	47	47	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	64½	64½	101½	49
5	,, ,, 5% Deb. ..	68½	68½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	62	63	84½	19
3½	,, 3½ Pf. Stk.	63½	63½	88½	40½
3½	,, 3½% Deb.	69½	69½	92½	51
3½	Met. Dis. Rly. Ord. Stk. ..	51½	51½	58	18½
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb.	65	65	73½	48½
—	Underground Elec. Rlys. Ord.(£10)	3½	3½	5½	21/3
5	Yorks. (W.R.)Trams. Ord. ..	11/6	11/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½*	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	68/9	67/6	62/-	26/6
6	,, ,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	23/-	23/-	23/4	19/7½
7	,, ,, ,, 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	26/3	25/7½	29/-	10/-
‡15	Callender's Cable Ord.	66/3	66/3	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref...	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)..	12/9	12/9	28/9½	1/11
7½	,, ,, 1st Pref...	21/3	21/3	26/-	5/-
10	Elec. Construction Ord. ..	31/10½	31/3	30/4	6/7½
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	16/3	16/3	29/3	7/3
6	,, ,, 6% C.P... ..	18/-	18/-	21/3	10/6
6	Ericsson Telephones 6% C.P...	21/10½	21/10½	21/-	12/7½
6	Ferranti 6% Pref.	19/4½	19/4½	18/6	16/9
7	,, 7% 2nd Pref... ..	18/-	18/-	19/-	13/9
5	,, 1st Mort. Deb. Stock..	91½	91½	106½	80½
7½	General Elec. Ord.	31/3	31/6	59/-	13/6
20	W. T. Henley's Ord.	82/6	85/-	86/6	23/3
17½	Johnson & Phillips Ord. ..	66/3	66/3	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	25/7½	25/7½	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	47/6	47/6	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	31/10½	31/4½	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	28¾	28¾	56/2/6	19½
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	75	75	87½	60
10	Eastern Ord. Stk.	180½	180½	213½	113/2/6
3½	,, 3½% Pref. Stk.	65½	65½	84/17/6	49
4	,, 4% Deb. ..	79½	79½	103½	60
10	Eastern Extension Ord. (£10)..	10½	10½	21½	10/12/6
4	,, ,, 4% Deb. ..	78½	78½	97½	60
22	Gt. Northern Telegraph (£10)..	27½	27½	42/12/6	19
‖10	Indo-European (£25)	47½	47½	59½	25
—	Marconi's Wireless T. Ord. ..	15/-	15/-	9/16/3	20/9
7½	,, Int. Mar.	20/-	20/-	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	18½	18½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	78½	78½	10	60/2/6

* Ex dividend. ‡ Plus share bonus.
¶ Plus 3 p.c. in respect of 1921. ‖ Including bonus.

ELECTRIC SUPPLY CORPORATION, LTD.—Int. div. 8 p.c. per annum, less tax, on ord. shs.

QUEBEC POWER CO.—Div. $1½ p. sh. on common shs. for quarter ended September 30th, 1926, payable October 15th.

HENDON ELECTRIC SUPPLY CO., LTD.—Int. div. at rate of 10 p.c. per annum, tax free, on ord. shs., payable September 25th.

INTERNATIONAL AUTOMATIC TELEPHONE CO., LTD.—Intm. div. 9d. p. sh. or 3¾ p.c., on ord. shs. For 1925 the total div. was 10 p.c.

MANILA ELECTRIC CORPORATION.—Div. of 50 c. p. sh. for quarter ending September 30th on common cap. stk., payable October 1st.

AUTOMATIC TELEPHONE MANUFACTURING CO., LTD.—Intm. div. 9d. p. sh. or 3¾ p.c., on ord. stk. Total div. for 1925 was 10 p.c.

GLOBE TELEGRAPH AND TRUST CO.—Intm. div. 5s. p. sh., net, on ord. shs., and quarterly intm. div. of 3s. p. sh., less tax, on pref. shs.

YORKSHIRE ELECTRIC POWER CO.—A further instalment of 4s. p. sh. is due for payment on the issue of 765 000 cum. pref. shs., which will make 17s. p. sh. paid.

EASTERN EXTENSION, AUSTRALASIA AND CHINA TELEGRAPH CO., LTD.—Int. div. for three months ended June 30th of 5s. p. sh. payable, tax free, on October 15th.

BRITISH INSULATED CABLES, LTD.—Intm. div. 5 p.c. less tax, on ord. shs. The rate of div. is the same as last year, but a capital bonus of 33⅓ p.c. has since been declared.

INTERNATIONAL TELEPHONE AND TELEGRAPH CORPORATION.—This company, which has interests in the Cuban and Porto Rico Telephone companies, has declared its regular quarterly div. of 1½ p.c.

DUNDEE, BROUGHTY FERRY AND DISTRICT TRAMWAYS CO., LTD.—Pft. for year to July 31st, 1926, was £6 457, including £144 brt. fwd. Int. on deb. stk. required £1 183, ord. div. 7 p.c., to res. £1 000, fwd. £264.

EASTERN TELEGRAPH CO., LTD.—Div. at rate of 3½ p.c. per annum, less tax, on pref. stk. for quarter ending September 30th, and second quarterly div. of 2½ p.c. on ord. stk., tax free, in respect of profits for year ending December 31st, both payable October 15th.

MIDLAND ELECTRIC CORPORATION FOR POWER DISTRIBUTION, LTD.—Intm. div. on ord. shs (1 to 280 000) for six months ended June 30th last at rate of 10 p.c. per annum and on the new ord. shs. pro rata on the amount called up. Warrants in payment of div. on pref. shs. for half year ending October 15th will be posted on October 14th.

EAST AFRICAN POWER AND LIGHTING CO.—Pft. for 1925 was 442 977 shillings, and, after payment of interest on 7 p.c. notes, the balance was 205 071 shillings, plus 30 060 brt. in. Div. at rate of 3 p.c. for year absorbed 162 000 shillings, and, after provision for reduction of premium on debs. and depreciation, the amt. carried fwd. is 29 767 shillings.

RADIO COMMUNICATION CO., LTD.—In the year ended December 31st last, the receipts decreased £6 724 compared with previous year, due to severe depression in the broadcasting business during past season. The marine business secured shows increase of £10 191, which resulted in this department earning pft. amtg. to £32 761. Blce brt. into pft. and loss acc. appears as loss of £22 369, to which must be added administrative exes., dirs.' fees, bank interest, etc. After allowing for credit brt. fwd. net blce. at debit of pft. and loss acc. is now £31 592. During the year divs. have been received from holdings in British Broadcasting Co. and Mullard Radio Valve Co.

MARCONI'S WIRELESS TELEGRAPH CO. OF CANADA, LTD.—Net pft. for 1925 was $37 984. During year company's marine service, consisting of rental of apparatus to vessels of Canadian registry, has shown satisfactory progress, and present indications point to further extensions of this section. Increase in cost of maintenance and operation during past few years at Government coast stations operated by company under contracts with the Canadian and Newfoundland Governments, coupled with decrease in traffic handled through such stations, has resulted in loss in operation in this branch during year. It is hoped that at an early date satisfactory arrangements will be concluded for a reasonable subsidy revision. New beam stations at Drummondville and Yama-

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chiche, for communication with similar stations now being erected in England, are now practically completed.

MEXICO TRAMWAYS CO.—The report for 1925 states that the operation of the tramways system in Mexico City and its vicinity has resulted in a serious deficit, in spite of all possible economies and of relief during the last six months from Government tax on earnings. No surplus revenue being available for payment of interest on 6 p.c. mortgage bonds, but a serious shortage, the reserve fund has had to be depleted by $607 437. Net income from investments was $317 023 and other income $7 517, the net loss from operation in Mexico being $265 127. After making sundry adjustments, meeting loss on remittances and providing for administration and general expenses, interest on Cia de los Ferrocarriles del Distrito Federal and Mexico Electric Tramways debentures and Mexico Tramways Co. gold bonds, and making the necessary allocation to the sinking fund for Mexico Electric Tramways A first charge debentures, the net deficit is $984 130.

MEXICAN LIGHT AND POWER CO., LTD.—Net income in 1925 from operation in Mexico was $4 545 970. Deducting exchange on remittances leaves $4 208 277, and adding net income from investments, etc., makes the total $4 465 099. Administration and general expenses required $144 688, and after provision for interest on Mexican Light and Power Co. gold bonds and second mortgage bonds, Pachuca Light and Power and Alameda River Hydro-Electric Co. bonds, the amount left to be contributed towards meeting capital expenditure is $2 781 015. The greater part of the money in hand for meeting capital expenditure will be required in near future in connection with construction of a new hydro-electric development which must be commenced at once in order to cope with the continued growth of the power demands on the system. This will also involve considerable expenditure on improvement and extension of the distribution system in Mexico City during the next few years.

STRATFORD-ON-AVON ELECTRICITY CO., LTD.—At the nineteenth ordinary general meeting Mr. Spenser Flower, who presided, said the position was by far the best ever recorded. With the carry forward the net profit was £3 892 19s. 2d., after paying all expenses, bank and debenture interest, and the directors proposed to allocate this sum by paying the fixed 10 per cent. preference dividend (which would absorb £600), 5 per cent. on the ordinary shares (absorbing £371), placing £2 512 to general reserve, and carrying forward £409. During the past few years the directors had built up a depreciation fund amounting to £3 987. Wishing to ascertain exactly how they stood with regard to their assets, a complete valuation had recently been made by independent valuers, and this disclosed the fact that plant, machinery, etc., stood in the balance sheet at a figure below their real value. That being the case, they had decided that this depreciation fund be transferred to general reserve. This depreciation fund, when added to the £2 512 allocated from this year's profits, would result in a total of £7 000 in the general reserve. It might be of interest to those present to learn that the Electricity Commissioners had granted the company leave to instal additional plant, as they found on close inquiry that the working costs in connection with the Stratford undertaking were lower than would be the case under any centralised scheme of supply.

New Companies.

THOMPSON, YOUNG AND CO., LTD.—Cap., £2 000. Manufacturers of and dealers in wireless sets. Reg. office: 20A, Bebington Road, Lower Bebington, Cheshire.

SUBMERGED COMBUSTION, LTD.—Cap., £21 000. Mechanical and electrical engineers, electricians, etc. Reg. office: 28, Victoria Street, Westminster, London, S.W.1.

ALLIED ELECTRIC MANUFACTURERS, LTD.—Cap., £1 000. Manufacturers of and dealers in electrical and general engineering plant, etc. Reg. office: 14, Paradise Square, Sheffield.

BOROUGH MOTOR SERVICE (TORQUAY), LTD.—Cap., £4 000. Electricians, dealers in and repairers of wireless installations and accessories, etc. Reg. office: Bank Chambers, Torquay.

EBONITE MANUFACTURING CO., LTD.—Cap., £1 000. Manufacturers of and dealers in ebonite, bakelite, etc. A permanent director: L. Partridge, Meadow Road, Quinton, Birmingham.

RUBBER CABLES, LTD.—Cap., £2 000. Dealers in electric cables, electrical equipments, appliances and accessories, etc. Solicitors: D. Cavell Evans and Co., 18, Ironmonger Lane, London, E.C.2.

BASE METAL EXTRACTION CO., LTD.—Cap., £825. Extractors of metals from ores, electrical and general engineers, etc. Reg. office: Imrie House, 33-6, King William Street, London, E.C.4.

DOUGLAS JOHNSON, LTD.—Cap., £1 000. Manufacturers of motor and engineering accessories, mechanical, electrical and general engineers, etc. Reg. office: Morley House, Regent Street, London.

O'BRIEN AND HANCOCK, LTD.—Cap., £600. To acquire and conduct agencies for the sale of the products, goods or merchandise of Cylinder Top Oilers, Ltd. Solicitor: F. W. Bell, 18, Park Lane, Leeds.

SOUTHERN WIRELESS, LTD.—Cap., £100. Manufacturers of, agents for and dealers in radio and wireless accessories, etc. Solicitors: Payne and Co., 10, New Square, Lincoln's Inn, London, W.C.2.

TELSEN ELECTRIC CO., LTD.—Cap., £1 500. To acquire the business of a wireless transformer manufacturer now carried on by A. W. Macnamara at 207, Aston Road, Birmingham, as "The Telsen Electric Co."

J. TEE AND CO., LTD.—Cap., £500. To acquire business of electrical and radio engineer carried on by J. Tee at 48, High Road, East Finchley, London, N.2. Reg. office: c/o Room 13, 31, High Holborn, London, W.C.1.

INGHAM ELECTRICAL CO., LTD.—Cap., £5 000. To acquire the business of electrical engineers, factors and agents now carried on by J. H. Ingham and H. N. Ingham as "Ingham Brothers," at 56, Manchester Road, Bradford.

FRANK WRIGHT AND PARTNERS, LTD.—Cap., £13 000. To acquire business of mining, mechanical, railway, electrical, hydraulic and consulting engineer and contractor carried on by F. C. Wright, at 20, Essex Street, Strand, London, W.C.

KELVINATOR, LTD.—Cap., £05 000. To adopt agreement with Kelvinator of Canada, Ltd., and to carry on the business of electrical and mechanical engineers, suppliers of electricity, etc. Reg. office: 30–35, Drury Lane, Kingsway, London, W.C.2.

BRITISH TRUSTS AND SECURITIES CORPORATION, LTD.—Cap., £40 000. To enter into an agreement to participate in financial, electric, railway, telegraph, wireless and other undertakings, etc. Solicitors: Last, Riches and Fitton, 18, Bolton Street, London, W.1.

ANDERSON AND PENNEY, LTD.—Cap., £500. To acquire business of Anderson and Penney, and carry on business of electrical contractors, wireless engineers, accumulator chargers and repairers, etc. Reg. office: 44-46, South Frederick Street, South Shields, Co. Durham.

J. V. BRITTAIN AND CO., LTD.—Cap., £1 000. Electricians, electrical and general engineers, manufacturers of, and dealers in, electrical and mechanical apparatus, dealers in telephones, wireless or other telegraphs, etc. Reg. office: 121A, Liverpool Road, Stoke-on-Trent.

Metal and Chemical Prices.

TUESDAY, September 14th.

		Price.	Inc.	Dec.
Copper—				
Best Selected ..	per ton	£65 0 0	—	5s. 0d.
Electro Wirebars ..	,,	£67 0 0	—	5s. 0d.
H.C. Wire, basis ..	per lb.	9⅝d.	—	⅛d.
Sheet	,,	9 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 1⅜d.	—	⅛d.
Brass 60/40—				
Rod, basis	per lb.	7½d.	—	—
Sheet, basis ..	,,	9⅛d.	—	—
Wire, basis ..	,,	10¼d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£4 14 6	1s. 6d.	—
Galvanised Steel Wire, basis 8 S.W.G. ..	,,	£14 0 0	10s. 0d.	—
Lead Pig—				
English	,,	£33 5 0	—	15s. 0d.
Foreign or Colonial	,,	£31 17 6	—	15s. 0d.
Tin—				
Ingot	,,	£310 0 0	£1 10 0	—
Wire, basis	per lb.	3s. 10½d.	½d.	—
Aluminium Ingots ..	per ton	£120 0 0	—	—
Spelter	,,	£34 2 6	2s. 6d.	—
Mercury	per bottle	£15 10 0	—	—

Sulphur (Flowers)—Ton £11 10 0 *Sodium Chlorate*—Per lb. 3d.
,, (Roll-Brimstone)—,, £10 5 0 *Sulphuric Acid* (Pyrites, 168°) *Copper Sulphate*— ,, £25 to £25 10s. per ton, £6 15 0
Boric Acid (Crystals) ,, £37 *Sodium Bichromate*—Per lb. 3½d.
Rubber—Para fine, 1s. 8d.; plantation 1st latex, 1s. 7½d.

The metal prices are supplied by British Insulated Cables Ltd. and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

The Lead Market.

APART from a few orders placed by consumers in the middle of the week, the market was mainly professional and had a holiday tone (state James Forster and Co. in their lead report dated September 11th). The position of supplies is not too favourable. There is just enough lead arriving in London to meet the demand, but a shortage is reported in the outports, where premiums have been paid to obtain prompt delivery. The prospect for the next few weeks is for a steady market with small fluctuations.

Closing prices on September 10th were £31 18s. 9d. for September and £31 11s. 3d. for December.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

COX, Mr. J. A., Hallwood Mills, Bridgefoot, Warrington, electrical and wireless factor. £15 16s. 2d. August 12th.

GOODCHILD, CHAPMAN AND CO., 357, High Road, Wood Green, electrical engineers. £11 4s. 10d. July 22nd.

HASLAM, WILLIAM H., 22, Iron Gate, Derby, electrician. £18 7s. 10d. July 30th.

MARTIN, Mr. R., 128, Tewkesbury Street, Cardiff, electrical contractor. £13 15s. 8d. August 13th.

MASON AND BROWN, 36, Upper Charles Street, Leicester, electricians. £11 4s. 2d. August 12th.

RELIANCE ELECTRICAL CO., 188, Brunswick Street, Oxford Road, Manchester, engineers. £19 3s. 2d. July 20th.

SPEKE, Herbert H., 12-14, Bilston Street, Wolverhampton. electrical engineer. £24 13s. 3d. July 15th.

STOPES, Lewis, 14, College Road, Bromley, electrical engineer. £14 0s. 8d. July 30th.

TIDD, Cyril, 44, Rutland Street, Leicester, electrical engineer. £10 2s. July 28th.

WAGG AND PULLEN, Holborn Viaduct House, E.C., electrical engineers. £26 0s. 10d. July 20th.

WILLETTS, Mr., Newtown Row, Birmingham, electrical engineer. £16 16s. 11d. August 11th.

ZOLA PRODUCTS, 39, Crough Hill, N., wireless dealers. £11 12s. 6d. July 29th.

Bill of Sale.

WARDELL, Frederick William, 83, Raleigh Road, Richmond. electrical contractor. Filed September 10th. £62 19s. 2d.

Deeds of Arrangement.

BROCK, Reginald Lewis, trading as R. L. BROCK AND CO., 5, Bedford Row, Tavistock Road, Plymouth, electrical engineer. Trustees, C. E. B. M. Smith, 1, Athenaeum Terrace, Plymouth. C.A., and another. Filed September 8th. Secured creditors, £3 009. Liabilities, unsecured, £2 140; assets, less secured claims, £847.

BUTLER, Clifford, 103, Mansfield Road, Nottingham, and 26, Danethorpe Vale, Sherwood, electrician. Trustee, A. C. W. Rogers, Cheapside, Nottingham, C.A. Liabilities, unsecured, £3 092; assets, less secured claims, £572.

SMITH, Howard Lancelot, trading as E. A. MANUFACTURING CO., 105, Dollman Street, Vauxhall, Birmingham, electrical accessories manufacturer. Trustee, F. W. Picken, 23, Colmore Row, Birmingham, I.A. Liabilities, unsecured, £2 240; assets, less secured claims, £720.

Receivership.

ELECTRICAL AND ALLIED INSTRUMENT MANUFACTURING CO., LTD.—S. R. Macdonald, of 29, The Mall, Surbiton, and G. C. McEwen, 35, Copthall Avenue, E.C., were appointed receivers on September 1st under powers contained in debenture dated July 28th, 1926.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

COGENT ELECTRICAL CO., LTD., 54, Berry Street, Liverpool At the statutory meeting of creditors held recently, a statement of affairs was presented showing liabilities £306, all due to unsecured creditors, and fully secured creditors for £7, holding security valued at £10, leaving a surplus of £3. The assets comprised cash in hand, 14s. 9d.; cash at bank, £26; stock in trade, £177, estimated to realise £60; fixtures and fittings, £59, expected to produce £10; book debts, £176, valued at £137; and surplus from fully secured creditors, £3, making total assets £237, from which preferential claims of £27 had to be deducted, leaving net assets of £210, a deficiency of £96. The company was formed on March 25th, 1926, with a nominal capital of £500, to take over an existing business. At the time of conversion, the surplus in the business was stated to be £472, and the consideration for the sale of the concern was the issue of 250 fully paid shares in the company; the agreement for sale had never been filed, neither were the shares issued. During the company's trading from March 25th to August 18th the purchases had amounted to £352 and the sales to £445. and a gross loss was shown of £206, the net loss being £420. The deficiency account showed depreciation of goodwill, £395; depreciation of fixtures and fittings, £49; depreciation of stock, £117; bad debts, £38; preliminary expenses, £22; suspense account, £25; and trading loss to date, £420. It was impossible to obtain further capital, and voluntary liquidation was decided upon. After discussing the position, the creditors resolved to confirm the voluntary liquidation, with Mr. Bryce M. Hanmer, C.A., as liquidator, and a committee of inspection consisting of General Electric Co., Ltd., Rowe Bros. and Co., Ltd., and Mr. Parkin S. Booth.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Companies Winding-up Voluntarily.

RADIO VALVES, LTD. By special resolution, August 20th, confirmed September 6th, W. H. Bevan, 182, Temple Chambers, E.C.4, appointed liquidator.

SEAGULL, LTD. W. H. B. de Mussenden Leathes, 27, Stanwick Road, West Kensington, W.14, electrical engineer, appointed liquidator August 30th. Meeting of creditors at Regent House, Kingsway, London, W., at 11.30 a.m., Thursday, September 16th.

Bankruptcy Information.

KINZETT, Fanny Elizabeth, trading as F. E. KINZETT AND SON (other than Eric Francis Kinzett, a minor), 54, Fielding Road, Chiswick, Middlesex, wireless factor. First meeting, September 22nd, 11.30 a.m., 9, Russell Square, London, W.C.1. Public examination, September 28th, 11 a.m., Court House, Half Acre, Brentford.

MILNES, Herbert, trading as "H. Milnes and Son," 6, Trinity Street, Huddersfield, electrical engineer. Date of receiving order, September 11th. Debtor's petition.

Notices of Intended Dividend.

GREENALL, William Hampton, trading as Hampton Electric Co., Newerne Street, Gloucester, electrician. Last day for receiving proofs, September 29th. Trustee, E. Owen, 34, Park Place, Cardiff, Official Receiver.

HUBBARD, Charles, 13, Magdalen Street, Norwich, electrician. Last day for receiving proofs, October 2nd. Trustee, C. B. L. Prior, 9, Queen Street Chambers, Norwich, Official Receiver.

Partnership Dissolved.

NELSON ECONOMIC ELECTRIC CO.—James Maitland HORNBY and James Stephen KIRKLAND, electrical engineers and contractors, 6, Bradley Road West, Nelson, by mutual consent as from June 1st, 1926. Debts received and paid by J. M. Hornby, who will continue the business.

Bankruptcy Proceedings.

FULLERS' UNITED ELECTRIC WORKS, LTD., Woodland Works, Chadwell Heath, Essex. Under a winding-up order made against this company on June 1st, the statutory meetings of the creditors and of the shareholders were held on Thursday, September 9th, at Bankruptcy Buildings, Carey Street, W.C. There was a large attendance at both meetings. A statement of affairs had been lodged showing, as regards creditors, gross liabilities £603 649, of which £303 248 are expected to rank; total assets estimated at £236 256, and after deducting preferential claims (£3 560) and debenture claims (£61 950), the estimated amount available to meet further unsecured creditors is £170 746. As regards contributories, the paid-up capital was £134 845, and there is a total deficiency of £498 094.

Mr. G. D. Pepys (Official Receiver) presided, and reported that the company was registered as a public one on March 13th, 1919, with a nominal capital of £500 000, reduced in July, 1921, to £378 794, and further reduced in December, 1922, owing to trading losses, to £231 001. The objects of the company were to carry on the business of electrical engineers at Woodland Works, Chadwell Heath, by four companies known as the Fuller Accumulator Co., Ltd., John C. Fuller and Son, Ltd., Fullers' Wire and Cable Co., Ltd., and Fullers' Carbon and Electrical Co., Ltd.

Mr. Leonard Fuller attributed the failure of the company to the endeavours to improve non-profitable departments, which endeavours used up the capital and prevented the profitable departments of the company being pushed to their fullest extent. In Mr. Wilson's opinion the failure was due to insufficient capital to develop the programme formed after the reconstruction in 1923.

Mr. Wade, the chairman of the company, was of opinion that the failure was primarily due to the action of the petitioning creditor in applying for a winding-up order. He also stated that the company had met with a serious loss when the wireless trade partially collapsed in 1925. He considered that the company would have succeeded in surmounting its difficulties but for the action of the petitioners. The creditors decided to leave the liquidation in the hands of the Official Receiver, and the shareholders confirmed the decision of the creditors.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

243 143 D. G. E. Barrie and Enterprise Manufacturing Co., Ltd. Electric resistances. (30/10/24.)
243 146 H. Stevens and A. J. Stevens and Co. (1914), Ltd. Electric condensers. (3/11/24.)
243 147 Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.) and E. M. Deloraine. Electron discharge devices. (3/11/24.)
243 153 G. Edmonds, Ltd., and H. Edmonds. Crystal detectors for wireless receiving systems. (12/11/24.)
243 155 W. E. Ashley, J. B. Broadhead, H. Tart and J. Lindsay. Electrically operated valves. (17/11/24.)
243 165 D. R. Davis and Metropolitan-Vickers Electrical Co., Ltd. Electrical switchgear. (28/11/24.)
243 179 British Thomson-Houston Co., Ltd., and F. P. Whitaker. Dynamo-electric machinery. (10/12/24.)
243 181 A. Wiseman, J. W. Harris and H. M. Dudgeon. Crossings for overhead electric conductors. (16/12/24.)
243 188 Coventry Automatic Telephones, Ltd., and J. E. Collyer. Telephone systems. (5/1/25.)
228 142 T. A. F. Holmgren. Resistance material electrically conductive in a cold state, usuable at high temperatures, and method for its manufacture. (22/1/24.)
243 200 Standard Telephones and Cables, Ltd. (formerly Western Electric Co.) (Western Electric Co., Inc.). Electron discharge devices. (31/1/25.)
243 201 C. R. Marshall. Crystal detector for wireless receiving apparatus. (6/2/25.)
243 206 P. Winocour and H. E. Thompson. Crystal detectors. (12/2/25.)
236 163 A. J. Jullin. Devices for regulating the voltage of dynamos of variable speed and load. (30/6/24.)
230 475 Landis and Gyr. Soc. Anon. Setting device for the element to regulate the speed of the disc of electricity meters. (8/3/24.)
243 218 Burndept, Ltd., C. F. Phillips and S. F. Woodell. Reduction gears for use in adjusting radio tuning instruments. (23/3/25.)
243 239 H. M. Genese, G. R. N. Minchin and Pritchett and Gold and E.P.S. Co., Ltd. Electric storage batteries or accumulators. (6/5/25.)
243 245 J. H. Hickey and G. E. Beatrie. Electric fuses. (20/5/25.)
243 252 N. Lawton. Reception apparatus for wireless. (28/5/25.)
243 254 P. S. Glover. Electric connection and switch boxes. (2/6/25.)
235 572 Kleinschmidt Electric Co., Inc. Telegraph typewriters. (5/7/23.) (Divided application on 218 643.)
235 574 Kleinschmidt Electric Co., Inc. Telegraph typewriters. (5/7/23.) (Divided application on 218 643.)
235 577 Kleinschmidt Electric Co., Inc. Telegraph typewriters. (11/8/23.) (Divided application on 220 280.)
235 897 British Thomson-Houston Co., Ltd. Induction motors. (20/6/24.)
237 579 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Glass bulbs for electric incandescent lamps or the like, and a process for repairing them. (23/7/24.)
243 278 A. K. Croad (Amsco Products, Inc.). Variable resistors. (9/7/25.)
237 893 F. Krupp Akt.-Ges. Surface condensers. (31/7/24.)
237 288 E. Liebreich. Electrolytic separation of metallic chromium. (21/7/24.)
238 216 British Thomson-Houston Co., Ltd. Protective relays. (8/8/24.)
239 845 Metropolitan-Vickers Electrical Co., Ltd. Tanks for electrical transformers and the like. (10/9/24.)
240 149 British Thomson-Houston Co., Ltd. Electric discharge devices and means for operating the same. (18/9/24.)
243 291 I. M. Bennett. Toy electric lamp. (11/9/25.)
243 396 E. A. Graham. Loud-speaking telephonic receivers. (26/5/24.)
220 280 Kleinschmidt Electric Co., Inc. Telegraph typewriters. (11/8/23.)
243 407 S. Brydon and D. B. Fletcher. Employment of thermionic valve circuits. (22/7/24.)
222 086 Benjamin Electric, Ltd. Shock absorbing devices for thermionic valves. (17/9/23.)
220 297 E. T. Fisk. Method and apparatus for generating, relaying, rectifying, transforming and amplifying alternating or pulsating currents. (9/8/23.)
243 427 W. Plumbridge and F. O. Helliwell. Frame aerials. (25/8/24.)
231 819 Sabin Electrical Products Corporation. Energisation and control of thermionic valves, particularly for use in wireless reception. (17/4/24.)
243 431 A. H. Midgley. Telephonic receivers. (26/8/24.)
243 432 A. H. Midgley. Adjustments for the magnets in telephone receivers and the like. (26/8/24.)
243 440 J. W. Combe. Inductance coils. (27/8/24.)
243 448 243 449 R. T. Smith. Wireless direction finding systems. (29/8/24.)
243 452 A. Reyrolle and Co., Ltd., F. Coates, and J. Mirrey. Oil immersed electric switches. (30/8/24.)
231 820 Hazeltine Corporation. Means for eliminating magnetic coupling between coils. (7/4/24.)
243 467 D. McGregor. Electric lamps for illuminating motor vehicle dash boards and for like purposes. (8/9/24.) (Cognate Application, 1044/25.)
243 471 E. C. R. Marks (Hart Manufacturing Co.). Electric switches. (9/9/24.)
243 493 M. L. Williams. Terminal electrical connections suitable for the sparking plugs of internal combustion engines. (15/10/24.) (Addition to 160 375.)
243 496 A. G. Gulliford. Gas detector for miners' electric safety lamps. (25/10/24.)
226 782 Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.). Telephone systems. (24/12/23.)
243 502 W. S. Worthington. Coil holders for wireless apparatus. (11/10/24.)
243 515 British Thomson-Houston Co., Ltd., and J. Hutt. Electromagnetic sound transmitters and receivers. (18/11/24.)
243 517 A. H. Guiness. Leading-in means for wireless aerials. (19/11/24.)
243 530 G. A. Mitchell. Amplifying units for use in wireless systems. (4/12/24.)
243 537 V. L. Williams and L. L. Williams. Electrolyte for accumulators. (9/12/24.)
243 538 Siemens Bros. and Co., Ltd., W. G. Patterson, and E. J. C. Rousseau. Automatic telephone systems and the like. (9/12/24.)
226 840 National Carbon Co., Inc. Electric hand lamps. (26/12/23.)
228 546 Akt.-Ges. Brown, Boveri et Cie. Apparatus for improving the power factor in an electrical network. (2/2/24.)
243 571 S. W. Cole. Electric terminal connection. (6/2/25.)
231 462 Deutsche Werke Akt.-Ges. Squirrel-cage armatures for dynamo-electric machines. (25/3/24.)
231 895 Sachsenwerk Licht- und Kraft Akt.-Ges. Compensated alternating current machines. (4/4/24.)
232 961 British Thomson-Houston Co., Ltd. Receiving apparatus for high-frequency signals. (25/4/24.)
243 618 G. Lombardi. Electrical variable condensers. (10/12/24.)
238 550 British Thomson-Houston Co., Ltd. Thermionic amplifying apparatus. (15/8/24.)
241 215 British Thomson-Houston Co., Ltd. Filament supports for vacuum tubes. (9/10/24.)
218 328 W. Dubilier. Electrical structures. (30/6/23.)
243 773 A. E. White Electric Apparatus Co. Radio receiving systems. (1/7/24.)
243 776 F. K. Woodroffe and R. H. N. Dawson. Electrical condensers. (2/8/24.)
243 781 E. A. Graham. Telephonic receivers. (6/8/24.) (Cognate application 23 506/24. (Addition to 221 856.)
243 783 N. Diamant. Wireless transmission and reception of photographs. (27/8/24.)
243 784 F. B. Cox. Heating elements for electric heaters, radiators, cookers and the like. (28/8/24.)
243 785 Mullard Radio Valve Co., Ltd., and L. S. Harley. Mounting of incandescent filaments. (28/8/24.)
243 787 Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.). Electromagnetic devices. (1/9/24.)

Applications for Patents.

August 23rd.

20 751 Calor Elektrizitats Akt.-Ges. and O. Dreyer. Devices for protecting electric circuits.
20 740 E. H. Fleming. Mountings for thermionic valves, etc.
20 721 H. Gamard. Thermo-electric apparatus.
20 739 Hotpoint Electric Appliance Co., Ltd. Electric heating elements.
20 804 R. W. James (Holmes Navigating Apparatus Co., Inc.). Electrolytic control system.
20 759 E. H. Leuffert. Electric luminous advertising device for aircraft. (19/2/26, Germany.)
20 793 N. W. McLachlan and W. S. Smith. Telegraphy.
20 794 N. W. McLachlan and W. S. Smith. Cable telegraphy, etc.
20 750 Metropolitan-Vickers Electrical Co., Ltd. Electrical signalling, etc., systems. (28/8/25, U.S.)
20 782 H. W. Norman. Electrical accumulators.
20 792 Telefunken Ges. fur Drahtlose Telegraphie. Radio receivers. (24/8/25, Germany.)
20 706 T. F. Wall. Thermo-electric generators.

August 24th.

20 871 A. W. Angold and A. Holter. Electricity meters.
20 843 British Thomson-Houston Co., Ltd., L. R. Nixon, J. V. Peacock, and C. J. H. Trutch. Systems of electric motor control.
20 874 Commercial Aeroplane Wing Syndicate, Ltd., and N. V. Piercy. Voltmeters.
20 854 A. E. Honey and J. Stone and Co., Ltd. Alternating-current installations for railway, etc., vehicles.
20 815 H. F. McLoughlin and Simplex Conduits, Ltd. Electric switches.
20 883 I. Rennerfelt. Electric furnaces.
20 840 Siemens Bros. and Co., Ltd., and W. E. Poole. Supporting of overhead conductors.
20 835 A. L. Trickett. Frame aerials.
20 827 M. Wilderman. Electric batteries.

August 25th.

20 902 S. H. Bagshaw and G. Jackson. Wireless receiving sets.
20 938 Eastern Telegraph Co., Ltd. (Higgitt and Jenkins). Electric signalling systems.
20 950 A. A. Mead. Secondary-battery plates.
20 921 Wired Radio, Inc. Wired radio broadcasting systems. (25/8/25, U.S.)

August 26th.

21 029 R. W. Bollen. Insulating holders for inductance, etc., coils.
21 053 Callender's Cable and Construction Co., Ltd., and J. F. Watson. Contacts for electric switches, etc.
21 083 L. B. Haigh and Standard Telephones and Cables, Ltd. Telephone systems.
21 028 A. Lewis. Galvanic batteries.
21 069 E. C. R. Marks (Western Union Telegraph Co.). Automatic switching arrangements for telegraph lines, etc.
21 045 W. J. Palmer. Combination loud-speaker devices.
21 003 J. V. Potter and Tonex Co. Tuning-devices for wireless receivers.
21 050 Siemens Bros. and Co., Ltd. Telephone systems. (31/8/25, Australia.)
20 996 A. Watts. Telephone systems, etc.

August 27th.

21 107 Anglo-American Chemical Co., Ltd., and A. Gourvish. Manufacture of high-tension batteries for wireless apparatus.
21 183 P. Baxter and C. Gleerup-Moller. Electromagnetic motor devices.
21 157 Dubilier Condenser Co. (1925), Ltd. Electric terminals. (10/9/25, U.S.)
21 117 S. G. Jones. Electric signalling.
21 159 H. C. Linzell. Electric fuses.
21 154 G. C. Lundberg, P. A. Lundberg and G. Pegg. Cord grips for electrical apparatus.
21 155 A. A. Price. High-tension accumulators.
21 103 A. W. Reeves. Wireless apparatus.
21 111 J. W. Tunstall. Telephones.
21 187 C. W. C. Wheatley. Inductances, transformers, etc.
21 189 C. W. C. Wheatley. Electrical lead-in devices.

August 28th.

21 250 British Thomson-Houston Co., Ltd., L. R. Nixon, J. V. Peacock and C. J. H. Trutch. Electric motor control systems.
21 238 A. Hartley. Device for utilising electric mains for supplying high-tension current to thermionic valves.
21 230 A. L. Large. Safety device for electrical heating elements.
21 215 F. J. Pearce, G. H. Scholes and H. Scholes and Co., Ltd. Electrical plug-and-socket couplings.
21 268 Siemens-Schuckertwerke Ges. Means for protecting minimum current plant against the influence of excess current wires. (29/8/25, Germany.)
21 220 A. J. Stevens and Co. (1914), Ltd., and H. C. Wilson. Loud speakers.
21 221 A. J. Stevens and Co. (1914), Ltd., and H. C. Wilson. Thermionic valve holders.
21 222, 21 225 A. J. Stevens and Co (1914), Ltd., and H. C. Wilson. Wireless signalling apparatus.
21 223 A. J. Stevens and Co. (1914), Ltd., and H. C. Wilson. Variable electric condensers.
21 224 A. J. Stevens and Co. (1914), Ltd., and H. C. Wilson. Electrical transformers.

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Friday, September 17th.

E.D.A. E.L.M.A. Autumn Campaign.—Inaugural luncheon, Hotel Cecil, Strand London.

Electrical Trades Commercial Travellers' Association.—St. Bride's Institute London. General meeting, 7 p.m.

Friday, September 17th-18th.

National Radio Exhibition.—New Hall, Olympia, Kensington. Daily 10.30 a.m. to 10 p.m.

Universal Smoke Abatement Exhibition.—Bingley Hall, Birmingham.

Friday, September 17th-25th.

Eighth "Model Engineer" Exhibition.—Royal Horticultural Hall, Westminster.

Thursday, September 23rd.

Meter Engineers' Technical Association.—E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Presidential address by Mr. G. F. Shotter, 7 p.m.

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THE ELECTRICIAN

ESTABLISHED 1861.

THE OLDEST WEEKLY ILLUSTRATED JOURNAL OF

Electrical Engineering, Industry, Science and Finance.

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The Electrician.

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THE DAY DAWNS.

A WEEK to-day the great Home Lighting battle will be joined, and there is every prospect of complete success for the electrical forces. The primary object of the campaign is, of course, to interest the public in electrical matters, and care has been taken by the organisers that that interest shall be maintained and even stimulated during the next six months. But this is going to be a soldier's battle, and it will therefore be well, while there is yet a day or two to spare, to survey the duties of the various arms that are to take part and to see whether, in an historic phrase, they are really complete to the last gaiter button. Given certain quite simple conditions the battle should not be hard to win, and the result will not therefore long be in doubt. For the public are already interested in the electrical idea and once they are shown, as the campaign will show them, how much electricity can do for them in the home they will not be slow to take advantage of its benefits.

To ensure success the task of the electrical industry at this stage is simple. Only energy and faith are required. In the first place it is essential that every electrical shop should be provided with an ample supply of the competition booklet for distribution to inquirers. We understand that about 250 000 copies have already been issued. This is satisfactory. Even so it may be that here and there there is a supply undertaking or a contractor who have not yet made known their requirements. If that is so, we appeal to them to remedy the omission without delay. In a little over a week the public will have received full details of what to do to win a £2 000 house. They will at once be demanding copies of the booklet. It is essential that nowhere in the kingdom should such a request be made without it being immediately satisfied.

The industry has yet another duty to perform. One of the ingenious points about the campaign is that the thousands of intending competitors must, as a preliminary, visit an electrical shop. Competitors will soon discover that to enter for the competition with any chance of success it will be necessary to decide between the claims of different electrical fittings for different classes of work. It is highly probable therefore that the first visit to the electric shop will not be the last; and that while the first is hurried, the second and third will be leisurely, and will be directed to obtaining advice, which will render the chances of securing the £2 000 house more rosy. Here is a golden opportunity; a golden opportunity to talk not only about lighting, but about the other uses to which electricity can be put in the home; an opportunity which the various showmen will, we feel certain, seize with both hands.

It therefore follows that the electrical shopkeeper must give his close attention, if he has not already done so, to stocking his shop with the latest and most efficient lighting fittings and domestic equipment, so that he can demonstrate to the inquirer all those advantages of electricity which it is desirable should be brought more closely to the public notice. Electricity supply undertakings and contractors must therefore get in touch with manufacturers, and manufacturers must in their turn get in touch with supply undertakings and contractors so that all electrical shops may be adequately and tastefully stocked. Attention must also be paid without delay to the problem of shop window dressing. Both the E.D.A. and E.L.M.A. have done much useful spade work in this direction and everyone should take full advantage of it. A tastefully arranged well-lighted shop window is a magnet whose attraction should during the next few months be turned to the fullest use. Any pressure that can be exerted to get the present absurd lighting regulations rescinded should be exerted.

The industry having done, and continuing to do, all that is humanly possible to ensure that the public will be interested and instructed when they pay a visit to the electrical shop, must however to a large extent rely on the assistance of the newspapers to make known that such visits are necessary. As is well known the organisers of the campaign are arranging for advertisements to appear in a wide selection of journals during the next six months. These advertisements will contain the necessary information about the competition. Enterprising supply undertakings are already arranging to follow these more or less bald statements up by advertisements in their local journals. These will call attention to what they themselves are doing to further the success of the campaign. Even the dullest sub-editors will thus begin to realise that electricity is news and this realisation will, we have no doubt, be duly reflected in the editorial columns. The Press have no excuse for neglecting the campaign. We do not think they will do so. For, as Mr. ATKINSON has correctly pointed out, they stand to gain by this increased interest and activity. The more widespread use of electricity in the home will raise the standard of living. Anything which raises the standard of living will at the same time increase

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the amount of leisure. And the greater the amount of leisure the more time will be devoted to the study of newspapers.

This is perhaps a very material appeal, but the argument that the daily journals should devote more space to electrical matters may be put in another way. It cannot be doubted that electricity will more and more become a subject of the greatest interest about which the public will expect to be told. The newspapers therefore which provide the most readable articles on this question will be publishing "what the public wants," and we need not enlarge on the advantages of that policy. We may perhaps add that the zeal which will, we hope, be displayed in this direction should be tempered with a little discretion. There are those who know, and their aid should be enlisted. The electrical industry desires its commodity to be judged on its merits. It does not desire that imaginative or preposterous claims should be made for it.

The final arm with which we shall deal is the technical Press. It has obviously not so close a connection with the public as the daily Press, but the part it can play in ensuring the success of this campaign will be none the less useful to the electrical industry. When a battle is in progress communication between the commander and his forces is essential. It is the duty of the electrical Press to provide the means of communication. It is not likely they will fail in this duty. During the next few months some modification in the details of the organisation may be necessary. The electrical Press can provide the means for making these changes known. Manufacturers will require to be kept in touch with electrical show rooms and electrical show rooms with manufacturers. The electrical Press can provide that duplex communication. News of the battle in one part of the field will be welcome in other parts. The electrical Press can disseminate that news. THE ELECTRICIAN will make a start next week by publishing the details of the more novel domestic apparatus which manufacturers consider should be stocked in the electrical shop. During the following weeks we shall take care to keep our readers in close touch with the progress of the campaign.

During the past few months, as SIR ERNEST BENN has rightly pointed out, an organisation has been built up to do something, to light a lamp in fact, whose rays will radiate further than may now be imagined. But an organisation, however carefully planned and however strong the foundation on which it is based, can do little without individual effort. It is for the electrical industry to provide that effort in the sure and certain hope that the hard work they will expend will bear ample harvest.

Current Topics.

Broadcasting Progress.

ON another page of this issue, Mr. W. L. MCPHERSON concludes, as the result of a survey of the apparatus shown at the Wireless Exhibition at Olympia, that this growing industry exhibits some very definite technical advances. The sets are developing a distinctive appearance, and can no longer be mistaken for something else, while the fact that, unlike JEROME K. JEROME'S cyclist, the majority of listeners do not wish to be constantly taking their sets to pieces, has brought with it a much needed simplicity. The entertainment function has also been recognised by making each set capable of reproducing the programme of the local station at loud speaker strength, and by rendering the change over from the local station to Daventry and vice versa easier. Another aspect of the endeavour to evolve receiving sets which are fundamentally suitable for domestic use, is the appearance of the somewhat quaintly named "battery eliminator." This enables the electricity supply mains to be used instead of a battery, but brings with it a crop of special difficulties which the apparatus exhibited at Olympia attempts to solve in various ways. It cannot be said that it has yet wholly done so. That interesting problem, the loud speaker, is not yet fully solved. Horns are still popular, but much of the recent apparatus indicates increasing improvement both in appearance and performance. These improvements require the use of larger valves, and these larger valves in turn will require the more widespread employment of the eliminator. It is obvious from this and from the other points raised by Mr. MCPHERSON that finality in design has by no means been reached, and that though perhaps for the moment, manufacturers are in some ways marking time, further interesting developments may shortly be expected.

Electricity or Gas at Woolwich.

THE dispute between the tenants of the Woolwich Borough Council Housing estate at Eltham and the Housing Committee with regard to the refusal of the latter to allow gas to be installed on the estate, reached something of a climax on Wednesday, September 15th, when a meeting of the tenants was held at the Eltham Parish Hall, with the object of deciding upon some form of action which would compel the Housing Committee to modify its attitude. A petition to the Borough Council, signed by over 300 tenants was presented a short time ago, but in spite of this the Housing Committee refused to allow gas to be installed on the estate. The complaint of the tenants is that they are compelled to use electricity for cooking, and that it is more expensive than gas, but in any case, they claim freedom to choose for themselves between electricity and gas and object to being compelled to use only electricity or solid fuel. The dispute has been going on since the early part of the year, and the meeting on September 15th, was with the object of sending forward a resolution to the Borough Council itself. Although over 300 people signed the petition, a very much smaller number than this attended the meeting. Moreover numerous residents on the estate who apparently were not in favour of having gas installed were also present. As these were in the majority, so far as the meeting was concerned, the Chairman, realising that the resolution to the Borough Council would be rejected if it were put to the meeting, decided not to do so, and after a statement of the negotiations between the Borough Council and the objecting tenants had been read, the meeting was declared closed without anything having been achieved. The Council would do well to examine the question carefully, and not be diverted from their enterprising policy by the strident opposition of the few. At the same time it may be doubted whether a policy of compulsion is wise, or does electricity any good. Another point that requires investigation is that it is not sufficiently encouraging for cooking and heating, and rather too encouraging for lighting.

A Wireless Amalgamation.

IT is to be hoped that the amalgamation of the National Association of Radio Manufacturers and Traders and of the Society of Radio Manufacturers, of which a good deal has been heard lately, will go forward to a successful conclusion. Many difficulties have been overcome, but there are rumours that some still remain. We are not surprised to learn that these are crystallised round the personal element. When the amalgamation of the strong and the weak takes place, it is inevitable and perhaps desirable that the former should assume the controlling interest in the new body. But in this case, there is no question of the stronger and weaker, and we hope, therefore, that the council of the new body will be found to be fully representative of the constituents forming it. A strong chairman is also necessary, and there is some considerable support of the idea that he should be drawn from outside the trade. On the other hand, there is a great deal to be said for recruiting the holder of this important position

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from within the industry itself. In this way only, it is rightly argued, will that singleness of purpose which is so necessary at this juncture be obtained. We hope that these obstacles will soon be overcome and that the new body will be free without delay to start on a useful career.

The Olive Branch and the Truncheon.

CONSISTENCY, it has been argued, is a much over-rated human quality, the reason being that a man who never alters his mind (women, of course, cannot be charged with this rigidity) ignores the changes which greater knowledge and different conditions impose upon our outlook. If this be so, we congratulate our contemporary "The Gas World" on the flexibility of its mind. A fortnight ago it published, a little belatedly, the announcement that a Joint Committee of electricity and gas interests had been formed, on the initiative of the Institution of Electrical Engineers, to inquire into the possibility of closer co-operation between electricity and gas undertakings in promoting capital and fuel economy in the supply of energy desired from coal and other fuel. Our contemporary is optimistic of the results, and criticises the non-committal attitude adopted by such doubting Thomases as Sir JOHN SNELL and ourselves. That attitude may be summed up in the sentence that while the whole position should be explored, no spectacular results can be expected, and at any rate, there must be no amalgamation on the distribution sides. We are confirmed in this point of view by our contemporary's own action. Last week, forsaking the olive branch and taking up the truncheon, it published a cartoon entitled "The Battle of Hastings." This with somewhat elephantine humour, celebrates the fact that in spite of "fierce opposition by a municipally endowed electricity undertaking" the Hastings Gas Co. has raised its annual sales of gas from 419 767 000 cub. ft. in 1900, to 531 590 000 cub. ft. in 1925. For the information of our contemporary, we may add that the output of the Hastings electricity department increased from 524 830 kWh to 3 374 705 kWh in the same period, or 544 per cent. as against 26 per cent. But that is not the point. When there is a proposal that two parties should enter into a treaty it is advisable that a little tact should be exercised.

Telephone Progress.

"THE Telegraph and Telephone Journal" gives an interesting survey of the development that took place in Europe in the use of the telephone during 1925. In Great Britain, for instance, 115 632 subscribers, or 9 per cent. over the number in 1924 were added, while corresponding figures in Germany were 202 839 (8 per cent.) in France 77 249 (11 per cent.), in Belgium 21 278 (15 per cent.), in Russia 20 000 (13 per cent.), in Sweden 16 726 (4 per cent.), in Holland 11 452 (5 per cent.), and in Switzerland 10 491 (5 per cent.). In America the percentage increase was 4·8 per cent. and in Canada 6 per cent. Our contemporary adds that the figures would suggest that Europe is slowly overtaking America, if it were not necessary to bear in mind that, after a certain incalculable point, as the telephone density becomes higher, the percentage increase becomes lower. It depends upon the speed with which the European figure of 8 descends to the American figure of 5, and on the rate at which the latter figure descends still lower, whether Europe will ever catch up with America.

Rate-Aid at Hackney.

THERE seems to be a little bother at Hackney over the old question of rate-aid. Though the rate for the next six months is to be 5s. 10d. in the pound as compared with 6s. 1d. during the current half year, a penny rate now yields £5 880 as against £5 260 owing to the increase in the rateable value. Moreover, what is of more interest to readers of THE ELECTRICIAN, it is proposed to increase the charges for electricity by 10 per cent. and at the same time to take £7 000 from the "profits" of the undertaking to relieve the general rate. Municipal electrical opinion, including that of the chairman of the Hackney Finance Committee, is opposed to this policy on the good grounds that the pockets of the ratepayers generally should not be lined at the expense of the electricity consumers. Its lack of soundness is emphasised by the accompanying proposal to raise the charges for electricity. The whole policy should be reversed. The charges should be left as they are and rate-aid should be abandoned.

School Lighting.

THE problem of school lighting, which was dealt with very fully by the Illuminating Engineering Society shortly before the war, when reports by its joint committee were issued, was again reviewed at a recent meeting. An introductory paper was read by Dr. JAMES KERR, late School Medical Officer for London. This consisted largely of a review of the recommendations of the joint committee, of which he is Chairman. Naturally, after thirteen years, some changes are necessary, though, in general, the recommendations seem to have stood the test of time well. The coming of the gasfilled lamp, the general improvement in standards of lighting, and the recognition of the exceptional demands on the eyesight of growing children, suggest an illumination for reading and writing of 5 to 7 foot-candles; the high intrinsic brightness of filaments makes screening essential, and Dr. KERR suggested that no lighting unit within the direct range of vision should have a brightness exceeding 3 c.p. per sq. in. These requirements can be readily met, provided educational authorities will take advantage of modern lamps and fittings. The difficulty, expressed by Dr. Nash, as a medical officer, and by several teachers who joined in the discussion, is usually to find funds for improvements in lighting. The only remedy seems to lie in education of the public to appreciate the fundamental importance of good lighting in schools and colleges. Both children and adults in these days learn chiefly through the eye. The very first requirement in education, therefore, is to ensure that the eye can see in comfort. Naturally the scrapping of obsolete lamps and fittings means some initial cost. But we believe that in many cases the running cost of up-to-date lighting would not exceed that at present incurred. Obsolete lamps and fittings are notoriously wasteful, and in schools and colleges, as elsewhere, one finds many instances of light misapplied. A good feature was the participation in the discussion of medical officers and representatives of educational bodies. This is emphatically a case in which the producer and user of light should be brought in contact.

Electrical Ore Finding.

IN a Paper read by Prof. W. PETERSSON before the meeting of the Iron and Steel Institute in Stockholm, it is stated that since the introduction of the electrical ore-finding method of DAFT and WILLIAMS in 1907, ore finding by electrical means has been the subject of lively interest, and at present two Swedish ore-finding methods have been worked out. These have been largely used in Sweden as well as in foreign countries, especially in the U.S.A. and South Africa. One of these methods is based on the investigation of the potential in an electrical field by tracing equipotential curves or measuring differences in potential between different points—the potential method; the other method—the electromagnetic method—is based upon investigations of the direction and intensity of an electromagnetic field. While the use of magnetic measurements is possible only for magnetite or magnetic pyrites, the electrical methods are suitable for all kinds of deposits which have an electrical conductivity different from that of the surrounding rock—that is, for practically all ore deposits. By means of the electrical ore-finding method large deposits of copper, pyrites, zinc and lead ores have, for instance, been detected in the north of Sweden in the neighbourhood of Skelleftea.

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BROADCASTING RECEIVING APPARATUS.

A Review of Olympia Exhibits—The Importance of the Entertainment Function—The Press and the Home Constructor—Loud Speaker Design.

By W. L. McPHERSON, B.Sc.

ALMOST exactly a year ago the Radio Exhibition held in the Albert Hall under N.A.R.M.A.T. auspices provided the grounds for a general survey in these columns of the progress made in the design and manufacture of broadcasting

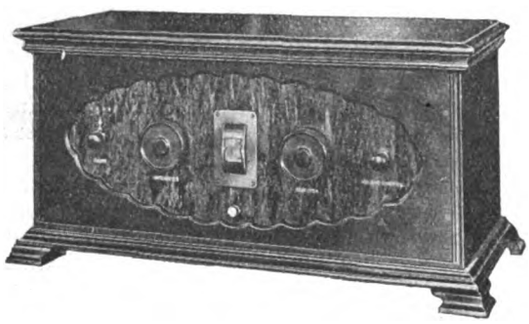

Fig. 1.—Gecophone four-valve set.

receiving apparatus during the previous three years. This year's National Radio Exhibition at Olympia, which closed last Saturday, was fully "open" and was not limited to manufacturers within any particular trade organisation. It was thus probably even more indicative of the present state of the art than any of the previous "limited" exhibitions could have been. Of the one hundred and eighty odd firms exhibiting, by far the greater proportion are actively engaged in the design and manufacture of complete receiving sets, components, or accessories, and a survey of their products brings to light some very definite advances in the industry as a whole.

Probably the outstanding feature is the general recognition that a broadcasting receiving outfit is fundamentally intended for home use and for entertainment, and is not to be classed with apparatus for laboratory work or commercial communication; while at the same time there is not the slightest necessity to disguise it as a gramophone or any other well-established piece of domestic furnishing. The industry appears at last to be gradually evolving its own distinctive shapes, finishes, etc., and there are now available quite a number of receiving sets which do not look out of place in an ordinary domestic room, which do not resemble commercial apparatus in any way, and yet in no way attempt to conceal their function, and could not possibly be mistaken for anything but what they really are—broadcasting receiving sets. This distinctive appearance has been attained in a number of ways

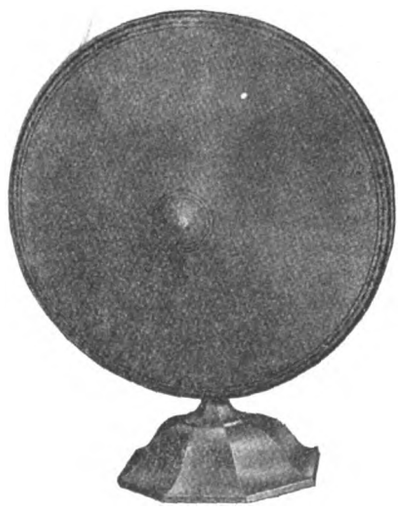

Fig. 2.—B.S.A. Improved Kone loud speaker (Model V).

In some cases the control panel has been made entirely of wood, as has been done by Messrs. Burndept; in others the control panel is still of ebonite or other highly insulating material, but framed with an ornamental wood panel, this device being used, for example, in the Curtis "Imperial" supersonic (ebonite panel) and the G.E.C. four valve set (Fig. 1) (mahoganite panel). In the case of some of the B.S.A. sets the control panel is made of metal with a very fine satin oxidised finish, which tones unobtrusively with the mahogany woodwork of the case. In many instances battery plinths are available, giving a floor cabinet set of neat appearance and without the multitude of visible battery leads to which objection is so frequently taken. Even the control handles have been studied, and there is a general tendency to abandon the ordinary 180 degree scale, and use small dials calibrated in wavelengths, or with only a few graduations; examples could also be seen of the "edge-on" dial whose calibrated scale is visible through a slot in the control panel.

That the entertainment function of a broadcasting receiving set has been generally borne in mind is very evident from the fact that every receiving set shown was intended to give loud-speaker reproduction of at least the local station. The set which will give headphone reception only has vanished from the general market together with the "unit" system. Two and three valve sets intended for the reception of the local station and Daventry were shown by many makers. In a few cases plug-in coils had to be used for Daventry reception,

Fig. 3.—B.S.A. Universal seven-valve receiving set.

but in the newer designs this is avoided and changing over from local to Daventry is reduced to some simple operation such as operating a switch and slightly retuning. Some manufacturers have actually provided duplicate aerial circuits, one being adjusted once for all to the local station, and the other to Daventry; in this case changing over merely involves switching the detector from one aerial circuit to the other, and distant push-button control through relays is easily arranged for if desired. Typical examples of this are the "Polar" four valve and the G.E.C. three valve "L and D" sets.

Apart from the foregoing points, there cannot be said to have been any serious advance in the design of receiving sets as such during the past year. Supersonic sets for frame aerial reception, and "neutrodyne" sets for open aerial reception are certainly far more numerous, and in the case of supersonic sets it is interesting to note that even here the general desire for simplicity in operation has been felt; there are few cases in which any attempt has been made to combine the oscillator and first detector in one valve. A separate oscillator valve is practically always used. The usual experience seems to have been that combining the two functions in one valve has either necessitated very accurate control of filament, grid, and plate voltages if efficiency and stability were to be retained over a reasonable range of wavelength, or else rendered it

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essential to select the detector-oscillator valve from a large number. Such selection is, of course, practically impossible for the ordinary user. Apart from this the use of a combined oscillator-detector inevitably results in the generation of a quite strong second harmonic in the oscillator which may seriously affect the selectivity of the set. A rather unusual example of the supersonic is the B.S.A. "Universal" seven valve set (Fig. 2), designed to work off an open aerial, and fitted with aerial and secondary tuning, and in addition a wave trap circuit of the simple acceptor type. This can also be used with a frame aerial if desired. A good but unusual feature about this set is the provision of amplification control on the supersonic frequency amplifier which is quite independent of grid bias and internal reaction effects, and which does not involve cut-off of the upper side frequencies on maximum amplification. The neutrodyne type of set does not yet have the vogue which one would expect, except with the home constructor, who is very well catered for in the matter of components for both this and the supersonic set. The popularity of the neutrodyne with the home constructor is indeed a tribute to the power of the Press, which furnishes him with very full information on their construction, and is followed by the makers of components who quickly put on the market any relatively complicated part which the home constructor

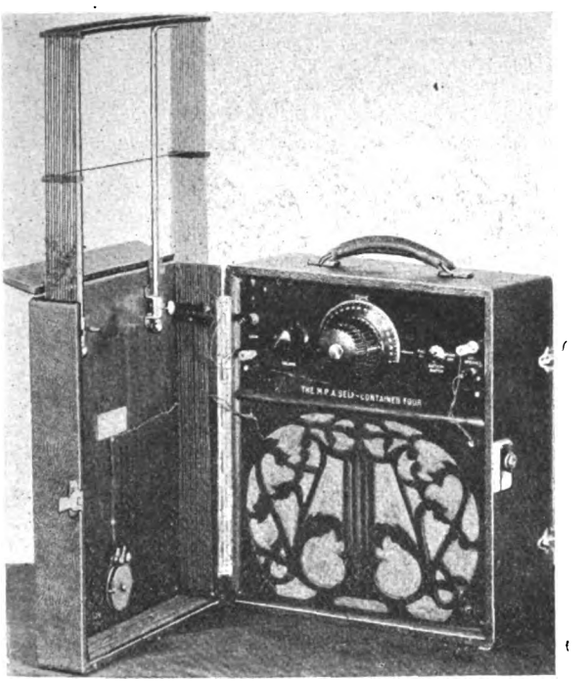

Fig. 4.—M.P.A. self-contained four-valve receiver.

himself might have difficulty in making; such parts, for example, as shielded high frequency transformers. Some of the better known of these "Press" neutrodynes are very reminiscent of transatlantic designs, both in circuit and dimensions, and so far as performance goes compare favourably with the industrially manufactured product.

Another aspect of the endeavour to evolve receiving sets fundamentally suitable for domestic use is the appearance in quite large numbers of the "battery eliminator," enabling plate and sometimes filament batteries to be dispensed with, the electric lighting mains being used instead. The majority of the eliminators shown covered plate supply only, especially where intended for use off a.c. mains. In a few cases firms had produced sets which incorporated the battery eliminator and were suitable for direct operation off the lighting supply. The use of electric light mains is, however, beset with difficulties; d.c. supply systems vary enormously in the amount and distribution of ripple, and in the smoothing system required to reduce this to reasonable proportions, while the use of a.c. filament supply is attended with special obstacles in the case of the detector valve. The problem is even more severe now than it was, say, three years ago, as the hornless loud speakers now in common use reproduce quite efficiently the low ripple frequencies which would not have appeared in the ordinary short horn type of loud speaker of that period. In the case of the a.c. battery substitute shown by the Dubilier Condenser Co., the filament lighting problem has been side-tracked by providing two accumulator batteries which are used alternately to feed the receiving set, the one not in use being connected to a charging system, the two batteries being interchanged automatically by a thermo-operated switch. The resultant unit is somewhat bulky and, of course, will require a certain amount of attention to the batteries at intervals; but it has the advantage that it can be used in conjunction with any set. It is probable that a.c. filament heating will be really successful only in receiving sets designed for the purpose. That the problem is being faced at last is, however, a welcome sign, for there is no doubt that the use of accumulators and dry batteries is a nuisance to the non-technical public, and is, moreover, very expensive. Their elimination may be expected to react on the design of receiving sets in permitting the use of large power amplifier valves capable of feeding large amounts of power to the loud speaker without overloading in any way.

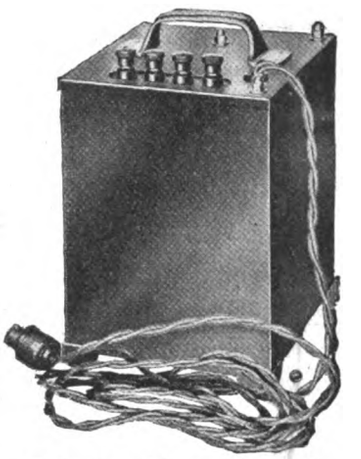

Fig. 5.—Marconiphone a.c. high tension supply unit.

Turning to loudspeakers, it is rather surprising to find that the horn type is still very prevalent. This is probably on account of their volume efficiency outweighing their loss in quality at the lower end of the musical scale when fed from small and inexpensive receiving sets and amplifiers. The hornless type of loudspeaker is now well represented by the B.S.A. model "A" and model "B" Kones (Fig. 3), both based on a type which is apparently universally accepted in America as the standard of quality. A compromise is found in the quasi-horn type Amplion "Radiolux," in which the equivalent of a long horn is obtained in a small space by means of an ingenious reflector system. In all except the very cheapest models there is an endeavour, by attention to shape and finish, to avoid the aggressive appearance formerly so characteristic of loudspeakers. With the improvement in quality of loudspeakers, and particularly the introduction of the lower bass frequencies by the hornless type, attention has been thrown on to L.F. amplifiers, not only in the matter of frequency range, but also in the matter of load capacity; the lower frequency tones have considerably greater amplitude than middle scale and upper frequency tones of the same audibility, and their presence in an amplifier is liable to overload the last valve at what appears to be a relatively low volume. The use of power amplifier valves is now imperative, and were it not for battery supply difficulties even larger valves than those now common could be used to advantage. There is, therefore, pressing need for progress in battery eliminators not merely from the standpoint of general convenience, but also for the sake of the improvement in quality which they will permit.

The valve situation as shown at the Exhibition is interesting. To all intents and purposes the "bright emitter" is dead, and the "dull emitter" reigns supreme. Coated

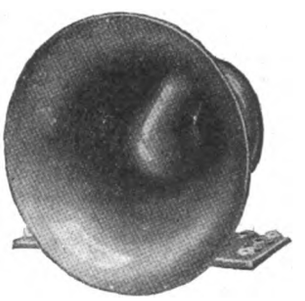

Fig. 6.—Frontal view of the acoustic radiating bowl. (A. Graham & Co.)

Fig. 7.—The acoustic system from the rear. (A. Graham & Co.)

filaments of various types are increasingly used, the thoriated filament being apparently in some disfavour on account of its microphonicity. A noteworthy feature is the extraordinary variety of valves available; specialisation of purpose seems

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to have been developed to a greater extent in this country than in any other. In addition to the ordinary general purpose and power amplifier valves, there are quite a number of high impedance valves designed for use in impedance-capacity coupled circuits, and as detectors, the filament voltages ranging from one to six. Soft detector valves are, however, conspicuous by their absence. This contrasts curiously with conditions in the States, where the range of valves available is much more limited, but soft detector valves are in common use. It is improbable that they would ever be in demand in this country, as unless carefully handled they are liable to be very noisy. Practically every valve shown has been pumped dead hard with the aid of a getter, usually magnesium; the metal base formerly used has generally been replaced by some form of moulding, with the object of reducing capacity effects; and even the valve legs have been improved in many cases, the tendency being to replace the old split pin type by legs with contact leaves after the pattern always used in German valves. Two-electrode rectifying valves were also on show, their entry into the broadcasting market being due to the advent of H.T. battery eliminators for working off a.c. mains.

some extent in the interests of portability. In spite of this, manufacturers have produced in some cases sets which are almost on a par with the smaller type of home set as regards suitability in appearance. This, of course, has only been made possible by the use of the newer types of dull emitter valves with their small battery requirements. It is questionable, however, whether any of the portable sets shown would be considered satisfactory from the standpoint of quality; it is hardly possible to incorporate in an attaché case the high tension batteries necessary to give good loudspeaker volume, at any rate as judged by a musical ear.

It will be seen from the foregoing that the progress made by the industry during the last year affects complete receiving equipments rather than receiving sets considered by themselves. The initial period of chaos consequent on the extraordinarily rapid growth of broadcasting has been passed, and it is now possible to obtain equipments both technically sound and artistically satisfying, and capable of delivering sufficient volume for family listening with a very high degree of faithfulness of reproduction, receiving from the local station. There has been a temporary pause in the development of

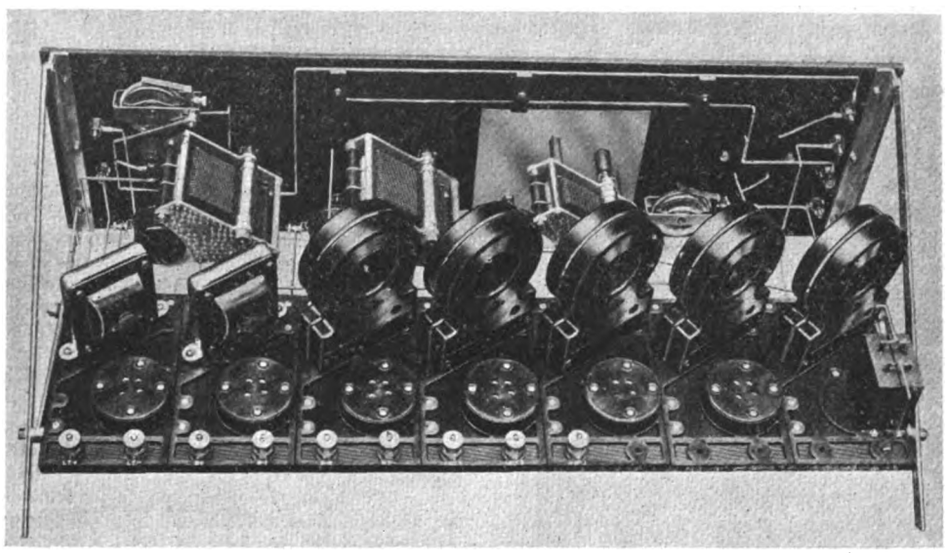

Fig. 8.—Rear view of Igranic six-valve supersonic heterodyne receiver.

The manufacture of components for use both within the trade and by the home constructor constitutes an appreciable section of the industry as a whole, and until recently it was a matter of comment that British components, while satisfactory for their purpose, could not compete with the American equivalents so far as finish was concerned. This reproach, however, is no longer justified; the majority of the components shown at the Exhibition were fully equal to anything that America can offer, and in some cases are probably superior. Straightline-frequency condensers are evidently going to replace the square law type (straightline-wavelength) which were almost universal a year ago; with the increasing congestion in the ether and the systematic allotment of wavelengths spaced a definite number of cycles apart, this change is almost inevitable. From the standpoint of efficiency, condenser design has not changed appreciably, and is indeed hardly likely to change. The influence of the home constructor market is evidenced by the number of condensers, variometers, etc., arranged for one hole fixing. There is a noticeable tendency to improve the efficiency of plug-in coils by increasing the gauge of wire, by using stranded wire, by air spacing of turns, and even by sectionalising. In some cases mechanical strength has been seriously sacrificed for the sake of higher electrical efficiency. Screened coils and high frequency transformers are recent additions to the list of components, and as already remarked the demand for these is largely attributable to the influence of the Press. Manufactured sets in general do not yet make use of screening to any appreciable extent. Kits of parts essential to the home construction of supersonic sets were not uncommon, one of the most complete examples being that of the Igranic Co.

Some mention must be made of portable sets, of which a number were shown. These can hardly be placed in the same category as sets for use in the home, and it is only to be expected that appearance and quality would be sacrificed to

receiving circuits and methods, balanced by progress in loadspeakers, components generally, and battery supply arrangements. So far as distant reception is concerned the problem of selectivity is now the governing factor, and it seems likely that the next big advance will be in the production of highly selective receiving sets with only one selecting dial, and perhaps means for controlling the degree of selectivity. Further progress may also be expected in the production of equipments operating entirely off lighting mains, and fitted with power-amplifier valves of appreciably greater capacity than at present.

Books Received.

"Die Elektrischen Maschinen." By M. Liwschitz. (Berlin: B. G. Teubner.) Pp. viii+337. R.M. 14.0.

"Engineering Factory Supplies." By W. J. Hiscox. (London, Sir Isaac Pitman and Sons.) Pp. 176. 5s. net.

"A First Course in Wireless." By R. W. Hutchinson. (London: University Tutorial Press.) Pp. 262. 3s. 6d. net.

"Journal of the Institution of Electrical Engineers." Vol. 64, No. 357 (September). (London: E. and F. N. Spon.) 10s. 6d. net.

"Accumulator Charging, Maintenance and Repair." By W. S. Ibbetson. (London: Sir Isaac Pitman and Sons.) Pp. 118. 3s. 6d. net.

"History of the States of Guernsey Telephone System." By Alfred Rosling Bennett. (London: Leonard Parsons, Ltd.) Pp. 139. 5s. net.

"Tungsten: A Treatise on its Metallurgy, Properties and Applications." By C. J. Smithells. (London: Chapman and Hall.) Pp. viii+167. 21s. net.

"Bulletin International: Resumés des Travaux Présentés, 1924 and 1925." (Prague: L'Académie Tchèque des Sciences. Vol. 24, pp. 187; Vol. 25, pp. 385.

"Intermediate Text Book of Magnetism and Electricity." By R. W. Hutchinson. 2nd Edition. (London: University Tutorial Press.) Pp. viii+630. 9s. 6d. net.

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THE EGUZON HYDRO-ELECTRIC POWER STATION.

The Long Distance Supply of Paris—Meeting the Traction Load on the Orleans Railway—Interconnection with Gennevilliers—Constructional Details.

By L. BLIN DESBLEDS.

THE Eguzon hydro-electric station, which has just been put into service and now transmits high-tension current to Paris, a distance of 200 miles, marks the beginning of

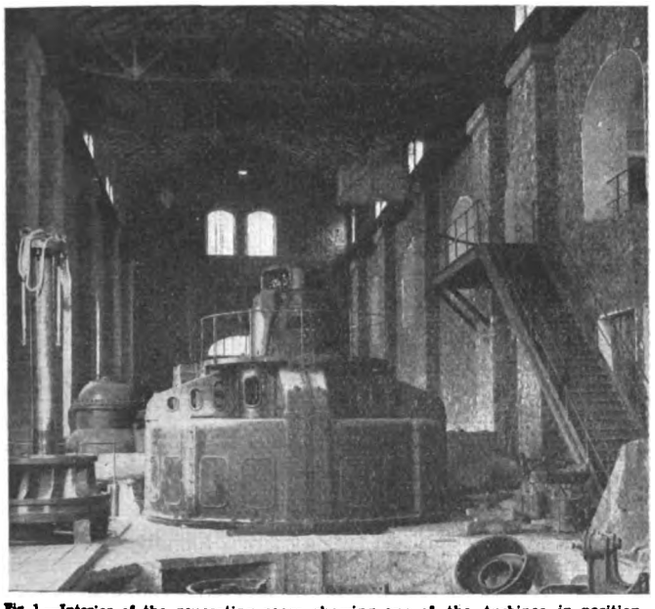

Fig. 1.—Interior of the generating room showing one of the turbines in position, and two others in course of erection.

what is virtually a new era in the industrial history of the French metropolis. For by its means Paris is for the first time supplied with electrical energy from a long-distance hydro-electric station. But, whatever the advantages which cheap electrical power may offer to the various industries of French capital, the greatest significance of the Eguzon installation is that its chief aim is to supply electrical energy to certain sections of the Paris-Orléans Railway; and that it thereby constitutes the first practical and important step in the scheme of long-distance railway electrification, throughout the length and breadth of France, which has been under consideration for some time. The Eguzon hydro-electric station, working conjointly with the thermal stations of the Union d' Electricité in the suburbs of Paris, especially with the great central station of Gennevilliers, in the north-west of Paris, will feed the first electrified section of the Paris-Orléans railway main line when, as anticipated, that section will be converted to electric traction towards the end of the present year.

The construction of the Eguzon station, which has a capacity of 75 000 H.P., is the result of co-operation between several undertakings with parallel interests.

In 1921 the French company "Production, Transportation and Distribution of Energy," known as the P.T.D.E., obtained authority to use, for the production of electrical energy, a waterfall of about 130 ft. at Eguzon, on the river Creuse, about 200 miles distant from Paris. The company at first intended to utilise the power of the fall mainly to supply the needs of the military establishments of Bourges; but as the Paris-Orléans railway was then considering the erection of hydro-electric stations in the central highlands of France and the Union d' Electricité was, on its side, engaged in completing its thermal stations by a hydro-electric installation, it occurred to the P.T.D.E. to suggest to those two undertakings that all three join forces and help to establish at Eguzon a much larger station than was originally intended. The Union Hydro-Electrique was therefore formed from the three interested companies; and a careful revision of the original plans was made to meet the requirements of a more extensive use of the Eguzon fall. It was in this way that the Eguzon undertaking led to the construction of the largest dam and the equipment of the largest hydro-electric station that has yet been built in France.

The Eguzon dam, which is 200 ft. high, is arched in plan on a 820 ft. radius. In section it is triangular (widening towards the crest), the base of the triangle being 177 ft.; the length of the dam along the crest is 836 ft.; the upstream batter is 0·06 and the downstream batter 0·834. The fact that 7 413 000 cub. ft. of cyclopean concrete was needed for the dam will help readers to visualise the magnitude of the undertaking just completed.

Holding back, as it does, a mass of 1 900 million cub. ft. of water, the Eguzon dam has to resist a formidable pressure. In its construction advantage has been taken of the latest American experience in large dam construction. Expansion joints, for instance, allow the free movement of the masonry work caused by temperature increase due to the setting of the cement. Inspection and drainage galleries make it possible to penetrate right into the heart of the structure, to cross it in every direction and keep a good watch on its behaviour; and, also, to collect and evacuate any infiltration water. Injections of cement up to a depth of well over 30 ft. under the foundations of the dam have ensured that any cracks that may have occurred have been completely stopped up.

Besides all the regulating and emptying devices, there are two spillways, one near each bank. These are capable of dealing with an overflow more than twice the largest ever registered on the Creuse. Finally, the dam is provided with two water intakes, in the form of two large reinforced concrete towers 80 ft. high, which make it possible to raise, to a height

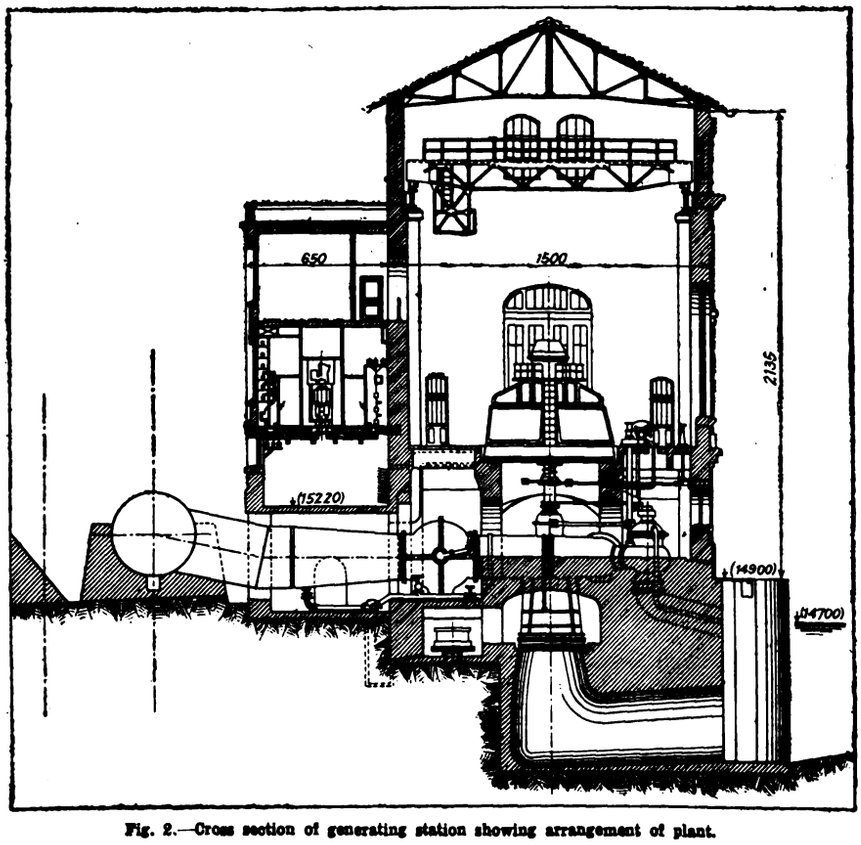

Fig. 2.—Cross section of generating station showing arrangement of plant.

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of 75 ft. above the normal water level, the water output required to work the turbines.

Two sheet steel penstocks, 14 ft. in diameter, carry the water from the artificial lake, 11 miles long, which is formed behind the barrage, to the power house, which is located immediately below the dam, at the rate of 880 cub. ft. per sec. per turbine.

The power house consists of a generator room and a switch house. In the former, which measures 246 ft. by 49 ft., the alternators are placed on a floor 17 ft. higher than that on which the turbines are mounted. The generator room contains five sets (space for a sixth being available). These sets consist of 15 000 H.P. turbines direct-connected to 12 500 kVA three-phase alternators at 10 500 V. The hot-air outlet flues of the alternators are placed under the upper floor; and ducts made in the foundation bed—and each of which may be cut off from the river by a double coffer-dam—ensure the exit of the water from the turbines.

The switch house, which adjoins the generator room and measures 246 ft. by 20 ft., is a three-storey structure. In the basement are the passages for the turbine piping and the cable gallery; on the ground floor are the busbars and the 10 000 V switches as well as the supply mains from the alternators and the outgoing feeders to the transforming station, which is erected a short distance from the power house; on the first floor are the low-tension switchboard, the high-tension control mechanism, a battery of accumulators and the manager's office.

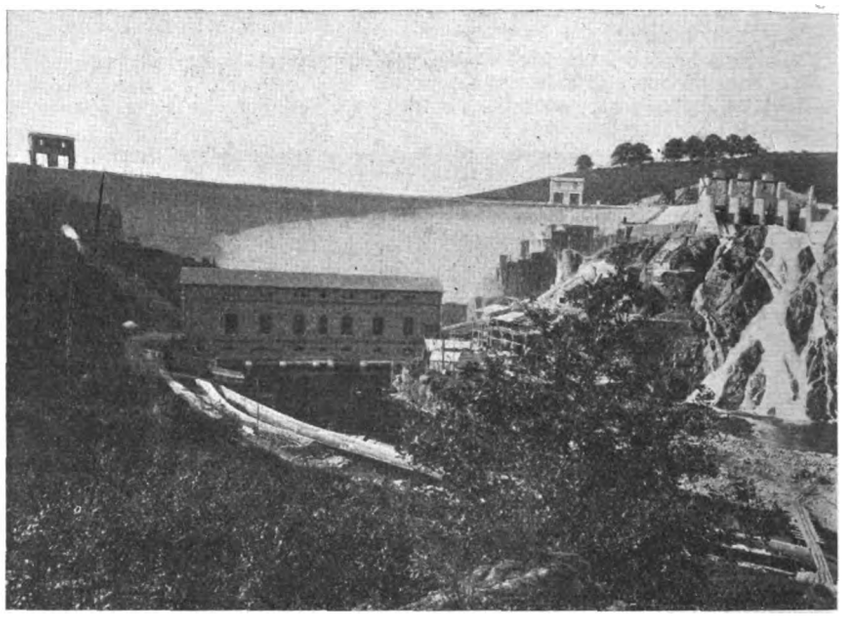

Fig. 4.—View of right bank of Creuse below dam and power house.

Although of different models, the main turbines installed at the Eguzon station are all of the vertical axis Francis type. They are each rated at 1 500 H.P. (head 180 ft., flow 880 cub. ft. per sec.) at 250 revs. per min. The guaranteed efficiencies for heads between 164 ft. and 131 ft. range from 80 to 84 per cent. at full load, 84 to 80·5 per cent. at three-quarter load, and 79 to 73 per cent. at half load. The main turbines as well as the auxiliary ones—which are also of the vertical type and rated at 750 H.P. at 500 revs. per min.—are controlled by individual spherical valves.

The five main alternators are of the three-phase, 50 cycle type and generate current at 10 500 V. Each one is rated at 12 500 kVA. The two 650 kVA auxiliary alternators generate at 220 V and a frequency of 50. Above them is a dynamo generating at 250 V which is available for emergency work should a mishap occur to a main alternator.

The main and the auxiliary alternators have fixed armatures. They run at 250 revs. per min. and 500 revs. per min. respectively; and are built to withstand a runaway speed twice the normal. Their guaranteed efficiencies vary between 96·5 per cent. at full load and 94·5 per cent. at half-load, with a power factor of unity.

To ensure continuous service in the case of accident to any of the alternator inductors, there is in the generator room, in addition to the two dynamos already mentioned, a converter which consists of a three-phase, 220 V motor (1 000 revs. per min.) coupled to a 125 kW dynamo generating at 250 V d.c. The generating room also contains a 3 000 Ah battery set which is used for lighting the power house and to work the small motors needed for the regulators, interruptors, etc.

A large number of small motors are distributed all over the station and in the hydraulic works. They are used to operate the regulating equipment of the turbines, the 150 000 V switches, and the water intake and spillway valves. Some of these motors work on 250 V d.c. and others on three-phase current at 220 V.

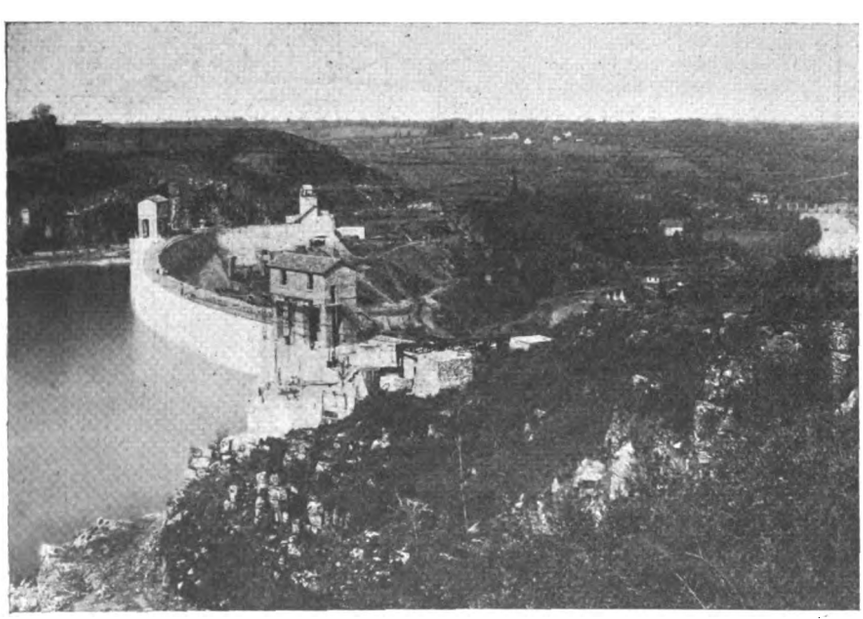

Fig. 3.—View from right bank of dam showing Creuse valley, etc.

The transforming station, which is of the open air type, is situated on the right bank of the Creuse, a little way beyond the crest of the dam. It consists mainly of a set of three single phase transformers, rated at 7 000 kVA which step up the voltage from 10 500 to 150 000 V and two similar sets rated at 8 333 kVA, which step up the voltage from 10 500 to 90 000 V. There are, of course, in addition, the oil switches for these high pressures, the distributors, the busbars and the metal framework which, through powerful insulators, carries all this outfit. A small structure, used as workshop, etc., is placed between the 90 000 V and the 150 000 V portion of the installation.

An aggregate of 18 three-phase cables (0·233 sq. in. in section per phase of each cable) connect the transforming station to the power house. The transforming station has two out-going feeders carrying current at 90 000 V and one carrying current at 150 000 V. All these feeders are provided with automatic circuit breakers. There are, besides, three outgoing feeders at 10 000 V.

All the transformers are of the oil-immersed type with water cooling by worm. For loads greater than half load and for power factors greater than 0·8, the minimum efficiency is 98 per cent. The transformers, without their oil, weigh 17 tons each. The ones supplying current at 90 000 V require 7·3 tons of oil, whilst those which supply at 150 000 V require 13 tons each, so that more than 100 tons of oil are needed to satisfy the requirements of the 11 transformers used.

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The cooling water is provided by a small pumping station installed near the up current side of the dam which contains two pumping plants with a capacity of 220 gall. per min. This pumping station is fed by an intake built through the dam itself.

From the Eguzon transforming station, there run, one 150 000 V and two 90 000 V outgoing current feeders. These mains go in almost a straight line to the two power stations of Chaigny near Orleans and

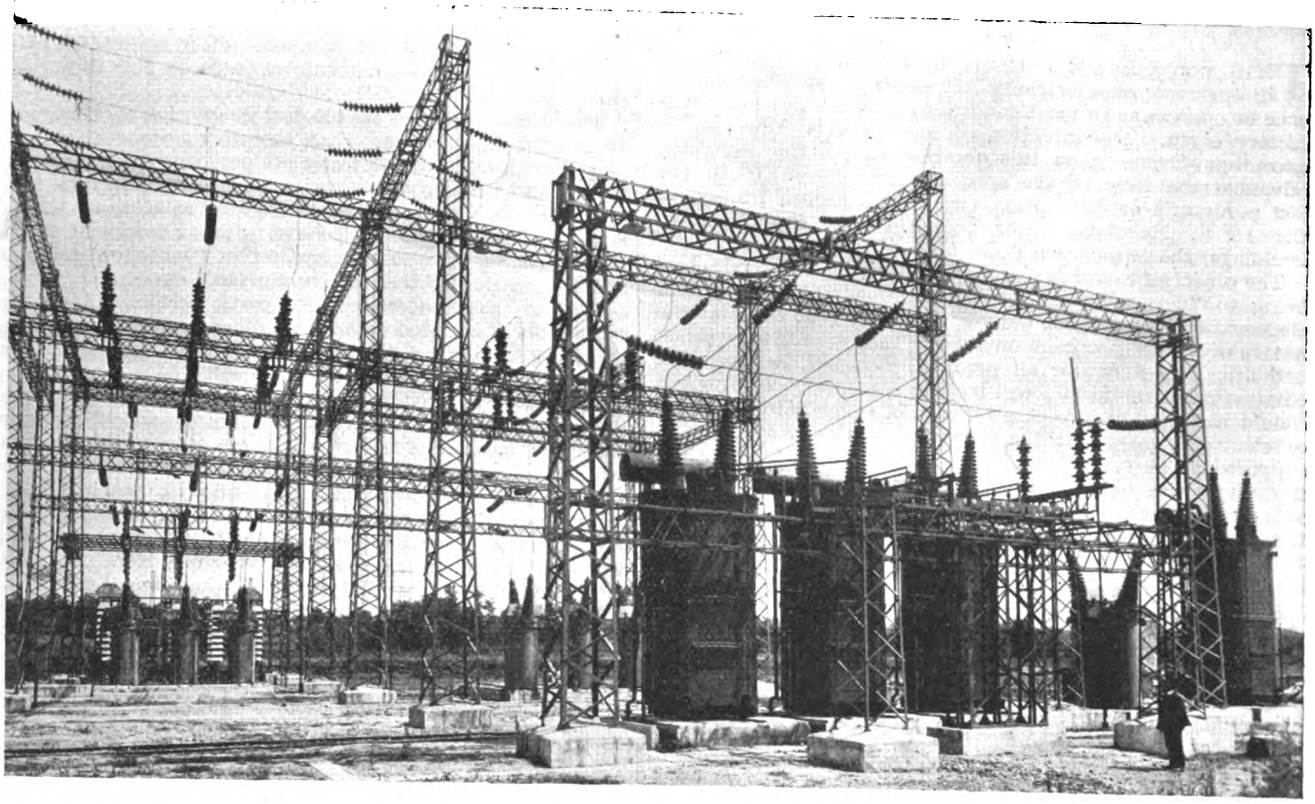

Fig. 5.—Detail view of transforming station.

The automatic oil circuit-breakers, which are placed on each group of transformers and on each outgoing current main, are of the 400 A type, and solenoid controlled from the station switchboard. They require an oil supply of 40 tons.

of Chevilly near Paris. The 150 000 V feeders go only to these two stations, whilst the 90 000 V ones go through 15 sub-stations which are situated between Eguzon and Paris.

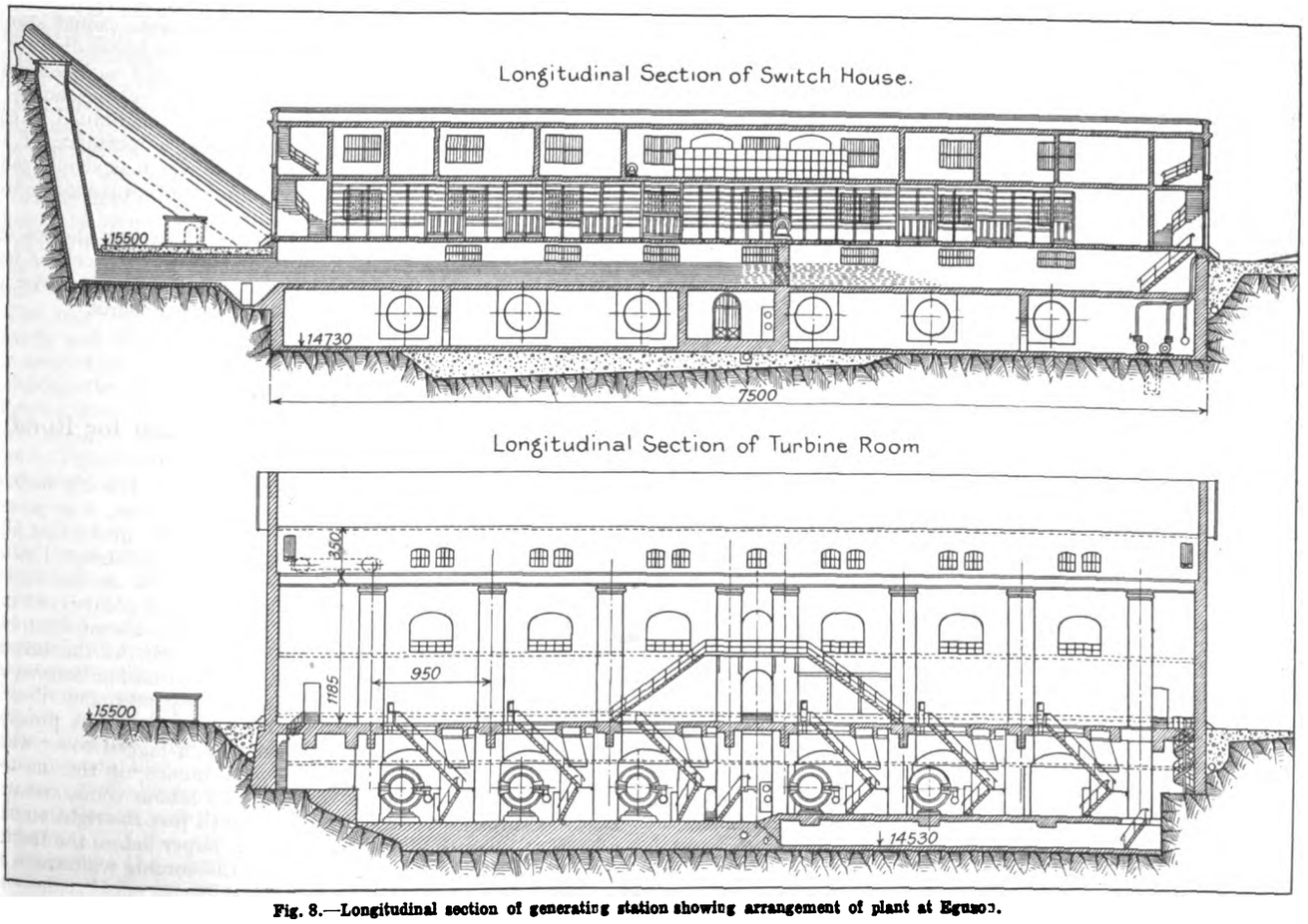

Fig. 8.—Longitudinal section of generating station showing arrangement of plant at Eguzon.

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EARTHING OF METAL OBJECTS.*

Application of Principles to Bodies other than Conductors—Need for Speedy Issue of I.E.E. Specification—Proper Testing Essential.

By L. HENSHAW.

THIS paper is the outcome of difficulties experienced in operating an Electricity Act under the existing divergence of opinion as to what conditions are essential to a satisfactory earth. The intention of the paper is, however, to encourage discussion on this question and, if the discussion advances the issue of the specification referred to in the last paragraph of Regulation 127 in the Eighth Edition of the I.E.E. Regulations for the Electrical Equipment of Buildings, the author will deem his work well done.

The object of earthing metal objects other than conductors being to "ensure at all times an immediate discharge of electrical energy without danger," we may first consider the nature of the dangers contemplated. They appear to be shock and fire. We may, for all practical purposes, assume that elimination of the former will include the latter. Equipment should therefore ensure at all times an immediate discharge of electrical energy without danger from shock. This is supposed to be carried out in practice by ensuring that, on the occurrence of a fault of a predetermined magnitude, sufficient current to operate the tripping device shall flow through the earthing system.

Path of Fault Current.

Let us now consider the path of the fault current and the obstacles it meets *en route*. Taking the simplest case—a 3-wire d.c. system with earthed neutral—our obstacles are composed of measurable resistances in series, collectively tending to restrict the flow of the fault current from the fault to the neutral point of the distributing system. Starting from the fault, they are: (1) the fault resistance, (2) the resistance of the earthing leads, (3) the resistance of the earth, (4) the resistance of the neutral earth, (5) the resistance of the neutral earthing leads, (6) any resistance inserted between the neutral and earth.

Since it is necessary to guard against the occurrence of a dead earth, (1) may be omitted and, assuming the earthing leads to have been correctly designed and installed, (2) and (5) may be ignored. Hence we have three resistances in series—r_1 represents the resistance of the earth connected to the metal body, r_2 the resistance of the neutral earth, and r_3 the neutral limiting resistance. Assuming a dead earth on B, the fault current will be limited to $E/(r_1 + r_2 + r_3)$. This, irrespective of tripping or fusing values, is the maximum current with which the earthing system will be called upon to cope.

In the author's experience the majority of the plant operating on earthed system relies for protection entirely upon its main fuses or breakers, and hence the circuit is not opened until a current equal to about twice the full-load current is permitted to pass. Hence, in the case of plant of any magnitude, the value $r_1 + r_2 + r_3$ is required to be very low.

An Unusual Case of Shock.

In the case most frequently met with, *i.e.*, an owner's plant operating on a licensee's system, r_2 and r_3 are fixed by the latter, with the knowledge and approval of the licensing authority. The owner is therefore able to control only r_1 in his earthing problems. In the plains of India, in the dry season—say, nine months in the year—r_1 is most difficult and expensive, and often impossible to maintain, and hence it is not surprising that the current of value $E/(r_1 + r_2 + r_3)$ is seldom sufficient to open the circuit. In fact, many attempts have, for experimental purposes, been made to open circuits by dead-earthing an outer conductor and these have, in spite of good earthing, very rarely met with success.

In this connection it may be of interest to note an unusual case of fatal shock received from a stay wire. The licensee was not aware of the fault on the line, the pole was earthed, and the stay wire was securely anchored in the ground. Apart from the pole and the stay wire there was no metallic path to the ground in the vicinity and the ground was dry. The stay wire was not directly connected to the earth wire but, the fault being on a cross-arm, it was obviously in good electrical contact with the pole. It is not known what the fault current was—the voltage across the outers was 440 a.c.—but apparently it was not high, and yet, in spite of the nature of the ground, a fatal current was able to flow through the shock circuit.

The author confesses that he has no solution of this problem. It is obvious, however, that the maximum current which may flow through the earthing equipment is a most important factor, and hence it is necessary first to develop rules for its computation. Then, having decided by what means the fault is to be made known and isolated without detriment to other consumers on the same distribution, we may consider the shock risks due to that maximum fault current.

We have so far dealt with the earth circuit. The earthing system may be looked upon as an *added* circuit for the purpose of taking from an *existing* circuit—the shock circuit—sufficient current to render the latter innocuous. Its function is to eliminate, or at least to limit, leakage current in undesirable directions. It is therefore incident to the shock circuit and should be treated as such. Hence we may consider a circuit which divides into two branches and unites again. One branch is the earthing system, the other a combination of a body touching the earthed member and the medium between that body and earth—the reuniting medium being earth. Our aim is to eliminate shock from the latter. These conditions are considered analytically in the original paper. Let y be the value of the resistance between earthing system and earth. On the other side we have the resistance of the contact-making body k, and x the resistance of the medium between that body and earth. Then, if I is the maximum leakage current and t the maximum current permissable through the contact-making body, it is deduced that for safety:

$$y < \frac{t\,(k + x)}{I - t}$$

If this condition is maintained under all circumstances the earthing is satisfactory from the shock point of view. The author suggests 20 mA as a safe value for t. The value of k varies enormously, but a high value is justified, and the author suggests 5 000 Ω.

In the concluding portion of the paper several examples are given to show that mere testing between earth and the earthing system is inadequate, and that tests should also be taken between earth and points within touchable distance of the earthed member. The condition already outlined above should ensure elimination of shock-risk, but it should be understood that in practice its application is limited by considerations of fault-localisation and the importance of not insulating a fault beyond the point at which it should cause the opening of the circuit. In a.c. distribution reactance will, of course, also enter into the problem.

A matter of great importance in testing is the selection of a test-earth. Water pipes are often considered excellent test-points, but the reverse is frequently the case, and it is wise not to judge a water-service by its visible components.

* Abstract of a communication presented to the Institution of Electrical Engineers.

Electrical Films.

Dr. Ekstrom Emphasises the Need for Rural Electrical Developments.

DR. EKSTROM, who for the sake of brevity may be described as the Swedish Borlase Matthews, is at present in this country, and on Tuesday showed two interesting films dealing respectively with "A New Type of Storage Electric Cooker" and with "The Use of Electricity on the Farm." In a short introductory address Dr. Ekstrom pointed out that it was even more necessary to spread the use of electricity through the countryside than in the town, as the benefits derivable from its use were greater. The first film showed the storage cooker in action. It has already been described in THE ELECTRICIAN, but it may be recalled that its principal feature is a low loaded hot plate with a lagged cover which is constantly in circuit. The convenience of this modern apparatus compared with the dirt and labour connected with the wood fired stove was illustrated with just the right amount of pathos. Dr. Ekstrom is to read a paper before the Institution of Electrical Engineers during the coming winter.

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THE WORLD POWER CONFERENCE AT BASLE.

Exchange of Electrical Energy between Countries—An Informative Discussion—Politics and Economics—Moving a Village.

By R. BORLASE MATTHEWS Wh. Ex., A.M.I.C.E., M.I.E.E., F.R.Ae.S.

GENERALLY speaking, the subject of the interchange of electrical energy between countries is a matter of policy, and of the steps that should be taken to obtain favourable legislation. The latter apparently turns upon the hackneyed and opposed principles of Free Trade and Tariff Reform—in other words, politics and economics. At first sight, the matter does not seem to concern Great Britain. But one of her Dominions —Canada—exports the greatest quantity of electricity in the world. Further, it is not generally known that it has been proposed to export current from the north-east of France to the south-east of England. The president of the opening session of this section was M. Legouerz, who is well known to many Britishers as President of the High Tension Lines International Conference, which is held at Paris—the next meeting is in the summer of 1927. He is also president of the Syndicate des Electriciens Françaises.

New Class of Customs Official.

Reports were only presented from five countries—France, Germany, Switzerland, Denmark and the United States. Prof. J. Landry, the general reporter, expressed his regret that information was not forthcoming from Canada, Italy and Scandinavia, as these countries had had so much experience in the matter. Apparently the engineering obstacles are not nearly as difficult as obtaining the legislative sanction. Many complaints were made as to the complicated and slow procedure to which export contracts had to submit. One of the difficulties that was mentioned was the opposition of electric power supply undertakings, and other industrial concerns in the countries to be supplied. However, as a rule it was more to the interests of these concerns to obtain a cheap imported supply. The official title of this section more correctly describes the situation in Europe, for at times of excess water supply, Switzerland exports current, and in her dry seasons she imports it. Similarly Sweden exports hydro-electric power, and in times of water shortage she imports thermally generated current from Denmark. A further complication that arises is where the exported current traverses another country, such as the proposed export of current from Norway *via* Sweden to Denmark. From the information gleaned at the conference it would seem that it is the policy of every country to construct interconnected high-tension networks. Hence the same argument should apply, even over the artificial boundaries of countries. It would seem as if a new class of customs official will have to be created who can read meters and who is versed in the intricacies of cost; for the visible transport, as in the case of goods, is lacking. A harmless looking high tension line shows no sign of transport of anything in either direction, any more than does a fence. At least five meters are required for this work. However, this is by the way.

The most important exports of energy occur between Canada and the United States; between Switzerland and her neighbours; and between Sweden and Denmark.

During the last sixteen years (1911–1926) Canada has exported over fourteen million units. Switzerland now exports one-fifth of her production, nearly one-half of which goes to France. France imports 3 per cent. of her national production, and Italy 3·7 per cent.

An Interesting Project.

An interesting project for international co-operation was outlined—viz., the exchange of current between sections of France, Germany and Switzerland, by means of the exploitation of the valley of the Moselle in conjunction with that of the Reuss at Andermatt. The latter proposal has caused a considerable outcry on the part of those whose anxiety is to preserve beautiful scenery against the intrusions of the utilitarians.

The members of the conference had an opportunity of inspecting the scene of the last named proposal, for on the occasion of the inspection of the Swiss Federal Railways the latter undertaking entertained them to an open-air lunch at Andermatt. If the scheme is carried through it is proposed to reconstruct the centuries-old village of Andermatt, timber for timber, stone for stone, at a higher level.

In commenting upon the comparisons of rates, M. Genissien very emphatically pointed out that there can be no fixed price per unit, as this must vary with the season, day, hour, method of production, way of utilisation, excess or the reverse of the power resources, possibility of equalisation, security of supply, natural difficulties, legal obstacles, nearness of power stations to reservoirs, rivers or mines, the geographical position, the local demand, the importance of the supply, etc.

Since 1925, Canadian exported power has been taxed 0·03 cents per kWh. Otherwise there are no legal restrictions, except in Quebec, where the renewal of contracts is prohibited. Denmark exacts a tax of 7½ per cent. of the value of the energy, imported. France also taxes imported energy, while that exported is free of tax. In Germany, Italy and the United States there is no restrictive legislation for either imports or exports of energy. Several countries, including France and Switzerland, demand an official inquiry before permission is given for export.

The complaint was made that accurate statistical data was lacking, as this was so useful as a basis for negotiations in new schemes. It was therefore decided to recommend that such particulars should be systematically collated. Further, it was also decided that standardisation of voltages was of utmost importance to facilitate the task of politicians, and also, to further the interests of the electrical industry, it was resolved that a strong appeal should be made to all Governments to so arrange that the laws and regulations in their respective territories should be applied in a liberal manner with due cognisance of the legislation of other countries.

Thus a number of very interesting facts were elicited at a meeting of a section which, from its title or the number of reports presented, did not seem by any means to offer too attractive a programme.

REVIEW.

Turbo-Blowers and Compressors. By W. J. KEARTON, (London: Sir Isaac Pitman and Sons.) Pp. xv+333. 21s. net.

While we have had a good book on compressor theory and practice in 1923, we think we are correct in saying this is the first book on turbo-compressors as distinct from reciprocating compressors which has dealt with modern machines both in design and practice.

Mr. Kearton as a writer on mechanical subjects is of the newer school and is already well known for his book on steam turbines and his paper on mercury turbines. On the whole, we think this is his best work so far, and it can be well recommended to all engineers. With reference to details such as collection of symbols, addition of tables, worked examples, which do so much to help the engineer when he is dealing with actual cases, the author is very clear and helpful. There is a short introduction, and a chapter on air thermodynamics, and the author then plunges right into detailed designs of air compressors. There is a useful chapter on cooling systems in which the author brings out that of which some of us are already aware, the exceedingly erratic values of the heat transmission co-efficient for coolers arranged in various ways. The problem is a very outstanding one in refrigerating work.

Much attention is paid to the various types of surging gear as used by different manufacturers. (As we write the A.E.G. have just published an enthusiastic description of a further one.)

The question of disc strength calculations, critical speeds, etc., is all dealt with in detail as for steam turbine design. There is a short chapter on testing, which at the present is in a far from happy state, and may engage the attention of the Institution of Civil Engineers shortly. There is a useful chapter on results obtained, not many of which are available.

Finally, as a *bonne-bouche* there is an interesting account of blowers for supercharging internal combustion engines, a very live question at the present time. Two useful appendices give the usual constants, equations, and general data. A very good book.

W. M. SELVEY.

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A KIOSK TYPE OUTDOOR SUB-STATION.

Solving the Problem of Capital Costs—Interesting Installation at Stretford.

THE large capital cost involved in building and equipping a sub-station of the conventional type often renders unremunerative a load which should be a source of profit to the supply authority. One solution of this problem has been found in the outdoor kiosk described below. This has been designed and installed by Ferguson Pailin Ltd., in conjunction with the engineers of the Stretford U.D.C. Electricity Department, and is installed in an outlying part of the Stretford system.

The kiosk, a general view of which is shown in Fig. 1, consists of a rigid angle iron framework embedded in a concrete foundation raft and covered in with heavy gauge boiler plate sheets. The concrete floor inside the kiosk is flush with the top of the base, irons thus facilitating removal of the transformers, oil tanks, etc., and rendering ingress of water impossible. Four separate compartments are provided in the kiosk for accommodating two 250 kVA transformers and the e.h.t. and l.t. switchgear. Double doors at each end of the kiosk give access to the transformers. The doors for the switch compartments are hinged horizontally and are divided into two sections. The upper half lifts up and forms a sloping roof to protect the operator from rain, etc. Hooks are provided on the underside to enable fitted waterproof sheets to be rigged up rapidly as an additional shelter. The lower halves of the doors are specially strengthened and drop down to form a working platform. In the l.t. switch compartment these doors are covered with rubber matting. All exposed metalwork is treated with a bitumastic composition to prevent corrosion and lantern louvres afford adequate ventilation to the interior.

E.h.t. switchgear of the metal-clad oil-filled type is employed and is shown in Fig. 2. The transformers are controlled by two type DV single busbar units, a description of which has previously appeared in this paper. These units are direct hand operated and are each fitted with metering equipment. Double pole overload and leakage protection is provided, with time limit features on the overload. The gear is mounted against one of the interior division walls and the outgoing connections consist of bare conductors passing through bakelite bushes into the transformer chamber.

This sub-station is on a 6·6 kV ring main and, as it was not desired to employ oil circuit breakers on the ring main feeders,

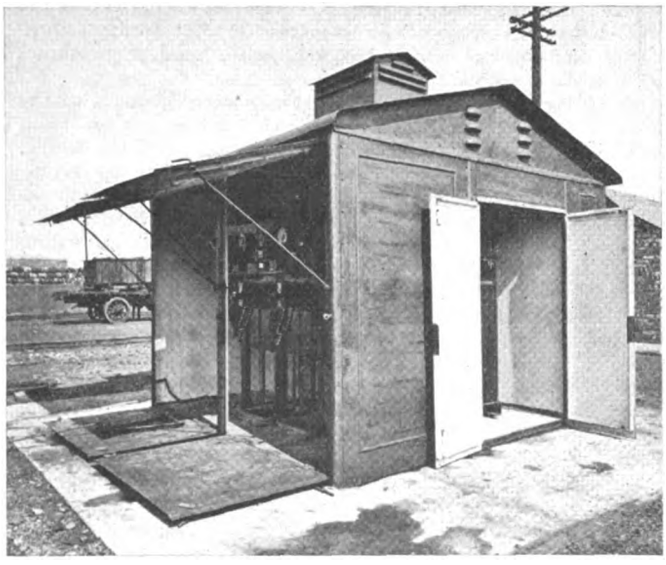

Fig. 1.—General view of kiosk used as sub-station at Stretford.

special arrangements have been made for their control. At each end of the switchboard an isolating switch chamber is provided and accommodates a triple pole oil immersed quick break isolating switch. This is mechanically operated from the front of the unit by means of a detachable handle and disconnects the ring main feeder from the busbars. A further movement of the handle earths the feeder, the earthing contacts being so arranged that the centre phase is earthed in advance of the other two phases. The operating gear may be locked in the "on," "off" or "earthed" positions. Test terminals are provided on the isolator box to enable tests to be carried out on the cables.

The low tension switchgear is of the flat back type. The supply from the two transformers is brought to the busbars through two triple pole knife switches mounted on a slate

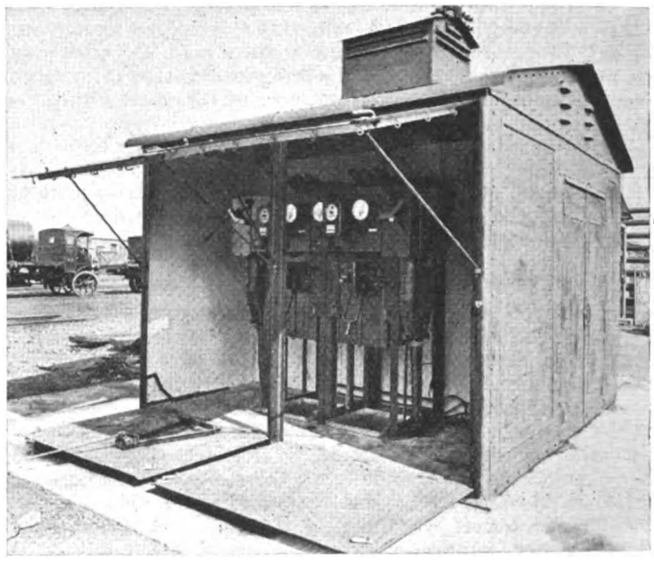

Fig. 2.—E.H.T. switching compartment fitted with type D.V. ring mains metal clad switchgear.

panel and then distributed through pillar type fuse units, nine of which can be accommodated. A neutral ammeter is mounted on each unit. The standard Stretford earth testing arrangements are provided and consist of a 4-Ω earthing resistance with short-circuiting circuit breaker, ammeter, and four-way change-over switch, together with indicting lamps and fuses.

Fetranti transformers are employed, those installed at present being of the three phase type with a capacity of 150 kVA each. Provided with low tension tappings, they are of the oil-immersed self-cooled type mounted in corrugated tanks.

Electric Lamps.

American Objections to Unnecessary Types and Expense.

ATTENTION is drawn in "The Electrical World" to the prevalent use of electric lamps with bulbs of special design, which are expensive and often unnecessary. In domestic lighting, for example, there are few occasions when the standard form of bulb will not do all that is required. It costs less than the exceptional types, is usually more efficient, and is more durable. Although "spherical bulb" fixtures often form one of the chief elements in exhibitions and displays, probably only 9 per cent. of the lamps used for domestic lighting have such bulbs. If all lamps in the home were properly equipped with shades or enclosing media standard lamps could be used in practically all sockets.

In large interiors—ballrooms, hotel lobbies, etc.—unshaded lamps in the smaller sizes may be permissible if the bulbs are obscured. In such cases spherical or tubular lamps may be justified for the sake of appearance. Nevertheless, their use is often overdone, and in many cases standard types of lamps might equally well be used. In the same way tubular lamps are often used on chandeliers, when much better results would accrue from the use of standard types. From the standpoint of the lamp company the multiplication of types is a drawback, as it is well known that concentration on a few types is favourable to cheapness, efficiency, and durability. As a general principle it may be urged that the time for exposed lamps of any kind, even if bulbs are obscured, has gone by. Much more satisfactory lighting conditions are obtained when lamps are concealed by suitable shades, or glassware, of which there is now a great variety available.

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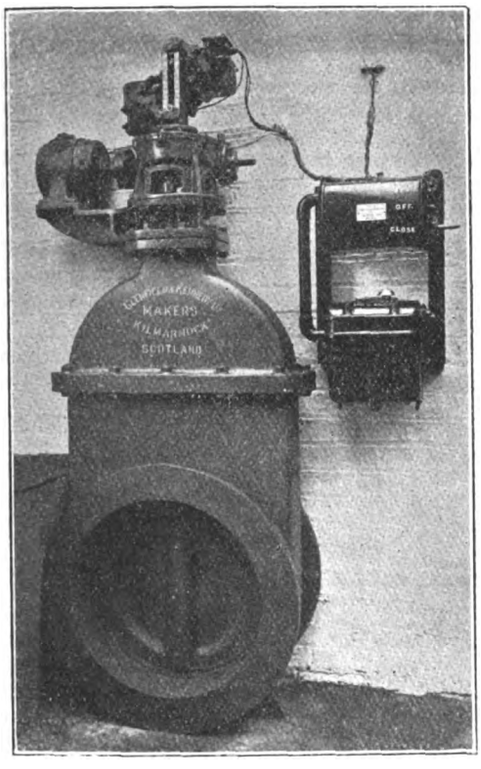
SLUICE VALVES.

Electrical Operation in Modern Power Stations.

A VERY important adjunct to the modern power station is the electrically operated sluice valve, with self contained electric motor, for cooling water, low pressure and exhaust steam, and other uses. This type of valve is a striking indication of the value of electrical methods, since all the valves can be operated from one switchboard.

In this field of special interest is the " Glenfield " standard electrically operated sluice valve, made in standard sizes up to 72 in. diameter, a type on which Glenfield and Kennedy have specially concentrated both as regards the valve itself and the electrical equipment. Exhaustive tests, research work and experience have evolved the present standard design. The valve body is either of homogeneous Scotch grey cast iron with low phosphorus content or of cast steel according to the pressure. The doors are wedge shaped, and four gun-



View of modern type electrically operated sluice valve.

metal contact faces are fitted, two being on the body, with the solid gunmetal forced into machined recesses by hydraulic pressure, allowing a very hard and resistant quality to be used. The gunmetal faces on the doors are pinned in, and the contact surfaces are hand scraped until satisfactory under hydraulic test at twice the working pressure. The operating screw is also of solid high tensile forged bronze, shaped up from the ingot under uniform heat, while the worm gearing has ball thrust washers at each end, being coupled to the motor through a solid cast iron coupling, no clutch being required. An efficient trip gear mechanism is included, as well as emergency hand operating gear if desired. The electrical equipment consists of an a.c. or d.c. motor, two limit switches for each end of the valve travel, a circuit breaker and a controller, all totally enclosed, while the motor, mounted on the valve cover, is equipped with grease filled ball bearings and requires no attention for long periods. An important point also is that the limit switches are operated and re-set within a fraction of an inch travel of the valve door, which gives complete control of the valve over the full period of travel. The circuit breaker is of the loose handle, oil immersed type with time limit overload release and automatic trip coil, while the controller is of the air break type with " open " and " close " positions on either side of the " off " point. The control switch is, of course, operated by hand on starting, but when the valve reaches either end of its travel the circuit breaker opens, and naturally the valve can be stopped instantly in any desired position. It is impossible for the valve to become jammed in its seating.

CORRESPONDENCE.

RADIO TRADE ORGANISATION.

[To the Editor.]

Sir,—The Wireless Retailers' Association wish to be among the first to congratulate the manufacturers on the successful issue of their protracted efforts to form a comprehensive union, resulting in the Radio Manufacturers' Association. As is well known, retailers in general have always favoured the policy of " one association for each section of the trade," and they will feel that an important step on the road to efficient organisation has at last been taken.

It now remains for dealers to realise the necessity of following this excellent lead and of similarly consolidating themselves in one representative organisation. Such an association can then voice their collective views, and so facilitate negotiation and co-operation with the Radio Manufacturers' Association in solving many difficult problems which could not otherwise be dealt with.

The W.R.A., which was formed between three and four years ago for the purpose of representing the interests of dealers, welcomes to its ranks all bona-fide retailers who can satisfy the Council that the conditions of membership are fulfilled. Its aims and objects are too well known to call for any recapitulation here, but, should there be any traders who are not familiar with them, full particulars will be sent on application.

The point which should be clearly and widely appreciated by retailers is that the new association, which represents the great bulk of the manufacturers in the trade, has no section for retailers, but looks to retailers to organise themselves. All responsible and bona-fide dealers who desire to see such problems as price cutting and, what is known as " dabbling," etc., dealt with in the one way which offers any certainty of effective results, will therefore recognise the advantages to be reaped from membership of the W.R.A., which remains, as it has always been, the only association *solely* representing the interests of retailers, and which has the goodwill of all the influential manufacturing firms with which it has come into contact.—We are, etc.,

Clifford and Clifford,
Hon. Secretaries.
The Wireless Retailers' Association of Great Britain.

70, Finsbury Pavement,
London, E.C.2.
September 16th.

J.E.A. Finance.

Borrowing Regulations—Raising and Repaying Loans.

THE establishment of the first " real " Joint Electricity Authority in the North-West Midlands has been followed by the publication of the Joint Electricity Authorities (Borrowing Power) Regulations, 1926, dated August 30th, 1926. These regulations are made by the Minister of Transport with the approval of the Treasury under the authority of Section 1 of the Electricity (Supply) Act 1922. This section enables a Joint Electricity Authority to borrow money either for a period not exceeding sixty years or temporarily, and makes provision for its repayment in various ways.

According to the regulations money may be borrowed by mortgages charged on the undertaking and all the revenues of the Joint Authority or any specific property forming part of that undertaking. It may also be raised by issuing stock or bonds, and certain powers of reborrowing are given. Money may be borrowed for a period not exceeding six months by way of temporary loan or bank overdraft, but must be repaid out of money borrowed as above. Money borrowed is only to be used for the purposes for which statutory borrowing power is being exercised, and any part not required is to be carried to the sinking fund. Repayment is to be made within a period not exceeding sixty years prescribed by the Commissioners, with the proviso that the repayment of not immediately remunerative capital expenditure may be postponed for a period not exceeding five years. Repayments are either to be made by equal yearly or half-yearly instalments of capital and interest, or a sinking fund may be created by setting aside equal annual sums sufficient without accumulations to repay the money within the prescribed period, or an equal annual sum which if accumulated at compound interest would be sufficient to pay off the sum within the prescribed period. The sinking fund may also be used instead of borrowing to meet further capital expenditure.

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NEWS IN BRIEF.

Contractors Favour Scarborough for Next Annual Conference—Increased U.S. Electrical Exports—Bringing the Dead Sea to Life.

THE second section of Dalmarnock power station will be formally opened on September 30th.

For the current year's construction of electric refrigerators in the U.S.A., some 15 000 tons of copper are being used.

The Helsby cable works of British Insulated Cables, Ltd., were inspected last week by the Chester Society of Natural Science, Art and Literature.

Members of the Electrical Association for Women will visit the all-electric farm of Mr. R. Borlase Matthews at East Grinstead, on October 2nd.

A motor van belonging to Frank Thornton and Co., electrical contractors of Burnley, collided with an Accrington tram standard and broke it in several places.

The Shropshire Worcestershire and Staffordshire Electric Power Co.'s new station at Stourport was visited last Saturday by the South Midland Students' Section of the I.E.E.

Already electrical contractors are eagerly discussing the next E.C.A. annual conference, and northern members are expressing the hope that Scarborough will be fixed as the venue.

The Rheostatic Co., of Slough, are this season running a football team in Division II of the Windsor, Slough and District Junior League. St. Helen's Cable and Rubber Co. are also playing in Division I of the same league.

Municipal electricity showrooms have been opened at Bury. Mr. A. H. Bennett is showroom superintendent.

Four thousand employees of the Hoffman Manufacturing Co. at Chelmsford, with their friends, visited London as the guests of the company.

At a special dedication of an electric lighting installation at Dalton Church, the lights were switched on by Mr. J. McAdam, the installation contractor.

IS YOUR TRIM TRIMMED?

IN other words, have you read and acted on the clear instructions given in the first issue of "Home Lighting News" for making a window trim that will "pull" inquiries for the E.D.A.–E.L.M.A. Competition booklet? If not, there is just time to do it in readiness for the opening of the Campaign. Do it NOW *!*

In a Faraday Society discussion on "Physical Phenomena at Interfaces," to be held at Burlington House on October 1st, Prof. H. Freundlich and Mr. R. K. Schofield will speak on "Electrification at Interfaces."

Electrical goods imported into the Irish Free State during July were valued at £36 933, compared with £23 358 in July, 1925. Total electrical imports for the first seven months were £258 407, an increase of £75 905 on the corresponding period last year.

Chasing the electric hare (illustrated in THE ELECTRICIAN last week) is proving increasingly attractive at Manchester. At last Saturday's "meeting" there were 17 000 spectators. Next year similar racecourses will be opened in London, Cardiff and other big centres.

Mr. R. Beveridge, Edinburgh's public lighting superintendent, advocates standardised times, controlled by the Government, for lighting and extinguishing street lamps, and has asked the Institution of Public Lighting Engineers to prepare schedules for the whole country for the consideration of local authorities.

It is reported that M. Edouard Imbreaux is the chief author of a plan to construct a canal from Haifa to Lake Tiberias and the Dead Sea, and to erect and equip a power station with a net output of 240 000 kW. The cost is estimated at £15 000 000, and the energy which is expected to be produced would be sufficient for the needs of Palestine, Syria, Asiatic Turkey and Egypt.

The annual report of the Commissioner of the Toronto Hydro-Electric System, states that operations for 1925 resulted in a gross income of $8 827 373, against $8 476 672 in 1924. After meeting cost of electric current and expenses, interest, depreciation, taxes, sinking funds and debenture retirals, the net income carried to reserve for stabilisation of rates was $81 382, compared with $51 923. Reserve amounts to $13 439 704, while total assets are $34 071 883.

Ilford U.D.C. invites tenders for the erection of a sub-station and transformer enclosure.

Worcester Corporation has invited tenders for the erection of an electricity sub-station.

The St. James' Street, Accrington, premises of Haworth and Williams, wireless factors, were slightly damaged by a fire originating in an adjoining building.

Hull Electricity Committee invites tenders for alterations to boiler house, supply of l.t. cable conduit, and erection of new mess room, etc., at the electricity works.

The International Exhibition of Inventions will be held next month at the Central Hall, Westminster. Particulars can be obtained from the Institute of Patentees.

J. Stone and Co., Ltd., who hold the Baghdad electric concession, have agreed to amend the agreement as required by the Colonial Office and the Crown Agents for the Colonies.

Electrical machinery and apparatus exported from the United States in the twelve months ended June, 1926, was valued at $80 676 000, compared with $66 871 000 in the previous year.

A Leipzig message in the New York "World" says the town is sending its burgomaster to New York to sign his name 7 000 times in connection with the £1 000 000 loan to the Leipzig municipal electricity works.

Special electrical illuminations were a feature of the Gravesend shopping week.

Referring to the £125 000 cable order recently placed in Great Britain by the Auckland Power Board, the "Industrial Australian" says the people of Australia "are practically of one mind in believing it to be the duty of the nation, when purchasing overseas, to see to it that none but British firms will get the orders."

Festooned with some 3 000 lamps, Bury's illuminated tramcar visited Rochdale last week.

In the centre of Sheffield the 500 W lamps used for street lighting are to be replaced by 1 000 W lamps. Better fittings and light distribution are other improvements.

The new automatic telephone equipment which has been installed at Hartlepool and West Hartlepool will come into operation to-morrow (Saturday). The new exchanges are of the Strowger type. Accommodation is provided for 1 700 subscribers at West Hartlepool and 200 at Hartlepool.

In addition to the two existing trans-continental telephone lines the Bell System is now constructing a third route to be known as the "Northern Overland Route" running from Chicago through Minneapolis and Helena, Montana, to Spokane and Seattle, Washington.

The eighth exhibition of model engineering was opened last Friday at the Royal Horticultural Hall, Westminster, and will remain open until to-morrow (Saturday). Model electric locomotives may be seen running on a track 66 feet long. There is also a varied show of electrical and wireless apparatus.

Manchester is organising a Civic Week, during which, if exemption from the ban upon display lighting can be obtained, the city will be brilliantly lighted during the evenings. A transport parade is to take place on the opening day, October 2nd. The Barton power station and numerous engineering and other works will be open to the public.

At an ordinary general meeting of the Electrical Trades Commercial Travellers' Association last Friday, Mr. E. A. Joyce (chairman) presiding, a resolution moved by Mr. A. S. Markes (vice-chairman) that the Association support the proposed British Commercial Travellers' Club and take up £10 of the Club's loan stock was carried unanimously. The Association also approved the action of the Executive Committee in asking Sir Hugo Hirst to become president of the Association for the ensuing year. It was reported that Sir Hugo had consented to do so.

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"ELECTRICAL CONTRACTIONS"—III.

More Practical Hints for Contractors—Concealed Wiring in Domestic Installations—Avoiding Damage and Disturbance.

By "FEEDER BOX."

ALTHOUGH contractors rightly take a lot of trouble over the technical side of a house wiring installation, the fact is frequently overlooked that the householder is not directly concerned with the technical features of his installation, but is often anxious about the finished appearance of that installation. Many customers are apprehensive of the amount of damage which may be done, and the extent of the subsequent decorators' bill for repairs, not to mention a possible general upheaval of the household, and the contractor should endeavour to modify these impressions by removing the causes.

Factories, new buildings, office blocks, and the like, are generally of a construction which renders possible the pre-planning and comparatively easy progress of the job, but in a private residence this is rarely possible, and the question of appearance and finish, therefore, becomes of vital importance.

Some people do not favour the use of any surface runs, and the removal of floor coverings, floor-boards and general fittings, not to mention the shifting and re-shifting of furniture, causes annoyance to some householders. While much of the disturbance and inconvenience is unavoidable, a great deal of it can be prevented by a little care on the part of the contractor and his staff.

The wiring of a private residence in the course of construction requires little or no special consideration unless it is being carried out in some system which is not provided with the maximum mechanical protection, in the absence of which the position of wiring runs under plaster will have to be considered from the point of view of safety.

In an old house, where all decorative features are already in existence, the arrangement of any wiring system must be considered from the point of view of adaptability, but, most important of all, from the customer's point of view, is the installation's appearance in its finished state, and the amount of disturbance involved.

Pliable System Needed.

Houses constructed, as many are, with main walls of brick and partition walls of lath and plaster, call for the use of a pliable wiring system which will enable the bulk of the cables to be inserted within the hollow spaces in the partition walls, thus rendering the wiring invisible and sufficiently protected. In a lath and plaster partitioned house it will be found that only the main walls and the ground floor or basement walls are of solid brick construction. Since the lowest floor is as a rule occupied by the kitchen and other offices, the fact that the wiring cannot be concealed is not of great importance.

On the upper floors, however, the wiring can be almost entirely concealed by the use of the hollow spaces in the lath and plaster partitions. A knowledge of the general constructional features of a house—more especially lath and plaster partitions—is invaluable to the wireman, who can then proceed with concealed wiring after quite a brief examination of the house. A few light taps on the walls, preferably with a pencil, or the handle of a small screwdriver, will reveal the extent of the available hollow spaces and the relative positions of the sundry wooden supports and cross ties.

The latter are of great importance, for if the exact position of a cross tie is not ascertained before entries are made and cables inserted the run will become obstructed, necessitating a fresh start, removal of further floorboards, floor coverings and furniture.

Should a cross tie, for instance, interrupt the clear drop in a hollow wall to a switch drop, and no other method of reaching the switch position presents itself, the following operation will obviate the difficulty. By means of a sharp knife a section of wallpaper and plaster should be cut clean out of the wall at a position hiding the obstructing cross tie. The cut-out section should overlap the width of the tie, and the hole thus made will reveal the tie and a small section of lath.

A suitable incision can then be made above and below the tie to allow for the passage of the necessary cables. The section of cables resting on the tie should be protected by means of a piece of sheet metal and the hole made good with plaster, and the wallpaper subsequently replaced. In the hands of a careful worker the operation can be completed in less time than would be necessary to lay, fix and draw in cables for conduit or for lead surface wiring. It is frequently more difficult to make satisfactory or neat fixings with saddles and pins or screws than manufacturers' catalogues indicate. The fault is, of course, with the plaster, which is frequently very dry and brittle, so that a firm fixing causes the saddles to be drawn into the wall, and a neat fixing is rarely strong enough.

Extra Trouble Justified.

The number of houses in which an opportunity for concealed wiring presents itself is considerable, yet this method has not been widely adopted so far in the majority of wired houses. Some readers may express doubts as to whether the small amount of trouble and extra time involved in concealing wiring is worth the result. It is decidedly worth it, when one considers how often a woman conjures up visions of household upheaval immediately an installation is suggested, and subsequently has them confirmed. A satisfied housewife is an excellent advertisement, and the wise contractor will agree that recommendations arising from the satisfaction of several customers are more valuable than the notoriety which results from jobs carried out at cut prices which eventually leave a trail of complaints of poor workmanship.

C.T.S. and lead wiring systems are the only really reliable systems which can be satisfactorily employed in the production of a concealed wiring installation, and many contractors prefer C.T.S. on account of the ease with which it can be pulled through small apertures or squeezed into small spaces.

Concealed wiring with a pliable wiring system also saves a good deal of general disturbance to the household, only the minimum amount of furniture moving and floor-covering removal being necessary.

It is frequently found that in one or more rooms of a house the floor-covering or the furniture is of such a nature or weight that removal becomes almost out of the question, and may subsequently put the householder to considerable inconvenience and expense. With the aid, however, of a suitably stout long wire, the removal of the most convenient floor-board at the edge of the room, and the use of C.T.S. or a lead wiring system, it is possible to lay a wiring run to a centre ceiling point in the room below without further disturbance.

Such an operation requires great care and judgment, but will earn the praise of the customer, whilst actually taking a very much shorter time to carry out than if furniture, floor-coverings and floor-boards were removed and conduit inserted. Beadings, door frame mouldings and skirting boards can usually be removed temporarily for the concealment of wiring. Their displacement only causes very slight damage, which with the aid of a small amount of paint, putty and plaster can be satisfactorily made good at trifling expense.

Work in Prospect.

Trade Possibilities for Electrical Installation Contractors.

BERKHAMPSTEAD.—Extensions to works, for Cooper, McDougall and Robertson, Ltd.

BETCHWORTH (SURREY).—Twelve houses, Hadbrook Lane, for Mr. C. Perry.

CORFE MULLEN, NEAR WIMBORNE.—Wesleyan church (£1 100). Particulars, the contractor, Mr. Griffin, Broadstone.

COVENTRY.—School, Earlsdon. Particulars, the architect, Mr. A. W. Hoare.

GODSTONE (SURREY).—Housing scheme, Wolvingham. Particulars, the Surveyor.

GRAYS (ESSEX).—Additional housing scheme (100). Particulars, the Surveyor.

ROMSEY (HANTS).—Eleven bungalows, Crampmoor, for Mr. F. G. Newell.

RUSHDEN.—Additional housing scheme. Particulars, the Surveyor.

SPALDING.—Houses, Scoldall Lane, Surfleet. Particulars, Mr. W. St. Leger Crowley, 32, Hall Place, Spalding.

WORKSOP.—Houses (24), Aston Avenue. Particulars, the contractors, Metcalf and Co., Doncaster.

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THE NATIONAL RADIO EXHIBITION.

Third Review of the Outstanding Exhibits at the Olympia Exhibition—Decorative Sets in Lacquer and Crystal Glass.

IN two previous issues we have referred to many of the interesting radio products shown at the National Radio Exhibition at Olympia, London, and although this show closed last Saturday, the following details of exhibits not previously dealt with will be of interest, as indicating lines that will be in demand during the coming season. The three issues containing reports of the Show together constitute a handy guide for retailers of the new productions for the 1926–27 season.

A novelty which attracted considerable attention was a two-valve receiving set (Cleartron Radio, Ltd.) incorporating Sir Oliver Lodge's "N" circuit, one of the fundamental principles of which is the employment of a single connection between the aerial system and the detector valve. The "N" circuit proper is included between the aerial and the detector grid. This circuit consists of a variable condenser in shunt with an inductance, and is a resonant circuit; the aerial itself, however, is a non-resonant circuit, and is heavily damped. The coil is of a fairly high inductive value and the capacity of the condenser is small. Owing to the much greater wavelength of the aerial system, and to its damping, it is impossible for radiation from the aerial to occur. Apart from the advantages of the circuit the set is noteworthy for its simplicity of control.

"Lewcos" screened coils, a new development of the London Electric Wire Co. and Smiths, Ltd., are claimed to have the advantages of the screened type, and none of their disadvantages. They are said to have an R/L value lower than any other similar coils. The coils are wound with the company's "Litz" wire. Multiway battery cords are another new "Lewcos" line.

Centre tapped coils for neutralised circuits, introduced by Falk, Stadelmann and Co., Ltd., are totally enclosed in a metal screen to obviate interaction. They have also two new models of the "Efesca" anti-capacity switch, both being made for one-hole fixing. An interesting new departure is the "Variform" l.f. transformer with interchangeable primary windings. This component permits of the impedance of the primary being accurately matched with the impedance of the anode circuits in which it is employed by plugging in the correct primary winding. Furthermore, by rotating the constant secondary winding it is possible to vary the magnetic coupling.

New cabinet receivers with the new "disappearing" door were presented by W. G. Pye and Co., who also have a new super-selective five-valve model designed for easy manipulation and an efficient portable set. Among the components shown was a new type of geared condenser (ratio 200/1), and a new antiphonic valve holder.

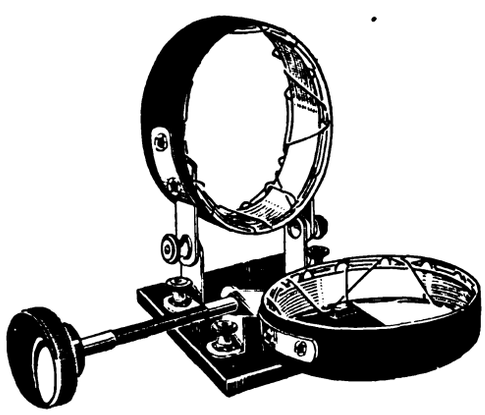
The "Eelex" semi-automatic lightning arrestor and combined lead-in tube is a new line by J. J. Eastick and Sons. The instrument is worked from inside the house, and all apparatus is entirely isolated from the aerial and earth system. The "Eelex" eight-way multiple connector is another new product.

A dual indicator dial, shown for the first time by the Ormond Engineering Co., Ltd., has a 4-in. aluminium dial marked on the upper half with an outer scale in 180 single deg., and an inner scale in 100 deg. The lower half is marked out in divisions for logging purposes. It is secured to the condenser and panel by a one-hole fixing nut, and a hair-line indicator is used for dial readings. When mounted the dial is insulated from the condenser shaft, so that it may be used as an earthing shield if required.

Specially designed for inside cabinet mounting, the "Varofix" filament resistance seen on the stand of S. A. Lamplugh, Ltd., has interesting features. The resistance elements are wound in the form of a cartridge, which is pressed into a spring holder which permits of different valves being used; furthermore, it is claimed, each resistance element can be varied to suit the particular valve it is working with. The use of this resistance obviates a control on the panel. A new slow-motion, straight line condenser and a new wire-wound potentiometer embodying the Lamplugh buffer method of contact were also on view.

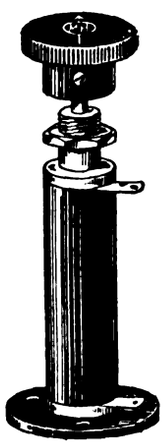
ABOVE we conclude our review of new radio goods shown at the National Radio Exhibition at Olympia. The accompanying illustrations are of apparatus seen at the Show. Fuller details of most of these components were given in the two preceding issues.

RADIO COMPONENTS

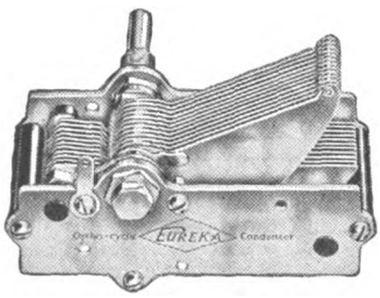


Coil holder (Reflex Radio Co.)

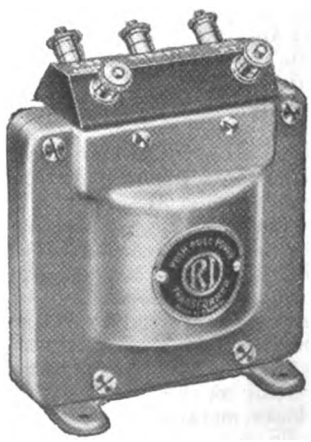
Straight line frequency condenser (The Formo Co.).



Balancing condenser (L. McMichael, Ltd.)



Ortho-cyclic condenser (Portable Utilities Co., Ltd.).



Transformer (Radio Instruments, Ltd.).

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Jacks and switches in bakelite, and designed to take up the minimum of space behind the panel, are among new lines of Garnett, Whiteley and Co., Ltd. The soldering tags of these components can be brought into almost any position behind the panel.

In a new pattern for attachment to the surface of the panel, the "Utility" automatic crystal detector evolved by Wilkins and Wright, Ltd., is an interesting component. It is so constructed that by slowly turning a knob the cat's-whisker is in turn advanced and withdrawn, while the crystal moves round in such a way that the whole of its workable surface is explored.

Novelties shown by Burndept Wireless, Ltd., included the "Ethopower" h.t battery eliminator which is said to be absolutely silent in action, an h.t. battery charger, and "Ethotron," a filament-less valve which operates in a similar manner to the American Ratheon tube.

The principles of the "Nife" nickel-iron alkaline cell are already well known, and it is of interest to note that the makers (Batteries, Ltd.) have introduced a high-tension battery on similar lines.

Service Radio Co., Ltd., was showing a new model straight line frequency condenser, with specially shaped vanes for easy separation of stations of similar wavelengths.

Sets with from two to five valves, constructed in crystal glass throughout, instead of the orthodox wooden cabinet, were a feature of the display of "Langham" Radio.

Claimed to be the only portable combination measuring instrument giving direct and accurate readings in amperes, volts and ohms without calculation of any sort, the "Avometer" shown by the Automatic Coil Winder and Electrical Equipment Co., Ltd., attracted considerable interest. Various improvements were noted in the "Macadie" automatic coil winder also shown by this firm.

An improvement in the Penton Engineering Co.'s "A" type geared coil holder is represented by the incorporation of helical gears, the use of which results in two teeth always being in mesh, thus giving smoother action with less wear on the gears.

Complete "Igranic" six-valve supersonic heterodyne receivers, installed in Queen Anne and Jacobean table cabinets of handsome appearance, were a feature of the Igranic Electric Co.'s exhibit. A new pattern was shown of the firm's "Unitune" aperiodic fixed coupler, suitable for wavelengths from 250 to 500 metres. This provides a simple means of increasing selectivity without making structural alterations to the set. Other new lines include the "Igranic" battery eliminators and three new sizes of "Xllos" inductance coils.

A patented spiral plate condenser shown by the M.A.P. Co. is of novel design. It comprises two flat helical plates rotating one within the other, and which, on a 0·0005 condenser give one continuous reading of 3·600 deg., so that 20 deg. on the dial of this condenser is equivalent to 1 deg. on the usual type of condenser. Other new lines include a cheap loud speaker, and the incorporation of polished white panels on all receiving sets.

Nickel Shrouds.

Special sets and installations for hospital use were shown by the Oxford Wireless Telephony Co., Ltd., who also presented a novel and elegantly finished intervalve transformer fitted with a nickel silver shroud.

Among new components exhibited by Metro-Vick Supplies, Ltd., was the "Cosmos" resistance capacity coupling unit which, in conjunction with the company's new "Blue Spot" valve, can be used when constructing a new set, or to replace a l.f. transformer and a general purpose valve in an existing set. Although primarily designed for use with the valve named, the unit may be used with any valve having an amplification of 30 or more. Improvements were noted in most of the company's existing receiving sets and another new dull-emitter power valve—the "Red Spot"—was also represented.

Some fine examples of sets in lacquered finishes were shown by the Edison Swan Electric Co., Ltd., who made a special feature of their "Hymeg" h.t. accumulator. The cells are fitted in glass boxes of special design, and are supplied in black enamelled teak crates with carrying handles, syphon type filler and two wander plugs.

Ferranti, Ltd., made a good display of their transformers, including the AF3 type and the cheaper-priced AF4, and their constructional details were clearly shown in a most interesting way. Reasons for the good performance of these transformers include the great sub-division of the windings and special design to reduce the self-capacity current and eddy current loss. There is an ample core section with practically no air-gap.

At the Mullard Wireless Service Co.'s stand the foremost exhibit was undoubtedly the P.M. series of valves. At the front was seen a working model of two children pulling on the P.M. filament as in tug-o'-war, and on the left the P.M. filament was shown actually supporting four P.M. valves. The giant model of P.M. construction was in the centre of the stand, giving everybody an opportunity to study the robust design of these valves.

MUNICIPAL FINANCE.

Leading Points from Accounts of Municipal Electricity Departments for the Year ended March 31st, 1926.

Supply Authority.	Total Revenue £	Gross Profit £	Net Profit (+) or deficit (—) £	(a) Working Expenses per kWh sold.	Total cost per kWh (inc. capital charges).	Electricity sold (kWh)	Increase (+) or Decrease (—) in kWh sold.	Maximum Load kW.	Load Factor.	Radiators & Cookers Connected (total) in kW except where otherwise stated.	Other Domestic Appliances connected (total) kW.	Contributed in Aid of Rates. £
Barrow-in-Furness T.C.	92 864	35 042	+6 945	0·960d.	1·428d.	14 454 079	+3 074 986	5 200	38·97	2 527	1 965	Nil
Belfast C.C.	355 753	211 286	+62 402	0·769d.	—	45 086 707	+4 879 237	—	—	—	—	—
Birmingham C.C. ..	1 323 831	596 294	+184 011	0·777d.	1·217d.	224 725 602	+31 354 854	113 650	22·60	7 053	796	31 000
Bolton T.C.	316 364	145 225	+23 916	0·579d.	1·100d.	50 066 009	+2 145 976	3 612	—	—	—	4 500
Carlisle C.C.	77 561	39 753	+8 110	0·935d.	1·650d.	10 073 720	+802 081	5 256	26·30	2 359	—	Nil
Chester C.C.	66 909	32 210	+12 612	1·265d.	2·085d.	5 720 300	+1 210 407	3 612	26·24	1 795	342	Nil
Colchester T.C.	35 908	10 168	+1 515	1·727 l.	—	2 528 800	+270 547	1 646	18·80	—	100	—
Colne T.C.	33 675	13 962	+3 173	1·400d.	2·280d.	3 171 103	+307 811	1 858	23·40	(2) 1 732	See footnote (2)	Nil
Coventry C.C.	252 537	101 953	+38 768	0·570 l.	0·820d.	62 654 719	+7 517 108	26 700	29·7	(2) 6 053	See footnote (2)	10 000
Dover T.C.	55 817	29 853	+9 253	2·030d.	3·640d.	3 070 884	—162 893	1 757	25·40	285	—	—
Eastbourne T.C. ..	84 153	30 287	+5 013	1·470d.	2·240d.	6 842 414	+1 227 812	4 385	21·35	—	—	4 300
Hampstead (London) B.C.	148 667	36 987	+17 388	1·880d.	2·220d.	13 787 382	+1 968 680	7 690	19·77	(2) 11 645	See footnote (2)	Nil
Ipswich T.C.	105 804	48 288	+15 822	1·547d.	2·278d.	9 478 876	+1 643 567	6 580	22·50	—	—	3 000
Kingston-on-Thames T.C.	59 147	29 078	+6 672	2·016d.	3·771d.	3 341 744	+526 163	2 400	23·82	(No.) 89 (increase 57	—	3 000
Lancaster T.C.	28 647	7 249	+1 374	1·960d.	2·190d.	3 162 178	+1 040 178	1 968	25·00	(1) 421	—	1 000
Leeds C.C.	563 902	341 292	+74 018	1·160d.	1·230d.	100 779 954	+6 578 882	48 400	26·98	(2)18 825	See footnote (2)	40 000
Leigh T.C.	43 248	16 123	+4 475	0·881d.	1·277d.	7 061 505	+2 309 156	3 880	24·95	—	—	—
Manchester C.C.	1 426 238	636 924	+32 856	0·630d.	1·113d.	300 440 765	+43 087 845	136 110	25·20	(3)12 702	(4)31 248	Nil
Poplar (London) B.C. ..	200 359	83 685	+14 269	0·839d.	—	33 356 622	+819 426	15 800	25·71	—	—	—
Portsmouth T.C. ..	174 692	67 426	+19 783	1·500d.	2·640d.	13 770 961	—	8 600	22·90	(3) 1 560	—	5 000
Southport T.C.	91 517	44 948	+17 104	1·380d.	2·320d.	7 079 539	+1 060 998	4 140	19·57	—	—	2 820
Walsall T.C.	104 122	44 691	+13 065	0·890d.	1·360d.	16 015 163	+2 061 216	6 500	34·20	(No.) 250	(No.) 216	9 000
Wimbledon T.C.	130 987	71 763	+33 505	1·046d.	1·722d.	13 586 008	+2 575 946	6 300	24·60	(No.) 1 506	(No.) 3 289	—
York C.C.	105 878	47 106	+18 366	0·860d.	1·200d.	17 454 837	+2 507 373	7 550	26·36	1 500	—	2 268

(a) Including management, repairs and maintenance, and, usually, rates and taxes, and special charges.
(1) In Lancaster. (2) Including other domestic appliances. (3) Cookers only. (4) Including radiators.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

MR. A. J. Stubbs, formerly assistant engineer-in-chief of the Post Office, has been appointed a Justice of the Peace for Croydon.

Mr. W. Day, electrical engineer, of Ascot, Berks, was involved in a motor collision at Ascot last week, but fortunately Mr. Day escaped without receiving any personal injury.

An "Electrician" portrait of Mr. R. B. Mitchell in a novel setting.

Evidence of the wide interest shown by the Japanese in British electrical affairs is furnished by the accompanying reproduction from the "Denkino-tomo," Tokyo's electrical newspaper. Readers will recall that this portrait of Mr. R. B. Mitchell is taken from the drawing specially done for THE ELECTRICIAN, and published in our issue of June 18th last.

The late Mr. F. J. W. Luck, of Hornsey Lane, Highgate, who was chief engineer to the Westinghouse International Electric Co. in Brazil, left estate valued at £20 324 (net personalty £20 093).

Exeter Tramways Committee recommends that the salary of Mr. W. Y. Smith-Savile, the tramway engineer and manager, be increased as from August 1st last from £450 to £500, from April 1st next to £525, and thereafter by annual increments of £25 to £600.

Obituary.

The following deaths have been announced :—

MEVROW CORA LULOFS, at Davos, Switzerland, on September 13th. The wife of Dr. W. Lulofs, managing director of the Amsterdam Electricity Works, she was the daughter of the late Mr. Alfred Copping, of Pevensey.

MR. JOSEPH RICHMOND, suddenly at Folkestone, on September 16th, aged 84 years. Mr. Richmond was a member of the Institution of Electrical Engineers until 1922.

Points of View.

Interesting Pronouncements on a Variety of Topical Electrical Subjects.

GLASGOW was to the tramways world what the Brigade of Guards is to the British Army.—*Mr. E. M. Wright.*

* * *

If the shop window is to be anything approaching a picture it must be a selection, and not an encyclopædia.—*Sir Michael Sadler.*

* * *

Technically the British electrical industry is very firm, and financially its position is very good to-day.—*Mr. Ll. B. Atkinson.*

* * *

Dean Inge has said that Britain is down and out, but he seems to have overlooked the E.D.A. and the E.L.M.A.—*Sir Ernest Benn.*

* * *

The obligation on all industries is to reduce the cost of their wares and to improve the wages of their employees.—*Mr. Bertram Austin.*

* * *

I am nearly the only man in England who has never confessed to his friends that he could run the B.B.C. better than the present staff.—*Mr. R. Magill.*

BUSINESS ITEMS.

Changes of Address, Representatives, and other Developments.

INTERNATIONAL Combustion, Ltd., are extending their Barrow and Derby works.

Electrolux, Ltd., have opened new branch premises at 35, George Street, Croydon.

Mr. H. C. Bates is opening an electrical showroom at 26, Corporation Street, Chesterfield.

G. Jarvis and Son, Christchurch Road, Reading, have opened an electrical and battery service depot.

Mr. E. C. Osborne has taken over the wireless business of Mr. F. Launchbury, at 17, Bridge Street, Boston.

S. D. Motors, 499, Oxford Road, Reading, have been appointed sole district agents for A. J. Stevens and Co., Ltd.

R. Millett and Sons, 55, King Street, Ramsgate, are carrying out alterations to their premises in order to extend their wireless and electrical department.

Mr. G. F. Watts, of 131, Gloucester Road, Bishopston, Bristol, announces that he has relinquished his wireless business, and his stock has been sold by auction this week.

S. G. Brown, Ltd., will send a neat folding pocket stereoscope with views showing the manufacture of "Brown" radio instruments to any retailer who cares to apply for one.

The Metropolitan-Vickers Electrical Co., Ltd., inform us that owing to the re-numbering of a portion of Charing Cross Road, London, the number of Metro-Vick House will be 155 instead of 145.

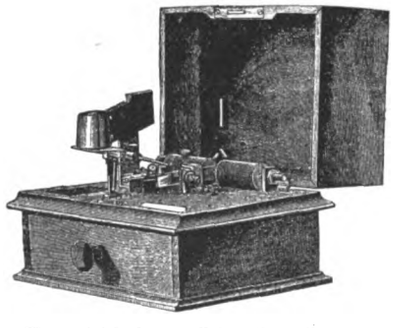
An agent in Auckland (N.Z.) wishes to represent, for the whole of New Zealand, British makers of electric torches, tools, etc. The Department of Overseas Trade has further details; reference No. 355.

All communications for the West Midlands Joint Electricity Authority and for Mr. S. T. Allen, the chief engineer and manager, should be sent in future to Phœnix Buildings, Dudley Road, Wolverhampton.

Forty Years Ago.

Interesting Gleanings from "The Electrician" of September 24th, 1886.

THIS week our backward glance through old files of THE ELECTRICIAN reveals the fact that it is exactly 40 years since the prepayment telephone call box was introduced. We reproduce herewith the old drawing of this device, known as the "Crossley, Harrison and Emmott" call box. Coins were inserted in the slit in the lid, and falling on to and overbalancing a lever, rolled into the drawer at the base. A counter was attached to the lever to enable the number of calls to be registered so as to "keep a check on the cash."



The first telephone call box (from "The Electrician" of September 24th, 1886.)

From the same issue of THE ELECTRICIAN we learn that :—

Frankfort railway station was lighted for the first time by electricity, power being obtained from the water mains!

* * *

A combination of tungsten and steel was suggested for magnets.

* * *

Attempts were being made to utilise electricity for train lighting.

* * *

An apparatus for electrocuting criminals was being exhibited at Leipzig.

* * *

A ship-lighting installation of 140 lamps was completed by Dorman and Smith, of Manchester.

* * *

A novelty was an electric railway in the Pyrenees, on which the motor of the descending train generated sufficient energy to make the ascent.

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"WIRING THE HOMES OF BRITAIN."

Speeches at the Inaugural Luncheon—Only a Week Left for Final Preparations for the Big Campaign—Details of Window Dressing Helps.

MANY well-known people in the electrical world and a large number of representatives of the lay Press were present at the inaugural luncheon at the Hotel Cecil, London, on September 17th, in connection with E.D.A.–E.L.M.A. Better Home Lighting Campaign. Major-General Sir Philip Nash presided.

Dealing with some of the wider aspects of the campaign Mr. Ll. B. Atkinson said the effort was like Bishop Latimer's famous light: it would go on relentlessly until its purpose was achieved. As the result of the work of our great electrical pioneers, some of whom were present at that gathering, a great structure had been built up; to-day it was technically very fine, and its financial position was very good. At the same time it was a lamentable fact that even now the bulk of our homes were still without the benefits which were lying at hand.

The E.D.A.–E.L.M.A. campaign would bring a lot of money to the electrical industry, but it would also make brighter the lives of the people. In recent years electricity had brought about a vast reduction of manual labour, but the workers were still not contented. Possibly this was because their home surroundings were not suitable. Outside their houses all was bright, but inside conditions were practically the same as they were fifty years ago. Architects were beginning to realise the benefits of electricity in the home, but houses were still being put up with obsolete lighting and heating installations. The change over to electricity for all home purposes would necessarily be a gradual one, and the campaign was concentrated on the first step—lighting—in the belief that the rest would follow. One development—electrical refrigeration—would be speeded up by the new food regulations next year, and that simple and useful apparatus would at last come into its own.

When the Electricity Bill became law, the smaller power stations would be gradually eliminated, a supply being given from larger stations. Then we should have a supply of electricity which in cheapness would compare with prices in force in countries where electricity was generated by water-power.

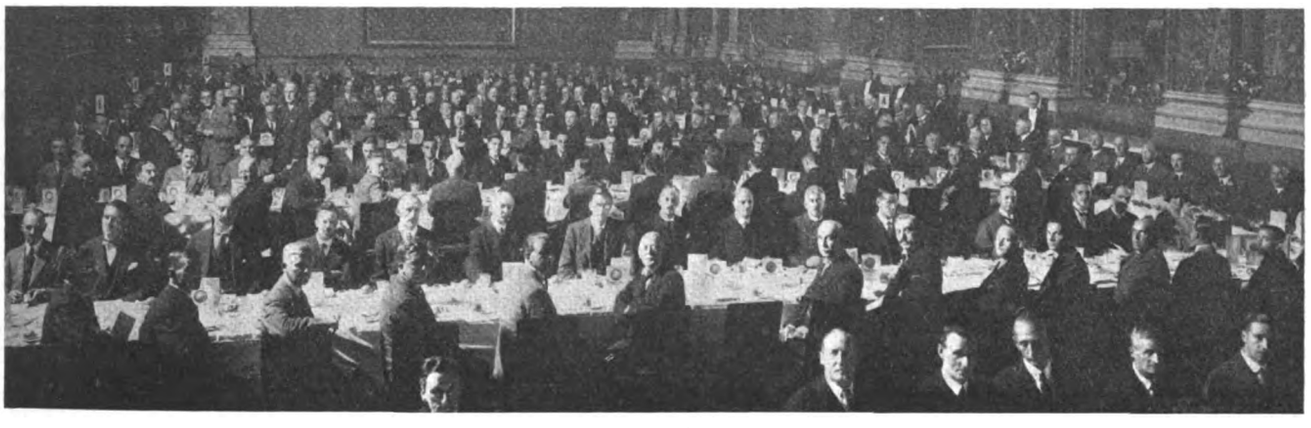
Despite suggestions that electric cooking was expensive, Mr. Atkinson continued, over 1 000 new full-sized electric cookers, all of British make, were being put into service every week, and he had even heard of miners in receipt of free supplies of coal installing electric cookers to escape the dirtiness of the older method of cooking.

Mr. J. Y. Fletcher thought the campaign was already assured of success. Unlike stunts, in which there was always a loser, the effort was for the good of all and to the detriment of none.

Sir Ernest Benn said that, according to Dean Inge, Britain was "down and out." Evidently he had overlooked the E.D.A. and the E.L.M.A., but possibly he might be forgiven as the campaign had not yet actually started. The electrical industry was singularly fortunate, as Mr. Atkinson had said its financial position was perfectly satisfactory; there were very few other industries of which that could be said to-day. He was glad to see an industry taking energetic steps to help itself by creating business. We were living in what might be called the "Committee Age," with a plethora of organisations, many of which seemed to exist solely for the purpose of restraining activity. Very few of them were banded together, as these electrical organisations were, for the promotion of activity which would be for the good of the whole community as well as for themselves. The campaign would not only do much to further the interests of the electrical industry and the well-being and home comforts of the people, but it would set a very useful example to other trades.

Preparations for the opening of the campaign are now well in hand, and the response throughout the country has been good. Already well over 250 000 of the competition booklets have been sold to electrical contractors and supply undertakings, and further demands for copies are being received by each post. In view of the short space of time that is now available before October 1st, all orders for these books should be sent in at the earliest possible moment. Delay is dangerous.

Splendid progress is also being made by the district committees in the organisation of local "electrical circles," of which, at the time of writing, over 100 have been formed.



Some of the company assembled at the Hotel Cecil, London, last Friday, for the inauguration of the E.D.A.-E.L.M.A. "Better Home Lighting" Campaign.

Arrangements are being made by many contractors to supplement the national advertising of the campaign by similar announcements, of which stereos are provided by the E.D.A., in their local newspapers, and one big supply undertaking has announced its intention, whenever a campaign advertisement appears in its local newspaper, of taking an equivalent amount of space to give extra impetus to the "push" in its area.

Having obtained their supply of competition books, electrical contractors should now be preparing for their first window display based on the campaign. Already preliminary displays have been made, and a photograph of the window of William A. Shaw and Co., Stockport, which reached us early this week, suggests that Lancashire is to the fore in this respect. Readers who are prepared to contest this supremacy are invited to send us photographs of their campaign displays.

Full particulars of a specially designed display suitable for use during the first month of the campaign are given in the first issue of the "Home Lighting News." Primarily designed with a view to economy in cost and adaptability to various sizes of windows, it should present no difficulty in construction and installation if the instructions are carefully noted.

Detailed instructions are given for the construction of the decorative background unit for the display, but for those who desire to purchase the unit ready made, the E.D.A. is prepared to supply at a cost of 35s. each, plus packing and carriage.

Ripening oranges by placing them in "sweat" rooms containing electrically heated ethylene gas has met with almost universal approval among Californian fruit growers.

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IN LIGHTER VEIN.

Random Comments and Reflections on Electrical Topics.

NOW that there has been a fusion of wireless interests we hope that the "fused electric wire" myth will be given a rest.

* * *

In a stimulating and militarily metaphorical article on the Better Home Lighting Campaign, an esteemed contemporary refers to "Pill Boxes." Beauchamp's, of course!

* * *

It is, however, regrettable that a writer so skilled in the use of military terms should refer, in conclusion, to the "salient features" of what is, after all, to be a straightforward attack.

* * *

According to a daily paper, worms have been made to turn under stimulation of an electrical device. Contractors should lay in a stock of these gadgets for distribution to husbands asking for E.D.A.-E.L.M.A. competition booklets.

* * *

On an envelope containing an income tax demand received by a Londoner one day this week was stamped the slogan, "Say it by telephone." Telephone engineers protest that no instrument, however robust, can be expected to stand this sort of treatment for long.

* * *

A daily paper writer states that amber contains electricity and that the electricity in amber cigarette holders absorbs the harmful ingredients in tobacco. As the gentleman in question is obviously amber-dextrous we suggest that he writes in future with the other hand.

* * *

At the Public Lighting Engineers' Conference attention was drawn to the moral value of lamp posts. Several electrical men also speak highly of the valuable support afforded by these fixtures and express the hope that the suspended type of street lighting unit will not be generally adopted.

* * *

A Brecon paper says "it is rumoured in the town that the Electric Light Co. propose to adopt turbines for their power," and remarks that "if that is so the company are to be congratulated on its policy and progress." Whilst deprecating the grammatical lapse of our contemporary, we can only say that we are in entire agreement with the sentiments expressed.

* * *

Asked by his wife to take down a menu broadcast by one American station, a radio enthusiast inadvertently tuned in simultaneously to another station giving a talk on physical jerks. Here is the result:

"Hands on hips, place one cup of flour on the shoulder, raise knees, depress toes, and wash thoroughly in one half cup of milk. In four counts, raise and lower left foot and mash two hard-boiled eggs through a sieve. Repeat six times, inhale one-half teaspoon salt, one teaspoon baking powder, and one cup of flour. Then, breathing naturally, exhale and sift. Attention. Jump to a squatting position of quick time. Twist sideways and forward right and left as far as possible and beat egg swiftly and briskly arms forward over head. Raise the cooked egg with the flour, and in four counts make a stiff dry dough, which is stretched at the waist. Thighs flexed, lay flat on the floor and roll into marbles the size of a walnut. Hop to a straddle in boiling water but do not boil at a gallop. After ten minutes remove and wipe with a rough towel and serve with fish soup."

* * *

Electro-Farming Notes.

A cow on an all-electric farm has been found with electric lights.

* * *

A manufacturer of electric drills has received an inquiry for a machine suitable for drilling turnips.

* * *

It is reported that an enthusiastic farmer with more ingenuity than practical knowledge of electricity, devised a rat trap by arranging a series of wires across the run and then connecting them to the electric power supply. He is stated to have reported that, far from killing the rats, it appears to put new life into them, for when he was removing an apparently dead rat from the wires it kicked him like a mule.

TRADE PUBLICATIONS.

Details of Catalogues and Dealer-Helps Issued by Manufacturers.

THE monthly list of Ateliers de Constructions Electriques de Charleroi (A.C.E.C.) contains particulars of a large range of single phase, three-phase and continuous current motors, transformers, etc., in stock.

A calendar (July 1926 to June 1927) received from the Leeds Flint Glass Co., Ltd., Aire Bank Lamp Works, Hunslet, Leeds, calls attention to the company's traction lamps for factories, ships, trams and trains.

A striking showcard advertising Hart batteries is now being issued to dealers. It depicts in the background a jazz band and a company of actors or singers engaged in broadcasting, and in the foreground a selection of Hart batteries, described as "the power behind the tone." Other showcards show the Hart "Enduro" wireless accumulator and the 6V Hart battery No. 523.

Siemens and English Electric Lamp Co., Ltd., 38-39, Upper Thames Street, London, E.C.4, send us a new price list (No. 158) of decorative lighting glassware. The ornamental designs of this glassware are in various styles and colours, and the pendants to which they are attached are made in polished or antique brass, toned bronze, and oxydised copper and silver.

Cosmos radiant fires are illustrated and described in a booklet issued by Metro-Vick Supplies, Ltd., Trafford Park, Manchester, together with small folding sheets on Cosmos electric home helps and Cosmos fires. These and an attractive fire showcard and a window cut-out, on which individual electric domestic articles, such as irons, kettles, or toasters can be displayed are available to the trade on request.

A new receiver for general interception service—Type R.g. 6B—and a new frame aerial direction finder—type 11F—have been produced by Marconi's Wireless Telegraph Co., Marconi House, Strand, London, W.C.2. A leaflet describing the type R.g. 6B receiver is a supplement to leaflet 1053, and it can be obtained on application to the company. Leaflet 1058 describes the new direction finder, which is particularly suitable for installing on small ships or on land where difficulty is experienced in erecting a loop aerial system.

Manchester Notes.

Electrical Traders Prepare for Civic Week.

[FROM OUR OWN CORRESPONDENT.]

THE Manchester area is having its fair share of anomalies under the lighting restrictions section of the Emergency Regulations. A leading electrical trader in the city is being threatened with an action on account of a very modest display, and he naturally feels rather sore when looking at the thousands of lights on Blackpool Shore and the long stretch of fairy lights recently displayed on Southport Promenade and in Lord Street. There can be little objection to the special permission granted for big events, and Manchester is very anxious that nothing should happen to interfere with some display in Civic Week; but there should at least be uniformity.

Meanwhile preparations are being actively pushed forward for Civic Week, and consumers are offered extra current for decorative purposes free of charge. Electrical traders are utilising every opportunity of exploiting this, and of ensuring that the best types of decorative apparatus, fittings, etc., are used. I noticed a very well arranged window display in the new B.T.-H. showrooms in King Street West, designed to attract those who avail themselves of the privilege granted by the Electricity Department.

During Civic Week the Corporation power stations and the distributing stations will be open to the public, and many firms are arranging to open their works at stated times. One might be pardoned for wondering how much of the Metropolitan-Vickers works the public will see in an hour's visit. Sufficient, perhaps, to show what a great industry it is, and how little one knows of it.

The Pageant of Industries promises to be a great success. Full details of the entrants are not yet known, but amongst other electrical firms there are the Chloride Electrical Storage Co., Ltd., Ferranti, Ltd., Manchester Corporation Electricity Department, Mather and Platt, Ltd., Matthews and Yates, Ltd., the Metropolitan-Vickers Electrical Co., Ltd., and the British Thomson-Houston Co., Ltd.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given.

DUNDEE CORPORATION, September 24th.—Supply of 2-core, 3-core, and 4-core l.t., paper insulated, lead covered and double steel tape armoured cable suitable for 660 V. Specifications, etc., from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

MERSEY RAILWAY CO., September 24th.—Supply of electrical sundries (tender form No. 10) and metallic and carbon filament lamps and fittings (form 13). Forms from Mr. J. Shaw, general manager and secretary, Central Station, Birkenhead.

DUNDEE CORPORATION, September 25th.—Electric lighting work in connection with reconstruction of premises for the Weights and Measures Department. Schedules, etc., from the City Engineer, 91, Commercial Street, Dundee.

MANCHESTER GUARDIANS, September 25th.—Supply of electric light cable required at the Bootle Hall Infirmary, Charlestown Road, Blackley, Manchester. Specification, etc., from Mr. E. Hargreaves, superintendent of works, Union Offices, All Saints', Manchester.

MIDLOTHIAN AND PEEBLES DISTRICT ASYLUM, ROSSLYNLEE, September 25th.—Six months' supply of electrical fittings, etc. Forms of tender from Mr. Chilton L. Addison-Smith, clerk and treasurer, 19, Heriot Row, Edinburgh.

NEWPORT (MON) CORPORATION, September 25th.—Motor converter and switchgear. Specification (L7) from Mr. A. Nichols Moore, Borough Electrical and Tramways Engineer, Town Hall, Newport; deposit £3 3s.

AYRSHIRE COUNTY COUNCIL (KILMARNOCK DISTRICT COMMITTEE), September 27th.—Electric wiring, etc., in connection with the erection of 16 houses at Mauchline. Applications for schedules, etc., to Mr. D. R. Sturrock, district clerk, 84, John Finnie Street, Kilmarnock, by September 27th.

IRISH NATIONAL CLUB, DEWSBURY, September 27th.—Electrician's work in new premises. Applications for further particulars to Newbold and Hartley, 4, Crown Court, Wakefield, by September 27th.

MEXBOROUGH URBAN DISTRICT COUNCIL, September 28th.—Electric wiring of 44 houses in connection with the Council's housing scheme.

WATH, SWINTON AND DISTRICT JOINT HOSPITAL BOARD, September 28th.—Electric light installation at Wath Wood Hospital. Particulars from the architect, Mr. James Totty, Moorgate Street, Rotherham.

CHEADLE AND GATLEY URBAN DISTRICT COUNCIL, September 29th.—(a) Extra high-pressure and low-pressure switchgear (Contract No. 24); transformer switch and distribution kiosk (No. 27), and ironclad switch unit (No. 28). Specification, etc., from Mr. R. W. Willis, electrical engineer and manager, 37, High Street, Cheadle, Cheshire; deposit £1 1s.

PORTSMOUTH GUARDIANS, September 29th.—Three months' supply of electric lamps and stores. Forms of tender from Mr. H. C. Morrell, Clerk to the Guardians, St. Michael's Road, Portsmouth.

BELFAST TUBERCULOSIS COMMITTEE, September 30th.—Six months' supply of electric lamps to the Municipal Sanatorium, Whiteabbey, and the Municipal Hospital for Tuberculous Children, Graymount, Shore Road, Belfast. Forms of tender, etc., can be obtained at the Sanatorium, Whiteabbey.

INDIA STORE DEPARTMENT, October 1st.—Two 125 kVA 3 300 V crude oil engine alternator sets, with water-cooling plant, switchboard, etc., and transformers for Cauvery Metur project. Specifications (5s.) from the Director-General, Branch No. 36, Belvedere Road, Lambeth, London, S.E.1.

PORTSMOUTH TRAMWAYS COMMITTEE, October 1st.—Six months' supply of insulating materials, lamps and motor windings (section Q) and overhead line materials (section R). Specification, etc., from the General Manager and Engineer, Guildhall, Portsmouth.

PORTSMOUTH CORPORATION, October 1st.—Six months' supply of insulating materials, lamps and motor windings (Section Q) and overhead line materials (Section R), etc., for the Tramways Department. Specification, etc., from the General Manager and Engineer, Guildhall, Portsmouth.

SOUTHEND CORPORATION, October 4th.—Supply of 2 500 pairs of fuse boxes and 1 250 troughs. Particulars from Mr. R. Birkett, borough electrical engineer and manager.

WATFORD CORPORATION, October 4th.—Wiring 11 houses. Particulars from the borough electrical engineer, Mr. A. W. Barham.

HULL CORPORATION, October 5th.—Supply of 20-ton overhead travelling crane (Contract 108). Specification, etc., from Mr. H. Bell, city electrical engineer and manager, Electricity Works, Sculcoates, Hull; deposit £1 1s.

LIVERPOOL CORPORATION, October 5th.—Two sets of pneumatic crude sewage ejectors and electrically-driven air compressors. Forms of tender from the City Engineer, Municipal Buildings, Dale Street, Liverpool.

PLUMS TO PICK.

THE electrical appliance harvest is being hastened by the E.D.A.-E.L.M.A. Campaign. There will be many plums for those whose baskets are sound and big enough. Plums that are dropped are useless. Need more be said?

PUDSEY CORPORATION, October 5th.—Supply of about four miles of l.t. cables, joint boxes, feeder pillars, etc. Specification, etc., from the Borough Electrical Engineer, Electricity Works, Pudsey, Yorks.

TICEHURST GUARDIANS, October 6th.—Electric light installation at the institution at Flimwell. Particulars from the clerk, Mr. William Bennett, Wadhurst.

MANCHESTER CORPORATION, October 8th.—Two 25 000 kVA three-phase transformers and one 1 250 kVA three-phase transformer (specification B.49); and one 100-ton electrically operated crane (specification B.50) for Barton power station. Specifications (deposit £2 2s. for each) from Mr. H. C. Lamb, Electricity Dept., Town Hall, Manchester.

MANCHESTER CORPORATION, October 12th.—Supply of tramway permanent way special track work. Specifications, etc., from Mr. Hy. Mattinson, general manager and chief engineer, 55, Piccadilly, Manchester; deposit £1 1s.

DUBLIN BOROUGH COMMISSIONERS, October 18th.—Supply and erection of four water-tube boilers, with stokers, economisers, feed pumps and accessories, for the Electric Supply Department. Specification from the City Electrical Engineer, Fleet Street, Dublin; deposit £5 5s.

DUBLIN BOROUGH COMMISSIONERS, October 18th.—Supply and installation of a complete 5 000 kW generating set (including steam turbo-alternator and exciter, condensing plant, etc.), at the Pigeon House generating station. Specification, etc., from the City Electrical Engineer, Fleet Street, Dublin; deposit £3 3s.

EDINBURGH CORPORATION, October 18th.—Two motor-driven circulating water pumps, drainage pump valves and pipework for Portobello generating station. Specification from Mr. E. Seddon, Electricity Department, Dewar Place, Edinburgh; deposit £1 1s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

AUCKLAND ELECTRIC POWER BOARD, September 27th.—One 14-ton electrically-operated crane. (Reference A.X. 3 415.)

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, September 28th.—Supply of pilot cable, joint boxes and dividing boxes Specifications from Preece, Cardew, and Rider, 8, Queen Anne's Gate, Westminster, S.W.1; deposit £2.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, September 28th.—Three motor-driven low lift pumps with control apparatus for Taieri drainage scheme. (Reference A.X. 3 274.)

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NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMWAYS (CHIEF ELECTRICAL ENGINEERS' BRANCH), September 29th.—One drag link ash conveyor. (Reference A.X. 3 432.)

VICTORIAN RAILWAY COMMISSIONERS, September 29th.—Two motor driven disc grinding machines and necessary equipment. (Reference A.X. 3 433.)

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, October 4th.—Pole oil switches. (Reference B.X. 2 795.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 5th.—Supply of one four-motor overhead travelling crane and runway for the Waikaremoana Electric Power Development, Section 30. (Reference A.X. 3 517.)

POSTS AND TELEGRAPH DEPARTMENT, MELBOURNE, October 5th.—Switchboard cords. (Schedule No. 115.) (Reference B.X. 2 747.)

PRETORIA MUNICIPAL COUNCIL, October 7th.—Transformer and switchgear for abattoir sub-station. (Reference B.X. 2 851.)

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, October 11th.—Ironclad switchgear and single phase transformers. (Reference B.X. 2 793.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, October 11th.—One d.c. generator and one internal combustion engine, for Helwan-les-Bains electric power station. (Reference B.X. 2 883.)

AUSTRALIAN POSTMASTER-GENERAL'S DEPARTMENT, October 12th.—Automatic telephone exchange equipment.

INDIAN STORES DEPARTMENT (ENGINEERING BRANCH), SIMLA, October 16th.—Supply of four electrically-driven horizontal centrifugal or turbine pumping sets, with transformers. (Order No. N/4 870.) (Reference A.X. 3 590.)

NEW PLYMOUTH (N.Z.) HARBOUR BOARD, October 16th.—Supply, delivery and erection of 30 cwt. portal electric horizontal luffing jib crane, fittings and accessories. (Reference A.X. 3 458.)

SYDNEY COUNCIL, October 18th.—Two 100 ton electrically-operated overhead travelling cranes. (Contract 1 033.) (Reference A.X. 3 467.)

CHRISTCHURCH (N.Z.) DRAINAGE BOARD, October 19th.—Supply and erection of three sets of electrical centrifugal pumping plants. (Contract 26 329.) (Reference A.X. 3 215.*)

VICTORIAN RAILWAY COMMISSIONERS, October 20th.—Supply and delivery of rail motor equipment. (Contract No. 39 614.) (Reference A.X. 3 449.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Telephone plugs and sleeves. (Schedule C.120.) (Reference B.X. 2 799.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Lamps, lamp caps, and lamp sockets. (Schedule C.124.) (Reference B.X. 2 800.)

SYDNEY ELECTRICITY DEPARTMENT, November 1st.—Supply, delivery, erection, setting to work, testing and maintenance at Bunnerong power station of boiler feed pumps (Reference A.X. 3 470.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd—Supply of 110 000 V transformers for Waikaremoana power scheme (section 17). (Reference B.X. 2 744.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Indoor control gear and switchgear for Waikaremoana electric power development (section 14). (Reference B.X. 2 675.)

VICTORIAN RAILWAY COMMISSIONERS, November 3rd.—Supply of 77 miles of seven-strand h.d. copper cable.

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, November 8th.—Diaphragms, cords, etc. (Reference B.X. 2860.)

POSTMASTER-GENERAL'S DEPARTMENT MELBOURNE, November 9th.—Telephone transformers. (Reference B.X. 2 797.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone protective apparatus. (Reference B.X. 840.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, November 10th.—Supply and erection of steam turbine-driven centrifugal boiler-feed pump. (Contract No. 770.) (Reference A.X. 3 534.) November 10th.—Supply and erection of motor-driven centrifugal boiler-feed pump. (Contract No. 771.) (Reference A.X. 3 536.)

SYDNEY CITY COUNCIL, November 15th.—Supply of 33 000 V cable and pilot cable. Specification (No. 1 047) from the Constructional Engineer, Electricity Dept., Town Hall, Sydney.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 16th.—Supply of timing clocks for indicating the duration of telephone trunk line calls. (Reference B.X. 2 827.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 23rd.—Lightning arresters and transformers. (Reference B.X. 2 792.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 30th.—Supply of 110 kW transformers. (Reference B.X. 2 874.)

SOUTHLAND ELECTRIC POWER BOARD, INVERCARGILL, N.Z. December 1st.—Supply of a 3 000 H.P. horizontal Francis turbine and 2 350 kW generator. (Reference B.X. 2 822.)

VICTORIAN RAILWAY COMMISSIONERS, December 1st.—Rotary converter or rectifier set, with switching equipment for its automatic operation.

STATE ELECTRICITY WORKS, MONTEVIDEO, December 6th.—Diesel-electric generating sets.

NEW ZEALAND GOVERNMENT RAILWAYS, December 10th.—Electric motors (Reference B.X. 2861.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 1st.—Supply and erection, at site of Seru pumping and power station, of four Diesel engine alternator groups, three pumps and accessories. Specification (10s. 6d.) from Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 4th.—Supply of switchgear and transformers for Waikaremoana electric power scheme. (Reference B.X. 2 872.)

Tenders Accepted.

GLASGOW CORPORATION.—T. Purdon and Sons, trolley wire.

PWLLHELI CORPORATION.—Johnson and Phillips, Ltd., mains and cables for electric lighting.

SWANSEA CORPORATION.—H. N. Kirk, electric lighting work at Hill House Hospital, £1 199 15s.

GLASGOW CORPORATION.—Associated Fire Alarms, Ltd., automatic fire alarms for new Kelvin Hall, £1 679.

GLASGOW CORPORATION.—Chalmers, Ltd., cinema screen, with electric winding gear, for St. Andrew's Halls, £105.

PADIHAM URBAN DISTRICT COUNCIL.—Lancashire Electric Power Co., electrical installation work and cable laying.

EPSOM COUNCIL SCHOOL MANAGERS.—Goodship and Saunders, electric light installation at Hook Road Schools, £226.

HORSHAM GUARDIANS.—Saunders and Son, electric light installation at the institution, £273, plus £11 for irons, etc.

BARNES URBAN DISTRICT COUNCIL.—English Electric Co., Ltd., one 3 000 kW turbo-alternator, with condensing plant, etc.

EGYPTIAN STATE RAILWAYS, TELEGRAPHS AND TELEPHONES.—Standard Telephones and Cables, Ltd., 1 100 desk telephones, £3 080.

EDINBURGH CORPORATION.—Stirling Boiler Co., Ltd., boilers, economisers, air heaters and mechanical stokers, for Portobello power station, £86 000.

SHANGHAI MUNICIPALITY.—International Combustion, Ltd., Lopulco powdered fuel equipment, in connection with extensions of Riverside power station.

MARKET DRAYTON URBAN DISTRICT COUNCIL.—Market Drayton Electric Light and Power Co., public lighting until April 16th next, £3 10s. per lamp.

ABERDEEN EDUCATION AUTHORITY.—J. Worling, electrical work in gymnasium at Causewayend School, £39, and at Aberdeen Grammar School, £41 10s.

TOTTINGTON URBAN DISTRICT COUNCIL.—Lancashire Electric Power Co., conversion of gas lamps in Bolton Road to electricity, £168, plus £12 for main control.

GLASGOW CORPORATION.—R. J. McIntyre, electrical installations in connection with Summertown Road housing scheme, £1 288 1s., and Balornock housing scheme, £990 15s.

LICHFIELD CORPORATION.—J. Richards and Co., electric light installations in Municipal Offices and Guildhall, £208, Free Library and Museum, £52 11s., and Art School, £35 15s.

BETHESDA (NORTH WALES) URBAN DISTRICT COUNCIL.—Pirelli, Ltd., supply and erection of distribution equipment in connection with the Council's new electricity scheme, £5 680.

CONSETT URBAN DISTRICT COUNCIL.—C. Hutton, lighting streets in The Grove, £220 5s. 6d. (recommended). Also tendered: Reid, Ferens & Co., £216, and Falconar, Cross and Co., Ltd., £260 14s.

LICHFIELD CORPORATION.—John Richards and Co., electric light installation at the free library and museum, £52 11s.; at the Guildhall premises and the municipal offices, £208 5s.; and at the art schools, £35 16s.

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GOVERNMENT CONTRACTS.

State Orders for Electrical Machinery, Apparatus and Material.

THE following contracts were placed by British Government Departments during September :—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).—*Cables, electric :* British Insulated Cables, Ltd., General Electric Co., Ltd., Anchor Cable Co., Ltd., Siemens Bros. and Co., Ltd., Hoopers Telegraph and India Rubber Works, Ltd., Johnson and Phillips, Ltd., Enfield Cable Works, Ltd., Hackbridge Cable Co., Ltd., and W. T. Glover and Co., Ltd. *Cells, Electric :* Chloride Electrical Storage Co., Ltd., and D. P. Battery Co., Ltd. *Cranes, Jib, Electrically driven :* T. Broadbent and Sons, Ltd. *Electric Lighting Installation :* G. E. Taylor and Co. *Fans, Ventilating :* Electromotors, Ltd., Newtons Dynamo Works, and James Keith and Blackman Co., Ltd. *Lamps, Electric :* British Thomson-Houston Co., Ltd., Siemens and English Electric Lamp Co., Ltd., Edison Swan Electric Co., Ltd., Metro-Vick Supplies, Ltd., and General Electric Co., Ltd. *Panels :* General Electric Co., Ltd. *Panels, Switch :* Bertram Thomas. *Plant, Fuel Oil Pumping and Electric Generating :* W. H. Allen, Sons and Co., Ltd. *Plant, Steam Generating :* Sturtevant Engineering Co., Ltd. *Switchboards, Charging :* Whipp and Bourne, Ltd. *Switches, Watertight :* General Electric Co., Ltd. *Thermometer Apparatus, Electrical :* Foster Instrument Co., Ltd. *Traveller, Overhead Electric :* Cowans Sheldon and Co., Ltd. *Valve Holders :* H. W. Sullivan, Ltd. *Valves, Wireless :* Mullard Radio Valve Co., Ltd.

WAR OFFICE.—*Batteries, Inert :* Siemens Bros. and Co., Ltd. *Batteries, Secondary :* Pritchett and Gold and E.P.S. Co., Ltd. *Cable, Submarine :* Standard Telephone and Cables, Ltd. *Cases, Battery :* Barrow, Hepburn and Gale, Ltd. *Cases, Lamp :* C. F. Timbers.

AIR MINISTRY.—*Underground Mains (Halton) :* Malcolm and Allan, Ltd. *Condensers, Mains, Earth and Grid :* H. W. Sullivan, Ltd. *Magneto Spares :* British Thomson-Houston Co., Ltd. *Telephone-Telegraph W/T Installation :* Marconi's W/T Co., Ltd. *Valves W/T :* General Electric Co., Ltd.

POST OFFICE.—*Apparatus, Telephonic :* Automatic Telephone Manufacturing Co., Ltd., Hall Telephone Accessories, Ltd., Peel-Conner Telephone Works (General Electric Co., Ltd.), Phœnix Telephone and Electric Works, Ltd., and Standard Telephones and Cables, Ltd. *Apparatus, Testing, Protective and Miscellaneous :* Phœnix Telephone and Electrical Works, Ltd., Standard Telephones and Cables Ltd., and M. W. Woods. *Battery Stores :* Accumulators of Woking, Ltd., Chloride Electrical Storage Co., Ltd., and Hart Accumulator Co., Ltd. *Boxes, Service :* General Electric Co., Ltd. *Cable, Various :* Connollys (Blackley), Ltd., W. T. Glover and Co., Ltd., W. T. Henley's Telegraph Works Co., Ltd., Johnson and Phillips, Ltd., Pirelli-General Cable Works, Ltd., Siemens Bros. and Co., Ltd., and Union Cable Co., Ltd. *Coils, Loading :* General Electric Co., Ltd. *Cords for Telephones :* British Insulated Cables, Ltd., London Electric Wire Co. and Smiths, Ltd., Reliance Electrical Wire Co., and Siemens Bros. and Co., Ltd. *Lamps, Electric :* British Thomson-Houston Co., Ltd., Cryselco Ltd., Edison Swan Electric Co., Ltd., General Electric Co., Ltd., Metro-Vick Supplies, Ltd., and Siemens and English Electric Lamp Co., Ltd. *Wire, Copper :* Whitecross Co., Ltd. *Cable—Manufacture, Supply, Drawing-in and Jointing :* Birmingham-Redditch-Evesham : Standard Telephones and Cables, Ltd. *Telephone Exchange Equipment :* Rowe Bros. and Co., Ltd. (Liverpool) ; Rylands Bros., Ltd. (Warrington) ; Hampton and Sons, Ltd. (S.W.1) ; E. and R. Garrould (W.2) ; Beswick Co-operative Society, Ltd. (Manchester) ; Equitable Trust Co. of New York (E.C.2) ; Messrs. John Gardner (E.C.3) ; Leyland and Birmingham Rubber Co., Ltd. (Preston) ; Blackley Co-operative Society, Ltd. ; Calico Printers Association, Ltd. (Manchester) ; Relay Automatic Telephone Co., Ltd., Colwyn Bay ; Llandudno : Siemens Bros. and Co., Ltd. Sub-Contractors : Hart Accumulator Co., Ltd., for Batteries ; English Electric Co., Ltd., for Charging Machines. Crompton and Co., Ltd., for Ringing Machines. Old Colwyn ; Llandudno Junction ; Penrhynside : Siemens Bros. and Co., Ltd. Sub-Contractors : Small Electric Motors, Ltd., for Dynamotor. Leeds Trunk : Siemens Bros. and Co., Ltd. Monument : Automatic Telephone Manufacturing Co., Ltd. ; Sub-Contractors : Chloride Electrical Storage Co., Ltd., for Batteries. Newton Bros. (Derby), Ltd., for Machines. Merstham (Surrey) : Automatic Telephone Manufacturing Co., Ltd.

BLACKPOOL LIGHTING.

Ambitious Preparations for the Autumn Electrical Illuminations.

ALL previous schemes of decorative illuminations bid fair to be surpassed by the arrangements made at Blackpool for the Autumn Illuminations which start to-morrow (Saturday).

A few details of some of the devices as supplied to a representative of THE ELECTRICIAN by Mr. C. Furness, the borough electrical engineer and tramways manager, will be of interest :

Promenade Festoons.

The promenade for a route length of three miles will be continuously treated with festoons of " Fairyland " strip with 100 V 20 W lamps spaced 36 in. apart, connected two in series across the Corporation's 200 V low-tension supply. Special feeding points have been arranged along the promenade, and cast-iron pillars erected to enable the supply to be given for this purpose, and spaced 300 to 400 yd. apart. The festoons from north to south run in three parallel lines, which alone absorb at least nine miles of strip. In addition, spaced every 40 yds. there are approximately 130 traverse festoons linking up the westerly festoons across the special tramway track and carriage drive to the easterly festoons, thus forming a complete canopy of colour for the entire distance of three miles.

On the top of the centre tramway standards carrying the middle longitudinal festoons are fitted large trellis lanterns with coloured windows of " Jecoid " medium material (supplied by the G.E.C.'s Manchester branch), which makes a very charming feature. Some 40 trellis pylons are also being erected, which will be outlined with 14 V 7 W lamps (15 in series).

At three important points on the promenade ornamental trellis arches have been erected outlined with from 3 500 to 4 000 14 V 7 W 50 mm. bulbs, and at vantage places some 20 48-in. diameter kaleidoscopic features have been erected. Sunken gardens at Princess Parade, North Shore, and South Shore have also been electrically treated, and altogether there will be approximately 200 000 multi-coloured lamps in the complete scheme of decoration. The predominant colours in the general scheme are ruby, green and gold (amber).

The Town Hall is receiving special treatment, the central feature being a large fountain in white lamps operated by a flasher, and surmounted with a sign " 1876—PROGRESS—1926," this being the jubilee of the Blackpool Corporation Charter. On two prominent pediments sunrise and sunset effects are reproduced, the " rise " effect being in amber and the " set " in deep ruby.

Interesting mobile features are provided by the Tramways Department. Some 26 " toast-racks " will be canopied in festoons of coloured lamps, and special features in the form of a gondola and lifeboat have been built up, and are outlined with lamps spaced 4 to 6 in. apart.

The Roman Baths at South Shore have been specially treated. There are 10 000 multi-coloured lamps, and an electric gondola and small boats provided with batteries and lamps will give animation on the water during the evenings, and will also give a Venetian atmosphere to the general scheme.

Suggestions for Schemes.

As previously stated in THE ELECTRICIAN special reduced rates have been offered to business firms and residents co-operating in the lighting scheme, and an interesting seven-page pamphlet issued by Mr. Furness gives many helpful suggestions for the most effective use of coloured lighting in connection with the scheme. Detailed information is given of the materials required for each of seven alternative schemes, including the cost of current consumption per hour for each scheme.

Valuable cash prizes are being offered for the most effective schemes. These are in two classes—*i.e*, business premises, and boarding and apartment establishments and private residences. There are separate prizes in each class for exterior and interior displays. In addition a silver trophy, valued at 30 guineas, will be presented for the most effective illumination and colour scheme ; this is open to hotels, picture theatres, etc., but excludes the Pleasure Beach, Tower, Winter Gardens, and the three piers.

Useful information about the uses of electricity in the home is included in the new " Year Book " of the Welsh Housing and Development Association.

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ELECTRICITY SUPPLY.

Supply for a Gas Department—Aberdeen's Assisted Wiring Success—Commissioners' Reasons for Rejecting Barrow Hydro-Electric Scheme.

ELECTRIC lighting is being installed at Cleveleys Congregational Church, Blackpool.

Bethesda (North Wales) U.D.C. has decided to proceed with its electric lighting scheme.

Cannock U.D.C. has sanctioned mains extensions in the district at an estimated cost of £1 894 9s.

Glasgow Electricity Committee has decided that its prices for electricity shall not be altered for the present.

Lichfield T.C. has applied to the Electricity Commissioners for an order to extend its electricity supply area.

The net surplus on the past year's working of the Swansea electricity undertaking was £16 333 (against £34 381).

Sarisbury (Hampshire) P.C. is expecting to receive an electricity supply from Portsmouth, and has repeated its request for a definite promise as to when the supply will be available.

The profit on the past year's working of the Shoreditch (London) electricity undertaking was £20 608. Revenue increased by £1 310, and consumers have been saved £8 352 by reductions of charges.

Coal Strike Effects.

Birkenhead Electricity Committee is increasing its charges by 10 per cent. in consequence of increased cost of fuel, due to the coal strike. Expenditure on fuel is more than £350 a week over the normal figure.

In order to comply with the Emergency Regulations, Halifax Electricity Committee closed at the end of the first week its electricity exhibition at the Y.M.C.A., which was to have been continued for a fortnight.

Nantwich Guardians have adopted a recommendation to adopt electric lighting at the Institution at a cost of £1 200, plus 10 per cent. for contingencies. It is proposed to take a supply of electricity from the North Wales Power Co.

Padiham U.D.C. has sanctioned a loan of £12 400 for an electricity sub-station, with mains and services. Fires have been lighted preparatory to commencing operations at the new generating station of the Lancashire Electric Power Co. at Padiham.

Carlisle T.C. has received the consent of the Ministry of Transport to the use of overhead lines in the rural area for transmission at 11 000 V of a supply to the Cocklakes Works at Cumwhinton. A loan of £10 000 for mains and services has been applied for.

Swindon T.C. has decided to supply electricity to dwelling houses on the basis of an all-in supply at a fixed charge of 15 per cent. on the net rateable value of the premises, plus 1d. per kWh for all electricity consumed for lighting, heating, cooking, and all other domestic purposes.

The Leicestershire and Warwickshire Electric Power Co. has applied for a Special Order to supply in parts of Ashby-de-la-Zouch, Barrow-on-Soar, Blaby, Loughborough, Market Bosworth and Tamworth rural districts. Any objections must be sent to the Electricity Commission by September 30th.

Mansfield T.C. has decided to retain for 12 months the turbo-generator and auxiliary plant and the storage batteries at the present generating station after the bulk supply to the Council has been commenced. In consequence of the increased cost of coal, no reduction in charges for electricity will be made at present.

North Wales Assessments.

A conference of the representatives of the Assessment Committees of North Wales, held at Chester to consider the assessment of electrical undertakings, decided that an executive committee of ten be appointed for the purpose of dealing with electricity undertakings and other matters appertaining to the conference.

Penybont R.D.C. has been notified that the Electricity Commissioners cannot sanction the Kenfig Hill and District electric lighting scheme, as it would involve an addition of 8d. to the rates. The Council has informed the Commissioners that the present oil lighting costs a 3d. rate, which would be 6d. if the whole district were lighted.

Burnley Gas Department requires a supply of electricity at the gas works, and the Gas Committee claims that it would be more economical to generate d.c. at the gasworks (the initial expenditure being about £2 000) than to take a.c. from the electricity works. The matter has been referred back for further consideration with the assistance of an expert.

Mr. J. A. Bell, city electrical engineer, in his report on the progress of Aberdeen Corporation Electricity Department during the year, states that the assisted wiring scheme put into operation this spring immediately met with gratifying support. New customers to the number of 933 have been added during the year, and the number of consumers now connected is 7 819.

Both Bradford Corporation and the Yorkshire Electric Power Co. have now renounced their claims to supply electricity to Clayton. It is probable that a bulk supply will be taken from the power company, and that the Clayton Council will itself undertake the distribution. About fifty houses in Clayton are already wired, in addition to two chapels and eight shops.

Reigate R.D.C. consented to an application by Edmundson's Electricity Corporation, Ltd., for a Special Order to extend the area of supply under the Dorking Electric Lighting Order, 1897, so as to include the parishes of Betchworth and Buckland. The Council had previously given consent to the supply of electricity in the two parishes by the Leatherhead and District Electricity Co., Ltd.

The maximum load upon Portsmouth Corporation's electricity undertaking has been increasing so rapidly that the installation of further generating plant has been decided upon, and it is proposed to instal, against the winter of 1927, another new turbine of 8 000 kW capacity and two additional boilers each of 50 000 lb. per hour capacity, the total cost of the extentions being estimated at £77 000.

It is stated that a scheme of interconnection of the systems supplying electricity to five large collieries adjacent to Doncaster, the houses of men working in the collieries, works at Doncaster and a local authority in the district will be in operation shortly. The aggregate output of the generating plants concerned is about 45 000 000 kWh per annum. The length of the connecting cables will be twenty-two miles, and they will transmit energy at 22 000 .V

Competition in Tamworth District.

The Leicestershire and Warwickshire Electric Power Co. and the Pooley Hall Colliery Co. have both been laying cables recently in Tamworth rural district. The R.D.C. has declined to assent to the former company's application for an Order to lay cables in Austrey, Newton Regis, Seckington and Kingsbury, as cables have been or are being laid in those districts by the Pooley Hall Colliery Co. The Council has decided to apply for the revocation of the Atherstone Order so far as Tamworth rural district is concerned, on the ground that no distributing cables have been laid in the district within the period described.

The Electricity Commissioners have stated their reasons for rejecting the application of Barrow T.C. for an Order to authorise the Council to establish a new power station at Backbarrow. Amongst the principal reasons are that the proposed plant (three 500 kW units) would be only a limited contribution towards supplying the future electrical demand of the district, that an alternative source of supply is available, and that the estimated cost of production at Backbarrow does not show any appreciable reduction as compared with such alternative supply. The Council has referred the whole question to the Electricity Supply Sub-committee.

At a meeting of Edinburgh Corporation last week, Mr. Seddon, the city electrical engineer, reported on his visits to powdered fuel plants in this country and on the Continent. He was of opinion that when fuel was supplied to boilers in the dry powdered state it provided greater ease of control and was more efficiently burned than was possible with raw coal burned in mechanical stokers. He was satisfied, however, that the plant available for drying and pulverising coal had not yet reached such an advanced state that it could be considered sufficiently reliable for central station work. Mr. Walker, convener of the Electricity Committee, said there was no powdered fuel plant in existence which the engineer would recommend for the Portobello power station. Bailie Mancor moved recommittal of the report, with instructions to the Committee to obtain advice from experts. The amendment was rejected and the report approved. A tender was accepted for boilers, etc., for the Portobello station.

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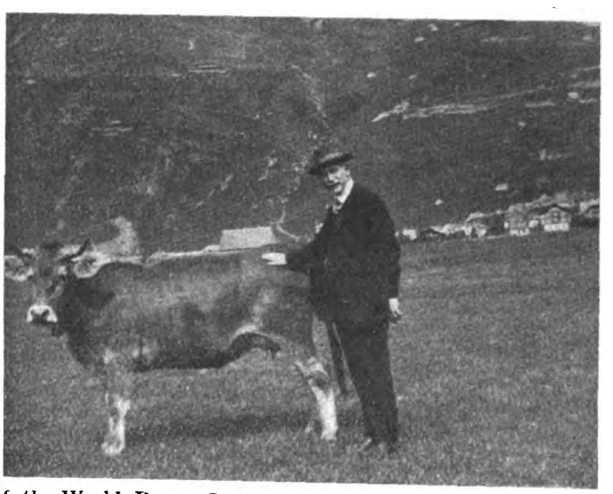
NEWS IN PICTURES

Dr. F. A. Wilson, of the American G.E.C., with a giant single crystal of copper. It is 17 in. long and weighs over 12 lb. This copper is said to be 13 per cent. more efficient as a conductor than ordinary copper.

Mr. H. T. Gambrell, of Gambrell Brothers, Ltd., radio manufacturers, with Miss C. L. Mould, to whom, as reported in THE ELECTRICIAN last week, he was married at Leatherhead.

Mr. A. C. Cramb, who, as exclusively announced in THE ELECTRICIAN last week is the president-elect of the Institution of Public Lighting Engineers.



These photos illustrate the social side of the sectional meeting of the World Power Conference, full accounts of which have been published in recent issues of THE ELECTRICIAN. To the left is a group including Sir John and Lady Snell and Mr. and Mrs. Roger T. Smith. In the other view Mr. R. Borlase Matthews presents a picture of "electricity in agriculture."

At the West Ham electrical exhibition there was a good attendance for the lectures and cooking demonstrations. The Information Bureau seen to the right was also a popular feature.

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ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

CREWE T.C. has referred to a sub-committee the question of running municipal trackless trolley vehicles.

The decoration of the entire tunnel and the escalator at the Bond Street station of the Central London Railway has been undertaken by the manufacturers of "Pears'" soap.

Wallasey tramwaymen are evincing a desire to form a local union and to support the policy of settlement of disputes by conferences with the employers or by arbitration.

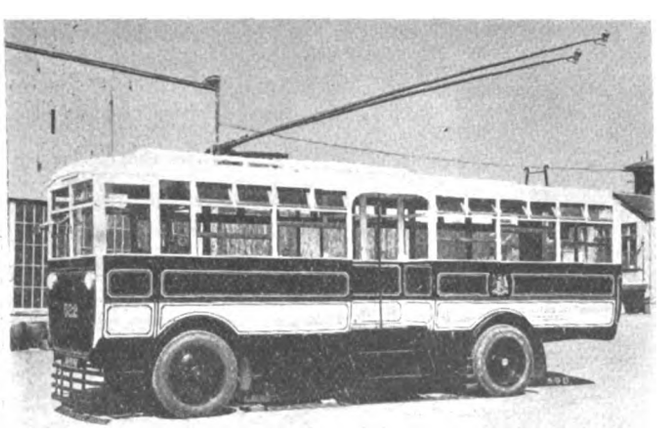
The wrecked Darwen tramcar.

The accompanying view taken by an ELECTRICIAN photographer shows the Darwen Corporation tramcar which on Monday crashed into a billiards hall during a storm which is said to have rendered the electric brake ineffective. One passenger was killed and the driver, conductor and others were removed to hospital.

It is stated that about 1 000 out of the 6 000 uniformed employees of the Glasgow Tramways Department have already joined the Local Association of Glasgow Tramway Employees, the declared object of which is to avoid use of the strike weapon in case of disputes.

Special arrangements are being made by the Metropolitan Electric Tramways, the London United Tramways and the South Metropolitan Electric Tramways Companies to cope with football traffic on Saturdays. Between 2 p.m. and 5 p.m. 50 extra cars are to be put on the road.

The trolley 'bus illustrated below has just been delivered to Bradford Corporation by the Associated Equipment Co., Ltd. It has thirty-six seats and is capable of a speed of 28 miles per hour fully loaded. The motor and control gear comprise a "Bull" trolley 'bus traction motor (by E. R. and F. Turner, Ltd.), and rated at 55 H.P. at 1 030 revs. per min., in accordance with B.S.S. 173–1923, and is of the ventilated and interpole



Bradford's new trolley 'bus, details of which are given herewith.

type. An "E.M.B." type T foot-operated controller is used, arranged with five plain series accelerating notches, operated in conjunction with the "A.E.C." patent governor device for automatically shunting the field current by means of a governor and a contactor. The fields of the motor are automatically diverted by 33½ per cent. at a speed of 16 miles per hour, and by 50 per cent. on the last notch of the controller. The rheostat is an "E.M.B." unbreakable, jointless and rustless grid type resistance. The 'bus is fitted with a trolley pole deviation indicator, a device invented by Mr. Wilkinson, of Bradford; and also with an electric horn, foot gong, electric wind screen wiper and a speedometer.

WIRELESS NEWS.

Radio Trade Organisations and Their Future Policy.

RELIEF is manifest in all sections of the industry at the conclusion of the guerilla warfare which has for so long existed between certain groups of radio manufacturers on questions of trading policy, and the new Radio Manufacturers' Association, will, it is hoped, prevent a recurrence of similar troubles.

Pending the election of officers and council for the new Association, the work is being carried on jointly by the officials of the old N.A.R.M.A.T. and the S.R.M.

Rumours have recently gained some circulation to the effect that the new body will be a sort of "re-hashed" N.A.R.M.A.T. under a new name. A representative of THE ELECTRICIAN, having investigated these stories, states that they are without foundation, and adds that any tendency for the N.A.R.M.A.T. to exercise undue control in the new organisation, would, according to responsible members of the trade, probably undo much of the good work that has been done in recent weeks.

Opinions as to who should be the chairman of the new Association, are somewhat divided. While there is a body of opinion in favour of appointing a prominent public man who is not directly connected with the industry, there is also considerable support of the view that the chairman should be a prominent radio manufacturer who has not been associated with either of the old manufacturers' associations.

The Retailers' Side.

With the consolidation of the manufacturers into one body, for manufacturers only, the need is felt for a similar co-ordination on the retail side, and this should be facilitated by the manufacturers' adoption of the policy of one association for each section of the trade. For this purpose, a suitable body is at hand, in the Wireless Retailers' Association of Great Britain, which, throughout its existence, has worked not only for the good of the retailer, but for that of the industry as a whole. With the addition of ex-retail members of the N.A.R.M.A.T., this organisation would render possible the more complete organisation of retailers.

The W.R.A.'s attitude towards the new manufacturers' Association was well expressed by Mr. F. S. Horsey, in a recent statement in which he expressed the hope that manufacturers as an independent body, and the retailers as an independent body, would co-operate for the common good. "They want our support," he said, "and we want theirs in fighting the parasitic excrescences which have attached themselves to the trade. With goodwill and co-operation between the repsentative associations of the different sections of the industry, and the determination of each organisation to give not only its moral, but so far as is possible, its active support to the other, it is my firm conviction that the trade may be made both an honoured and a lucrative one."

Foreign Orders at Radio Exhibition.

Reports of business done at the National Radio Exhibition in London are generally satisfactory, the high percentage of overseas orders being a noticeable feature. A Kenya Colony order was taken for a receiving set to pick up London broadcast programmes, and Indian inquiries included one for a nine-valve super-heterodyne set, similar to two already in use in Lucknow, on which English stations are heard.

Other countries from which orders have been taken at Olympia include Australia, New Zealand, Egypt, Portuguese East Africa, Portugal, France, Germany, Holland, Sweden and Finland.

Wireless News in Brief.

The International Radio Traders' Association will hold an exhibition at Amsterdam from October 2nd to 11th.

Complaint has been made to the Hungerford R.D.C. that tenants of council houses are damaging the property by boring holes through steel casements for leading in aerials.

The British Commercial Secretary at Prague states that the number of wireless receivers in operation in Czechoslovakia totals some 115 000, of which 80 000 are situated in Prague.

In the Limburg coal mines M. Corver has recently succeeded in sending and receiving intelligible signals by wireless telegraphy through the earth. The wave lengths employed varied from 30 to 50 metres, and it was found that communication was more satisfactory in a lateral than in a perpendicular direction.

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COMPANY NEWS.

Demand for Bournemouth and Poole Shares a Feature—Rises in London Supply Descriptions—Improvements in Traction Quotations.

THE feature of the electrical share market during the past week has been the demand for the ordinary £1 shares of the Bournemouth and Poole Electricity Supply Company, the official quotation for which has consequently been advanced to £3 from last week's figure of under 57s. City of London preference are sixpence better, and Kensington and Knightsbridge £5 shares are 5s. higher at 13¾. British Electric Traction stock is now over 140, and the £10 shares of the Underground Electric Railways Co. of London at 3⅞ show an improvement of half-a-crown. Among manufacturing shares, Callender's ordinary are 7½d. up, but Ericsson preference and Siemens ordinary are each 7½d. lower. Telegraph Construction £12 shares have improved 10s.

Last Annl. Divd.	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
%	**Electricity Supply.**				
10	Brompton & Kensington Ord.	31/3	31/3	45/-	24/-
4	Central Elec. Supp. 4% Deb..	90	90	100	67
15	Charing Cross Elec. Ord. (£1)..	44/4½	44/4½	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-*	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	49/4½	49/4½	52/6	20/3
6	,, ,, 6% C.P. ..	23/-	22/6	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	58/1½*	59/4½	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	13¾	13½	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	32/-	32/-	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	36/10½	36/10½	41/6	8/-
4½	,, ,, 4½% C.P...	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	22/6	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord (£5) ..	16½	16½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	43/9	43/9	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
	,, ,, 6% C.P...	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	140½	139½	123	24
6	,, 6% Pf. Stk.	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69	69	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	78½	78½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	50½	50½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	78½	78½	89	65
4	Lon. Un. Trams. 1st Deb. ..	47	47	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	64½	64½	101½	49
5	,, ,, 5% Deb. ..	68½	68½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	62	62	84½	19
3½	,, 3½ Pf. Stk.	63½	63½	88½	40½
3½	,, 3½% Deb.	69½	69½	92½	51
3½	Met. Dis. Rly. Ord. Stk. ..	51½	51½	58	12½
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb.	65	65	73½	48½
—	Underground Elec. Rlys. Ord.(£10)	3¾	3¾	5½	21/3
3	Yorks. (W.R.)Trams. Ord. ..	11/6	11/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	70/*	68/9	62/-	26/6
6	,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	23/-	23/-	23/4	19/7½
7	,, ,, 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	26/3	26/3	29/-	10/-
‡15	Callender's Cable Ord.	66/10½	66/3	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref...	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)..	12/9	12/9	28/9‖	1/11
7½	,, ,, 1st Pref...	21/3	21/3	26/-	5/-
10	Elec. Construction Ord. ..	31/10½	31/10½	30/4	6/7½
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	16/3	16/3	29/3	7/3
6	,, ,, 6% C.P... ..	18/-	18/-	21/3	10/6
—	Ericsson Telephones 7% Pref.	21/3	21/10½	21/-	12/7½
6	Ferranti 6% Pref.	19/4½	19/4½	18/6	16/9
7	,, 7% 2nd Pref... ..	18/-	18/-	19/-	13/9
5	,, 1st Mort. Deb. Stock..	91½	91½	96½	80½
7½	General Elec. Ord.	30/9	30/9	59/-	13/6
20	W. T. Henley's Ord.	82/6	82/6	86/6	23/3
17½	Johnson & Phillips Ord. ..	66/3	66/3	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	25/7½	25/7½	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	47/6	47/6	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	31/3	31/10½	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	29½	28½	56/2/6	19½
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	75	75	87½	60
10	Eastern Ord. Stk.	190½	189½	213½	113/2/6
3½	,, 3½% Pref. Stk.	65½	65½	84/17/6	49
4	,, 4% Deb. ..	79½	79½	103½	60
10	Eastern Extension Ord. (£10)..	10½	10½	21½	10/12/6
4	,, ,, 4% Deb. ..	78½	78½	97½	60
22	Gt. Northern Telegraph (£10)..	27½	27½	42/12/6	19
‖10	Indo-European (£25)	47½	47½	59½	25
—	Marconi's Wireless T. Ord. ..	13/6	15/-	9/16/3	20/9
7½	,, Int. Mar.	20/-	20/-	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	18½*	18½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	78½	78½	10	60/2/6

* Ex dividend. ‡ Plus share bonus.
¶ Plus 3 p.c. in respect of 1921. ‖ Including bonus.

WESTERN UNION TELEGRAPH CO.—Regular quarterly div. of $2 is announced.

BRITISH ALUMINIUM CO., LTD.—Intm. div. 4 p.c. actual, less tax, on ord. shs., payable October 1st.

DIRECT SPANISH TELEGRAPH CO., LTD.—Intm. div. 4 p.c., tax free, on ord. shs., payable October 1st.

WARD AND GOLDSTONE, LTD.—Intm. div. 7 p.c. per annum on cum. participating pref. shs., payable September 30th.

FOLKESTONE ELECTRICITY SUPPLY CO., LTD.—Div. at rate of 8 p.c. per annum, tax free, on ord. shs. for half year, payable October 1st.

OFFICIAL QUOTATION.—The Stock Exchange Committee has ordered 500 000 £1, fully paid, ordinary shares of Electrical Distribution of Yorkshire, Ltd., to be quoted in the Official List.

CLARKE, CHAPMAN AND CO., LTD.—Dirs. have, with regret, informed shareholders that, owing to general strike, continuance of coal strike and present uncertain conditions, they are unable to declare intm. div. on ord. shs.

CITIES SERVICE CO.—The company has acquired control of the Lake Shore Power Co. and the Toledo and Indiana Interurban Co. These properties are in the vicinity of Toledo, and they will come under the direction of the Toledo Edison Co., a Cities Service subsidiary. With this acquisition the Toledo Edison Co. will supply power to practically all towns and villages within a radius of fifty miles of Toledo. The Lake Shore Power Co.'s capital consists of $500 000 in shares of pfd. stock., 10 000 shares of no par value, common stock, and $1 278 000 in bonds.

DUNDEE, BROUGHTY FERRY AND DISTRICT TRAMWAYS CO., LTD.—Mr. Geo. Balfour, M.P., presiding at the meeting in Dundee last Friday, said that in Dundee and district, as elsewhere, the trade depression had been aggravated during the last three months under review by the general strike and the coal strike. The result had been a reduction in the number of passengers carried. The directors had not made any offer to sell the undertaking, but they were willing to consider any offer. An ordinary dividend of 7 per cent. for the year was approved.

EAST ANGLIAN ELECTRIC SUPPLY CO., LTD.—Mr. F. Massingberd Rogers, presiding at the annual meeting last week, said there was a surplus of £8 536, out of which it was proposed to place £6 000 to general reserve and to pay a dividend of 5 per cent. per annum on the ordinary shares. Within the last few months they had been accorded statutory powers for the supply of electricity in the areas around Braintree and Sudbury. In addition, they contemplated applying for similar powers in other areas in Norfolk, Suffolk, and parts of Essex, which were not at present covered by any authorised undertaking. Up to March 31st, 1926, the electricity sold was 1 009 556 kWh., and at that date the company had 3 250 consumers. The report was adopted and the dividend approved.

BURNDEPT WIRELESS CO., LTD.—A meeting of pfd. ord. shareholders will be held on September 28th to consider a resolution for the issue of £50 000 in £100 debentures at 7 p.c., redeemable on June 30th, 1929, at £106, or, at the option of the company, before June 30th, 1928, at £103. The directors state that unless a further sum be raised at this juncture the board will be unable to make proper provision for essential expenditure and so take advantage of the business which now lies before the company. The only secured creditor of the company and the only creditor who would stand before the debenture holders, is the company's bank, and the company will covenant with the debenture holders that they will not borrow from the bank any sum in excess of a total of £60 000, or create any prior charge.

New Companies.

H. W. HUNTER AND SON, LTD.—Cap., £35 000. Electricians, etc. Reg. office: 110, Leith Street, Edinburgh.

SHERREN, LTD.—Cap., £1 000. Electric light contractors, etc. Solicitor: H. W. Aldriche, 5, Arundel Street, London, W.C.2.

SKY SIGNS, LTD.—Cap., £1 500. To acquire sites for displaying electrical signs, etc. A director: W. T. Williams, 35 Claude Road, Cardiff.

ARNOLD WILLIAMS AND CO., LTD.—Cap., £100. Electrical and general engineers, etc. A director: A. Williams, 9, Cadogan Gardens, London, S.W.1.

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LIVERPOOL HARDWARE CO., LTD.—Cap., £1 000. Dealers in electrical fittings and accessories, etc. Solicitors: Yates, Norton, Clare and Higgins, 41, North John Street, Liverpool.

HIGHGATE CABLE AND ENGINEERING CO., LTD.—Cap., £1 000. Manufacturers of electric cable plant, metal workers, etc. Solicitor: C. A. Thompson, 18, Ironmonger Lane, London, E.C.

RICHFORD SUPPLIES, LTD.—Cap., £500. Manufacturers of and dealers in electric accumulators and batteries, etc. Solicitor: M. W. Prentis, 68, Lincoln's Inn Fields, London, W.C.2.

LUEN ELECTRICAL SUPPLIES, LTD.—Cap., £1 000. Manufacturers of and dealers in electrical equipment and appliances, etc. Solicitor: C. A. Thompson, 18, Ironmonger Lane, London, E.C.

COWELL, WYATT AND CO., LTD.—Cap., £1 500. To acquire business of wireless and electrical engineer carried on by Arthur Lee, trading as "Cowell, Wyatt and Co.," at 47, Abington Street, Northampton.

PHONODEX, LTD.—Cap., £100. Manufacturers, distributors, selling agents for appliances for use with telephone installations or telephone equipments, etc. Reg. office: 10–12, Copthall Avenue, London, E.C.2.

LONDON RADIO MANUFACTURING CO., LTD.—Cap., £1,000. Manufacturers, merchants, factors and sales agents of radio and wireless instruments, fittings, apparatus, etc. Reg. office: 61, Borough Road, London, S.E.1.

BARLBOROUGH ELECTRIC SUPPLY CO., LTD.—Cap., £3 000. To carry on at Barlborough and elsewhere the business of an electric lighting and supply company, etc. Reg. office: Beechwood House, Barlborough, near Chesterfield.

SMALLS, LTD.—Cap., £500. Manufacturers of and dealers in mica and insulating apparatus and materials, wireless, electric, magnetic, telegraphic, telephonic and other appliances, electricians, etc. Reg. office: 178, Aston Road, Birmingham.

CHAS. E. BEDAUX, LTD.—Cap., £2 250. To promote the use and application of the Bedaux principle of human power measurement, to carry on the business of mechanical and electrical engineers, etc. Solicitors: Linklaters and Paines, 2, Bond Court, Walbrook, London, E.C.

EUROPEAN INDUSTRIAL AND ENGINEERING ASSOCIATION, LTD.—Cap., £20 000. Capitalists, financiers, promoters, concessionaires, bankers, merchants, exporters, importers, shippers, general engineers, generators and storers of electricity, etc. Reg. office: 2, Queen Street Place, London, E.C.4.

BRITISH HOME AND OFFICE TELEPHONE CO., LTD.—Cap., £10 000. Manufacturers of and dealers in and erectors and maintainers of installations, instruments or plant used in connection with telephones and telegraphs, and other electrical apparatus, etc. A first director: F. R. Baldock, Angleside, 93, Downs Court Road, Purley, Surrey.

LODGEN, LTD.—Cap., £300. To acquire from Sir Oliver J. Lodge, E. E. Robinson and M. M. Melinsky the benefit of certain inventions; to acquire patents relating to the development or improvement of telegraphy or telephony or wireless telegraphy or telephony or any electric or similar science or art, etc. Reg. office: 4, Copthall Chambers, London, E.C.2.

PRIORSELLS, LTD.—Cap., £1 200. To acquire benefit of certain patent rights and of certain applications for letters patent, to establish electrical appliances and apparatus, including erection and maintenance of stations, equipment and apparatus for the transmission or receiving of signals by means of radio action, land lines, cables, etc. Reg. office: 65, Cannon Street House, 110, Cannon Street, London, E.C.4.

Appointments Open.

Brief Particulars of Positions Open to Electrical Men.

A METER tester and repairer is required in the Works and Building Department, Air Ministry, Iraq. Applications to Secretary, Air Ministry (W.B.5), Kingsway, W.C.2.

London County Council invites applications for the position of electrical engineer in its Tramways Department. Salary £1 200 (subject at present to temporary additions), rising to £1 500.

An assistant electrical engineer is required on the Bombay, Baroda and Central India Railway. Particulars are obtainable from the Secretary, Mr. S. G. S. Young, 91, Petty France, Westminster, S.W.1.

A resident assistant engineer and clerk of works, qualified to take charge of a power station, is required for the Severalls Mental Hospital, Colchester. Applications should be made to the Medical Superintendent.

Telephone maintenance inspectors, not over 25 years of age, are required by the Shanghai Mutual Telephone Co., Ltd. Applications should be sent to Preece, Cardew and Rider, 8, Queen Anne's Gate, Westminster, S.W.1.

Applications are invited for the post of senior lecturer in electrotechnics at the University of the Witwatersrand. Forms of application from the Secretary, Office of High Commissioner for the Union of South Africa, Trafalgar Square, London, W.C.2.

SPECTACULAR FINANCE.

Big Scheme for Amalgamation of Light, Power and Traction Undertakings.

M. A. Loewenstein, the Belgian financier, who is said to have offered to the Belgian Government a loan of £10 000 000, and is also credited with the promotion of a scheme involving a capital of $50 000 000 for electric light, power, and traction developments in Barcelona, Mexico and Brazil, was very successful in evading representatives of the Press during his stay at the Ritz Hotel (London) last week.

A representative of THE ELECTRICIAN who called at the hotel shared the common experience of finding M. Loewenstein invisible, but was informed by one of his secretaries that the preliminary company for the flotation of the new Canadian company, the Hydro-Electric Securities Corporation, has been registered.

Our representative was also informed that resolutions will be considered at a meeting of the Cellulose Holdings and Investment Co. to-day (Friday) to increase the capital from £55 000 to £500 000, and to change the company's name to the International Holding and Investment Co. As M. Loewenstein is the chairman of this company it is presumed that its expansion is to assist in the capitalisation of the intended electrical developments abroad.

An article, emanating from Toronto, and which appeared recently in a financial contemporary, states that through Sidro (the Société Internationale d'Energie Hydro-Electrique) M. Loewenstein now controls the Barcelona Traction Co. and the Mexico Tramways and Mexican Light and Power companies, and it is these companies, with the Brazilian Traction, Light, and Power Co., which it is proposed to consolidate into one trust. Their aggregate capital is over £80 000 000, apart from that of the Sidro Co.

Metal and Chemical Prices.

TUESDAY, September 21st.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£64 15 0	—	5s. 0d.
Electro Wirebars	,,	£67 0 0	—	—
H.C. Wire, basis	per lb.	9⅝d.	—	—
Sheet	,,	9 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 1⅝d.	—	—
Brass 60/40—				
Rod, basis	per lb.	7½d.	—	—
Sheet, basis	,,	9⅞d.	—	—
Wire, basis	,,	10¼d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£4 16 0	1s. 6d.	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£13 10 0	—	10s. 0d.
Lead Pig—				
English	,,	£33 10 0	5s. 0d.	—
Foreign or Colonial	,,	£32 2 6	5s. 0d.	—
Tin—				
Ingot	,,	£312 10 0	£2 10 0	—
Wire, basis	per lb.	38. 11d.	½d.	—
Aluminium Ingots	per ton	£112 0 0	—	£8 0 0
Spelter	,,	£34 12 6	10s. 0d.	—
Mercury	per bottle	£16 0 0	10s. 0d.	—

Sulphur (Flowers)—Ton £11 10 0 *Sodium Chlorate*—Per lb. 3d.
,, (Roll-Brimstone)—,, £10 5 0 *Sulphuric Acid* (Pyrites, 168°)
Copper Sulphate— ,, £25 to £25 10s. per ton, £6 15 0
Boric Acid (Crystals) ,, £37 *Sodium Bichromate*—Per lb. 3½d.
Rubber—Para fine, 1s. 8d.; plantation 1st latex, 1s. 8½d. to 1s. 8¾d.

The metal prices are supplied by British Insulated Cables Ltd.

The Lead Market.

Battery Manufacturers Reported to be Fully Employed but not Buying Largely for Future.

IN their lead market report dated September 18th, James Forster and Co. state that there is little change in the general position. Home consumers, particularly battery manufacturers, are fully employed, but few of them have covered their future requirements, preferring to continue a "hand to mouth" policy of buying.

Supplies on the other hand are none too plentiful and any prompt lead available commands a premium. Some lead from Australia is due next week, which will relieve the position temporarily.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BARLOW AND REDRUTH, LTD., Union Street, Wolverhampton, electrical contractors. £14 3s. 7d. August 18th, and £10 15s. 1d. August 20th.

BOSTON WIRELESS AND ELECTRICAL CO., LTD., 191, Chapel Street, Salford, wireless engineers. £11 10s. 6d. August 6th.

ENGLISH ELECTRIC WIRING AND FITTINGS CO., 161, West Street, Sheffield, electrical engineers. £22 7s. 6d. July 29th.

JOHNSTONE, Robert, Market Place, Radcliffe, electrical dealer. £26 12s. 11d. August 4th.

KEMP, Mr. J. T., 13, Derby Road, Nottingham, electrical engineer. £15 2s. August 11th.

OWEN BARNES AND CO., 26, Buckingham Gate, S.W., electrical engineers. £19 12s. 5d. August 6th.

WHITFIELD ELECTRICAL CO., LTD., 357, Caledonian Road, King's Cross. £15 8s. 1d. August 14th.

WEST SCIENTIFIC APPARATUS CO., LTD., Premier Place, High Street, Putney, wireless factors. £11 8s. 2d. August 14th.

TYAS, H., AND CO., Swinton Road, Mexborough, electrical engineers. £17 12s. 4d. July 28th.

Bills of Sale.

HUXLEY, James, 9, Fairhaven Road, Bolton, electrical engineer Filed September 14, £30.

MILLER, George, 419, Holloway Road, Holloway, electrician. Filed September 14th. £45.

ODDY, Frederick, 20, Jupiter Terrace, Well Hall Road, Eltham, electrician. Filed September 20th. £50.

Deed of Arrangement.

BROWN, Reginald Duncombe, High Street, and Bridge Street, Halstead, wireless engineer. Trustees: G. S. M. Moger, Halstead auctioneer, and another. Liabilities unsecured, £351; assets, less secured claims, £316.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BRITISH GLOWLAMP AND VALVE CO., LTD., London, E.C.—Registered September 13th, £300 debentures; general charge.

CALLINGTON AND DISTRICT ELECTRIC SUPPLY CO., LTD.—Registered September 3rd, £1,000 debentures (filed under Section 93 (3) of the Companies (Consolidation) Act, 1908), present issue, £750; general charge. *Nil. June 4th, 1926.

ORFORD ELECTRIC LIGHT AND POWER CO., LTD. (Suffolk).—Registered September 3rd, £100 debentures and registered September 4th, £100 debentures, part of £7 500; general charge. *£6 710. December 31st, 1925.

Satisfaction.

MAWDSLEYS, LTD., Dursley, electrical engineers.—Satisfaction registered September 10th, £6 300, registered May 29th, 1907, May 10th, 1909, and September 28th, 1910.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*],

SEAGULL, LTD., wireless manufacturers, Regent House Kingsway, London, W.C. In this voluntary liquidation a meeting of creditors was held recently, when the liquidator submitted an approximate statement of affairs showing total liabilities £2 386, of which £386 was due to the trade, there was rent due amounting to £33, a bank overdraft of £14, and the balance £1 952 was due to unsecured loan creditors. The assets consisted of: cash at bank, £24; petty cash, £2; book debts, £58; stock, £224; plant, £87; tools, etc., £12; fixtures and fittings £30; lease of works, £30; lease of office, £32; share in B.B.C., £1—a deficiency of £1 884. The issued share capital of the company was £1 150, all of which was fully paid up. On August 19th a meeting of the shareholders was held and the position was fully discussed. Subsequently it was decided that the company should go into voluntary liquidation, and Mr. W. H. B. de M. Leathes was appointed liquidator.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Bankruptcy Information.

MASON, George, and TINSLEY, George Edward, trading as, MASON AND TINSLEY, 6, Alberta Terrace, Sherwood Rise, Nottingham, lately 94, Upper Parliament Street, Nottingham, electrical engineers. Receiving order, September 15th. Debtor's petition. First meeting, September 30th, 11 a.m., Official Receiver's offices, 4, Castle Place, Nottingham. Public examination October 7th, 10 a.m., County Court House, St. Peter's Gate, Nottingham.

Bankruptcy Proceedings.

BRITTAIN, Percival Frederic, trading as Brittain's Electric Motor Co., East Down Works, Dermody Road, Lewisham, S.E., and 110, Cannon Street, E.C., electrical engineer. The first meeting of creditors herein was held last week at Bankruptcy Buildings, Carey Street, W.C., before Mr. Walter Boyle (Senior Official Receiver. Debtor estimated his liabilities at between £2 000 and £3 000 due to about 50 creditors. He did not consider he was insolvent and attributed his present position to lack of ready capital due to industrial conditions. The business was a good one, as he had 500 good customers and a list of about 5 000. He valued his assets at more than £17 000, including cash, £50; stock in trade at Lewisham, £7 000; plant, tools, etc., at works, £5 000; fixtures and fittings, £500; book debts, £1 900, and household furniture, £1 000. A solicitor representing the debtor asked the creditors to adjourn the meeting in order that the debtor could approach his friends with a view to getting their help to pay the debts. The sum of £1 000 had already been promised. After some discussion the creditors agreed to an adjournment of the meeting until October 8th to enable the debtor to lodge his proposal. A resolution was passed for the continuance of Mr. Hodgson as Special Manager of the business.

PADGETT, Harold, and NICHOLSON, Arthur, trading as Padgett and Co., 218, Spring Bank, and 10, Beverley Road, Kingston-on-Hull, electrical and radio engineers. The receiving order in this matter was made on August 18th on debtors' own petition. The statement of affairs shows liabilities £722 against assets £189. The first meeting of the creditors was held on September 9th at the Official Receiver's Office, 37, Scale Lane, Hull. The following are creditors:—Barker, Robt., Hull, £33; Clark, H., and Co. (Manchester), Ltd., Manchester, £25; Dyson, J., Bradford, £194; Electric Fires, Ltd., Norwich, £10; Graham, Alf., and Co., London, £26; General Electric Co., Ltd., Newcastle, £13; Metro Vickers Supplies, Ltd., Manchester, £65; Mageris and Co., Hull, £25; Rothermel Radio Corporation of Great Britain, London, £25; Shenton and Co., Ltd., London, £23; Webster, S., and Co., Hull, £82; Wholesale Supply Co., Hull, £18.

WHITE, William, The Shielding, Bread Lane, Wheberley, near Coventry, wireless and electrical supplies factor. The first meeting of creditors was held on September 20th, the statement of affairs showing liabilities of £990 against assets of £33, or a deficiency of £957. Debtor attributed his failure to bad trade, and depreciation in value of wireless stock. It appeared that he commenced business as a factor in electrical supplies at 22, Much Park Street, Coventry, in October 1921. He stated that at that time he had a capital of about £100 consisting of cash saved, and in addition he obtained an advance of £100 from another. Debtor explained that it was intended that this person should join him in partnership, but no agreement was actually entered into, and in about two months from the commencement of the business, the gentleman left and regarded the £100 he had provided as a liability of the debtor. The amount, however, was still outstanding. Debtor stated that in March 1922 he gave up the Much Park Street premises and conducted his business, then mainly in wireless accessories, from his residence at Park Gate Road, Holbrooke, Coventry. In September 1923 he removed to Sovereign Road, Coventry, in March 1924 to Broomfield Road, Coventry, and in March 1925 to his present address. He admitted that he had been aware of his position since 1922. The case being a summary one was left in the hands of the Official Receiver as trustee of the estate. The following are creditors:—Cryselco, Ltd., Bedford, £18; Cleartron Radio, Ltd., London, £226; Cable Accessories Co., Ltd., Tipton, £32; Forum and Co., Birmingham, £40; Hestavox, Ltd., London, £117; Morris, J. R., London, £22; Metro-Vick Supplies, Ltd., Manchester, £117; Roberts, R., Birmingham, £22; Seasons, Ltd., London, £32; Smith, F. J., Birmingham, £25; Van Haden and Co., Ltd., Coventry, £200; Wineberg and Co., Birmingham, £30.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

243 794 G. W. Hale and Radio Engineering Co. Electrical condensers. (3/9/24.) (Cognate application 29 602/24.)
243 799 H. B. Irvine and H. Wooff. Automatic cut-out means for electric irons and the like. (4/9/24.)
243 800 E. Y. Robinson, C. R. Burch, and Metropolitan-Vickers Electrical Co., Ltd. Thermionic rectifier systems. (4/9/24.)
243 806 R. L. Cleaver (C. S. Harrison). Supporting of electric insulators. (4/9/24.)
243 807 W. H. Goodman and Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.) Means for connecting the insulating and metal parts of insulators. (4/9/24.)
243 815 Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.). Electric signalling systems. (6/9/24.)
243 818 C. Lindstrom Akt.-Ges., and F. Jokel. Sound-box diaphragms for use in telephones, loud speakers, acoustic apparatus, and the like. (8/9/24.)

A PRESSING MATTER.

HAVE you read—and acted on—the stop press information in No. 1 of the "Home Lighting News"?

243 828 A. Trafford. Portable electric lamps. (11/9/24.)
243 834 C. J. Beaver and W. T. Glover and Co., Ltd. Joints of electric cables. (15/9/24.)
243 839 A. W. G. Tucker and Ferranti, Ltd. Electric cable-connecting devices. (18/9/24.)
243 843 Mavor and Coulson, Ltd., and W. Lawrence. Switch mechanism and cable connections for electric motors. (29/9/24.)
243 852 Igranic Electric Co., Ltd., and E. A. Bitton. Fixed condensers, more particularly for use in connection with wireless telegraphy and telephony. (9/10/24.)
243 854 Dr. M. Hauser. Electric heaters and process for manufacturing same. (9/10/24.)
243 866 C. E. Foster. Electric switch or commutator. (21/10/24.)
243 868 Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.). Electron discharge devices. (22/10/24.)
243 873 Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd. (A. Nyman.) Electric condensers. (27/10/24.)
226 791 Forges et Ateliers de Constructions Electriques de Jeumont. Asynchronous electric motors. (27/12/23.)
243 894 L. W. Skogh (née Wahlgren). Electrically heated pressing or smoothing apparatus. (24/11/24.)
243 896 P. M. Edinborough and Metropolitan-Vickers Electrical Co., Ltd. Electric fires. (23/4/24.) (Cognate application, 10 572/25.)
243 900 J. Illingworth. Means for securing and locking electric lamps in position. (6/12/24.)
243 902 J. G. Kjellgren. Connectors for electrically bonding the rail joints in electric railways. (11/12/24.)
226 233 J. L. La Cour. Alternating direct current converter with wide voltage regulation. (15/12/23.)
227 824 Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.). Telephone systems. (19/1/24.)
243 918 W. O. Kensington. Electrical couplings. (12/1/25.)
234 442 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Filament for electric apparatus. (21/5/24.)
243 945 S. C. Price and Pressland Electric Supplies, Ltd. Coil holders for wireless purposes. (24/2/25.)
243 953 British Thomson-Houston Co., Ltd. (International General Electric Co., Inc.) Cores of compressed magnetic powder for induction coils and the like, and method of manufacturing the same. (13/3/25.)
231 167 Siemens-Schuckertwerke Ges. Meters for alternating current. (19/3/24.)
243 958 J. F. G. P. Hartmann. Electric jet-wave commutators and interruptors. (25/3/25.)
232 593 E. Haefely et Cie. Measurement of high alternating current voltages. (16/4/24.) (Addition to 221 495.)
243 969 L. N. Reddie (Pirelli and Co.). Cables for transmitting electrical energy. (16/4/24.)
230 827 W. Eshbach. Delay devices for electrical blasting fuses. (13/9/24.)
243 966 F. Cox. Shades or deflectors for electric lamps. (2/6/25.)
235 191 Neue Gluehlampen Ges. Incandescent electrical lamps. (3/6/24.)
236 582 International General Electric Co., Inc. Electric measuring instruments. (4/7/24.)
244 009 B. Hesketh. Variable electric condensers and the like. (3/7/25.)
241 865 Rheinische Metallwaaren-und Maschinenfabrik. Means for automatically interrupting the current in electric furnaces if a fault occurs in an electrode. (22/10/24.)
244 025 Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd. Telegraph signalling systems. (7/8/24.) (Divided application on 241 327.)
240 453 International General Electric Co., Inc. Electric rectifiers. (26/9/24.)
241 914 British Thomson-Houston Co., Ltd. Electric arc welding and apparatus therefor. (25/10 24.)
217 230 Dr. E. F. Huth Ges. Electric discharge devices such as thermionic tubes and the like. (5/6/23.)
244 136 J. D'A. Clark. Electrical connectors. (11/6/24.)
244 137 W. P. Durtnall. Closed circuit electrical regenerative motor systems. (12/6/24.)
244 139 E. Fiamma. Wireless distant control apparatus. (14/6/24.)
231 821 F. S. McCullough. Electric discharge tubes. (3/4/24.)

Applications for Patents.

August 30th.

21 371 Akt.-Ges. Brown, Boveri et Cie. Mercury vapour rectifiers. (17/5/26, Germany.)
21 324 F. Coates, and A. Reyrolle & Co., Ltd. Electric relays, etc.
21 316 W. G. Gall. Telephone receivers, etc.
21 336 H. E. Humphries and Siemens Bros. and Co., Ltd. Electric signalling.
21 337 H. E. Humphries and Siemens Bros and Co., Ltd. Key sets for telephone systems.
21 387 W. S. James. Wireless receiving circuits.
21 338 W. G. Patterson and Siemens Bros. and Co., Ltd. Automatic telephone systems.
21 296 E. M. Wildey. Electric hair combs.

August 31st.

21 449, and 21 448 J. Anderson. Electric switches.
21 450 J. Anderson. Electrical resistances.
21 459 Automatic Telephone Manufacturing Co., Ltd. (Automatic Electric Co.). Telephone systems.
21 432 British Thomson-Houston Co., Ltd. Electromagnetic operating means. (31/8/25, U.S.A.)
21 420 W. Cooper and Sykes and Dyson, Ltd. Electric distribution boxes.
21 444 N. R. Davis and Metropolitan-Vickers Electrical Co. High-frequency electric induction furnaces.
21 441 C. D. Melhuish. Wireless apparatus.
21 414 H. K. Parsons and I. H. Parsons. Insulators.
21 440 H. N. Swan. Vernier attachment for variable electric condensers, etc.
21 420 P. Sykes and Sykes and Dyson. Ltd. Electric distribution boxes.

September 1st.

21 568 D. E. Barnett. Electric plug-and-socket connectors, etc.
21 572 S. G. Brown. Electrical oscillation-amplifying apparatus.
21 587 A. Cameron and H. L. Kirke. Corrective circuits for electric oscillations.
21 548 Compagnie pour la Fabrication des Compteurs et Materiel d'Usines a Gaz. Electric relay. (19/9/25, France.)
21 527 F. Downes, W. D. Rogers, Siemens and General Electric Railway Signal Co., Ltd. Electric contact apparatus.
21 580 S. Hector and C. W. Smith. Electric inductance, etc., coils.
21 521 A. A. Harrison. Wireless receiving apparatus.
21 564 H. C. Jenkins and T. G. Nyborg. Electric switches, etc.
21 586 H. L. Kirke. Thermionic oscillation-generators.
21 581 Landis et Gyr Soc. Anon. Securing device for terminal box of electricity meters. (21/11/25, Switzerland.)
21 582 Landis et Gyr Soc. Anon. Electricity meters. (17/11/25, Switzerland.)
21 553 F. Matuscheck. Electric railway signalling devices.
21 486 A. E. Stokes. Electric hair waving tongs.

September 2nd.

21 641 British Thomson-Houston Co., Ltd. Remote control systems. (2/9/25, U.S.)
21 651 P. Emsley. Control devices for wireless apparatus, etc.
21 656 A. E. Heath. Inductance, etc., coils.
21 610 H. F. McLoughlin and Simplex Conduits, Ltd. Electric fuses.
21 627 J. J. Rowe. Holders for grid leaks of wireless apparatus.
21 673 J. F. de Tovaros. Sliding collectors for electric current.
21 598 M. Urbinati. Collectors for electric engines. (3/9/25, Italy.)

September 3rd.

21 790 American Resistor Corporation. Electrical furnaces. (3/9/25, U.S.)
21 791 American Resistor Corporation. Electrical heating apparatus. (3/9/25, U.S.)
21 800 H. Andrewes and Dubilier Condenser Co. (1925), Ltd. Means for controlling wireless receiving apparatus, etc.
21 684 D. R. Bateman. Double-acting electro-magnets.
21 709 F. J. Brislee, British Insulated Cables, Ltd., and G. H. Nisbett. Electric cables, etc.
21 735 British Thomson-Houston Co., Ltd. Regulating systems for dynamo electric machines. (3/9/25, U.S.)
21 736 British Thomson-Houston Co., Ltd. Electric relays. (14/9/25, U.S.)
21 737 British Thomson-Houston Co., Ltd. Lightning arresters. (14/9/25, U.S.)
21 738 British Thomson-Houston Co., Ltd., and C. J. Sarjeant. Multiple unit electric control.
21 730 R. L. Broadwood and A. D. Lacy. Wireless apparatus.
21 761 Creed and Co., Ltd., and R. D. Salmon. Telegraphic receiving apparatus.
21 744 D. R. Davies and Metropolitan-Vickers Electrical Co., Ltd. Electric outdoor switchgear and sub-station apparatus.
21 789 P. Fleischer. Method of utilising electric currents for promotion of plant growth. (26/11/25, Germany.)
21 745 E. J. E. Hubbard, Metropolitan-Vickers Electrical Co., Ltd., and E. Y. Robinson. Vacuum electric tube devices.
21 743 K. G. Maxwell and Metropolitan-Vickers Electrical Co., Ltd. Supporting electrical conductors within tubular insulators.
21 746 and 21 747 Metropolitan-Vickers Electrical Co., Ltd., and E. Y. Robinson. Vacuum electric tube devices.
21 729 L. W. Murkham and Rotax (Motor Accessories), Ltd. Combined tuning condenser and coils for wireless receivers.
21 678 J. J. Rowe. Condenser and grid leak for wireless apparatus.
21 795 Telefunken Ges. fur Drahtlose Telegraphie. Oscillation-generators. (11/9/25, Germany.)

September 4th.

21 805 F. J. Cooper. Electric armoured cable.
21 869 F. G. Creed and Creed and Co., Ltd. Telegraphic receiving-apparatus.
21 843 W. H. Grinsted and Siemens Bros. and Co., Ltd. Arrangements for measuring electrical quantities.
21 861 H. F. Herbig. Electric signalling.
21 844 H. E. Humphries and Siemens Bros. and Co., Ltd. Telephone systems.
21 822 H. B. Jackson. Electric kettles.
21 858 E. C. R. Marks (Williams Oil-O-Matic Heating Corporation). Electric controls.
21 824 I. E. Poyser. Secondary electric batteries.

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Friday, September 24th.

Birmingham Electric Club.—Grand Hotel, Colmore Row, Birmingham. Lecture on "Breaking Electric Circuits," by Mr. J. Anderson. 7 p.m.

Saturday, September 25th.

Association of Special Libraries Information Bureau.—Balliol College Oxford. Mr. R. Borlase Matthews, on "The Information Bureau."

Monday, September 27th.

Electrical Contractors' Association. (Ealing Sub Branch.)—Ordinary meeting.

Tuesday, September 28th.

Electrical Contractors' Association. (Birmingham Branch.)—Ordinary meeting.

Wednesday, September 29th.

Electrical Contractors' Association. (Croydon Branch.) — Ordinary meeting.
Electrical Contractors' Association. (Cardiff Branch.) —Ordinary meeting.
Electrical Contractors' Association. (Belfast Branch.)—5, Bedford Street, Ordinary meeting. 3.30 p.m.

Friday, October 1st.

Junior Institute of Engineers.—30, Victoria Street, Westminster. Inaugural meeting. Paper by Mr. L. Smith on "Notes on Transformer Testing and Test Plant Requirements." 7.30 p.m.

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THE ELECTRICIAN

ESTABLISHED 1861.

THE OLDEST WEEKLY ILLUSTRATED JOURNAL OF

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The Electrician.

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INDUSTRIAL HEATING.

THE principal task of the British electrical industry to-day is to wire more homes. It is proposed to achieve this object, as our readers know quite well, by pressing the advantages of electric lighting on a not by any means reluctant public. The means by which this is to be done are also well known; and we need only add that about 450 000 copies of the competition booklet have already gone out to electrical shops. We shall not therefore be over-optimistic in prophesying that before next week is very old the arrangement of electric fittings in the best possible way will have usurped the place of cross-word puzzles in the popular favour. Amid all this enterprise and enthusiasm it must not be forgotten, however, that there are other uses to which electricity can be put and certain fields of development which offer possibilities quite as encouraging as does the home. It is perhaps hardly necessary to add that we refer particularly to industrial heating. This is a field which has recently attracted a great deal of attention, and we hope all supply engineers and manufacturers will use it as a second string in the efforts they are making to increase their output. They must not rest until both home and industry are much more electrified than they are at present. Generally a good way of tackling any problem is to look at it all round. In this particular instance it will therefore be well to find out what the field for industrial electric heating is, and to what extent it can be developed. In other words, to adopt the advice given by several speakers at the I.M.E.A. meeting in Glasgow and undertake a survey, so that both what has been done and what remains to be done may be discovered. The main field for the application of industrial electric heating is obviously to be found in the metal-working industry; electro-chemical processes come a good second, while there are many other useful outlets, such as bread-baking, to mention only one, which fall into a third class. Electricity has also been successfully used for smelting and heat treatment, for baking japans and drying paint, for welding and for various subsidiary purposes, such as the heating of shoe machinery and gluepots. The field is therefore extremely wide and the results of cultivating it likely to be very satisfactory.

With a view to ascertaining exactly what was involved, the Edison Electric Illuminating Co., of Boston, undertook an industrial heating survey, some information regarding which has been kindly supplied to THE ELECTRICIAN by Mr. J. L. FADEN, the industrial heating engineer of the company. The potential heating load in a number of factories producing different classes of goods was worked out, and it was found that this was practically two-thirds of the existing power and lighting load. After this data had been secured each factory was studied separately and, where it appeared that electricity could be utilised to advantage, an industrial heating report was drawn up. Something of the same sort is urgently required in this country and it should be the first duty of the Electric Heating Conference which will, we hope, meet shortly, to put this work in hand.

As regards the present use of electricity for industrial heating purposes, Mr. FADEN gives some figures which are very encouraging, the more so as they indicate how rapid is the progress that is being made. Fifteen years ago electric steel furnaces hardly existed in the United States. But in 1925 practically 20 per cent. of all the steel produced in America was melted electrically and some 500 furnaces, with a load of 400 000 kW, were in operation. The potentialities for iron smelting are even better. The field is four times as large as that of steel, and it has hardly been touched, though 8 000 tons is being melted electrically every month. Progress with brass furnaces is good, there being 600 furnaces with a total loading of 58 000 kW now at work. It is estimated that 25 per cent. of this load operates for 24 hours a day. The importance of these figures for this country during the present coal crisis can hardly be over-estimated. The iron and steel industries of Great Britain are for the moment badly stricken and much work of the greatest national importance is held up. That happens in every coal strike. Nothing should therefore be neglected to draw the attention of iron and steel manufacturers to the fact that a substitute for coal exists whose advantages merit their close consideration.

Heat treatment is another most important division of industrial heating, and one in the conduct of which electricity has special claims to attention. Whether it be for annealing, tempering or carburising, electricity can be employed in one or other type of furnace. Using electricity in this way has the advantage that the process is continuous, the temperature is automatically controlled, the results are uniform and reproducible, little attendance is required and the after-treatment is reduced to a minimum. Electricity, though not cheap in itself, definitely leads to

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a saving on other items. This is indicated by the fact that when a certain furnace in Boston was changed over from oil to electric heating the fuel costs were raised from $2.4 to $6.12 per ton, but, on the other hand, $11 000 per annum was saved on labour, sand blasting, annealing boxes, machine tool cutters, maintenance and material.

The points made by Mr. FADEN are confirmed by Mr. J. H. CROSSLEY in the article which we publish on another page of this issue. He calls special attention to the employment of electricity for baking, an application which will certainly increase if only because of the excellent conditions that it renders possible in the bakehouse. In this connection we are glad to learn that propaganda is beginning to bear fruit, and the testimony which he gives from the bakers themselves as to the reliability and efficiency of the electric ovens is most gratifying. Mr. CROSSLEY also deals with the subject of what may be called industrial baking—that is, ovens and furnaces for such purposes as baking armatures, hardening hacksaw blades, curing rubber, annealing springs and stoving enamel. The advantages of using electricity for these purposes are no less great than in any other field.

Not the least important application of electric heating is welding, both because of the reliability of the work it produces, and because its field of application is almost universal. Electric welding saves labour and cost and results in a better product than any other method of fastening. It is not surprising to learn therefore, as Mr. HULLUS points out, that other methods are being gradually eliminated from the workshop. Financially the results are highly satisfactory and at the same time there is less waste, a more uniform structure and the costs of inspection, finishing off and machinery are reduced. A very strong point is that worn parts can be built up and that repairs effected in this way give results that are equal to new.

Enough has been said to show that the industrial electric heating field is one which will well repay exploration. It remains to convince electrical engineers of this and to ensure, as Mr. CROSSLEY suggests, that at least one engineer in every supply undertaking shall be familiar with the fundamentals of the design of electric heating apparatus. The reason for this is clear. A study of the subject will convince anyone how much there is to do, while familiarity with it will not only lead to the discovery of fresh applications, but will ensure that certain pitfalls are avoided. Mr. CROSSLEY calls attention to one—the need for care in converting crudely insulated fuel-fired ovens to electrical operation.

Current Topics.

The British Magneto Industry.

TWELVE years ago the demand for magnetos in this country was met almost entirely from German and, to a lesser extent, from American sources. Attempts were, it is true, being made to remedy this state of affairs, but without much success, mainly, it must be admitted, owing to the excellence of the rival product. Now all that is changed, and a visit to the works of the British Thomson-Houston Co. at Coventry last week, to which we shall refer in more detail in a later issue, indicated that not only have we nothing to learn on the technical side from foreign competitors, but that we have succeeded in capturing and retaining a market. Long may we continue to do so. As has often been pointed out, British engineers are generally pioneers, but too often their work, as in the case of the motor car, has been taken more advantage of elsewhere than at home. With magnetos the reverse has been the case. For following the fundamental of discoveries of FARADAY most of the work of development was due to BOSCH, and though there is no doubt that his ideas have been improved upon, Mr. A. P. YOUNG was well advised to point out that we owe a great deal to him. In these days, however, excellence of design is insufficient without organised production and energetic selling. The Coventry works of the British Thomson-Houston Co. show that much attention has been given to these points. The system employed may be termed continuous flow production, as it ensures the needful output and allows for the checking of the raw material and the various parts, both as regards quantity and quality, at each stage in the process. The results leave nothing to be desired.

The Bill Again.

WHEN Parliament reopens in November one of the principal items of business will be to dispose of the Electricity Bill. This, it is obvious, will not be effected without a fight, though much of the opposition is strident rather than weighty. During the recess the measure has received the attention of various bodies, and in some cases resolutions objecting to the policy laid down in it have been passed. These indicate a spirit of conservatism which is not altogether encouraging, when it is remembered that the progress of British commerce depends on broadness of outlook and an opportune adoption of every improvement. A typical resolution was that brought forward by the Leeds Chamber of Commerce at the annual meeting of the Association of British Chambers of Commerce last week. This expressed apprehension of the Bill, even as amended, Mr. H. LUPTON remarking that the only way of stopping a bad measure was to prevent its third reading. Fortunately, this sweeping statement was effectively countered by Mr. ARTHUR NEAL, who, it will be remembered, was Parliamentary Secretary of the Ministry of Transport when the 1919 Act was passed, and finally the resolution was referred to the Executive Council for consideration. The point that this body should consider is this: Electrical development in this country is slower than it should be owing to past mistakes. Are these mistakes to remain unrectified or is the opportunity to be taken to remedy them and so leave the way clear for progress at an accelerated rate? It is possible to do that now at the cost of some disturbance. But the longer the delay the more impossible will any change become.

Lighting Restrictions.

AN important statement on what may and may not be done under the present lighting restrictions has been drawn up by Mr. F. W. CABLE, lighting controller to the Westminster City Council. This may be considered to represent the views of the authorities on the subject. All lighting in shop windows during the daytime is forbidden except in most exceptional cases, where it is necessary to conduct a particular class of trade such as the exhibition of gems. For this a special permit is required. Shop window lighting after dark must be confined to the minimum number of lights necessary to conduct the business, and *in no case must any light be used when the shop is shut or in the daytime*. Sky signs and other lights used for the purpose of display or advertisement are forbidden. The electrical industry has therefore to consider how far these regulations fulfil the desired object of saving coal, and whether, considering the importance of the Home Lighting campaign to their prosperity, representations should not be made to get them relaxed. There will be general agreement that the saving is small. As it is, shop window lighting and sky signs are *mainly* an off peak load, and could be made so entirely. At the same time, it is clear that every effort should be made to encourage trade so that when the coal dispute is settled a real advance may take place without delay. Without considering the baleful effect of such restrictions on electrical propaganda therefore, a strong case seems to be made out for the interpretation of the regulations in a more broadminded way.

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Electrical Refrigeration.

On another page of this issue Mr. Raymond J. Mitchell deals with the important subject of electrical refrigeration, indicating the physical processes that are employed to reduce the temperature of the refrigerating chamber to a level which prevents bacteria from contaminating food. The subject is an important one, for, as we have already pointed out, at the beginning of next year the Ministry of Health regulations, which forbid the use of food preservatives, will come into force, and a new field will be created for the electrical industry to develop. From the manufacturer's point of view the problem, as Mr. Mitchell remarks, is to produce an airtight compartment in which foodstuffs may be stored at a temperature of about 40 deg. F. or less, the mechanism of the system being entirely automatic and operated electrically. The principle employed is that of heat absorption by evaporating a liquid, sulphur dioxide being the most convenient medium for small plants, and of recondensing and abstracting the heat from the refrigerant, so that it can be expanded and used again. To carry out this procedure involves some interesting technical problems, which Mr. Mitchell discusses, the most important being the avoidance of leakage and the provision of proper insulation. Electrically the problem is simple, but supply engineers should note that the load factor is good though the load is small, and that in this country, where the extremes of temperature are not great, it should be possible, without reducing the efficiency of the process, for it to come off the peak.

"Best Sellers" in Home Lighting.

If Mr. W. E. Bush is not the Commander-in-Chief of the Army which is fighting and going to win the Home Lighting Campaign, he is at least one of its most important staff officers. A contribution from his pen is therefore welcome at the present time, the more so as he discusses the need for "arranging a special sale of electrical ironmongery," so that we can start afresh on new and better lines. For the proportion of houses in this country which use electricity is not only low, but many of the fittings that are employed are obsolete, ugly and inefficient. In fact the public do not understand what an important factor lighting is in the furnishing of their homes, or that the principal difference between good and bad lighting lies in the use of sensibly designed fittings and shades so as to obtain a pleasing and comfortable illumination. To prove that this ideal is not incapable of attainment, he goes through the house room by room, and indicates how it should be lighted and the fittings that are available for the purpose. This sounds almost like a solution of the competition, and it is fortunate for the thousands of other competitors that Mr. Bush is disqualified. We feel sure, however, that no one who does not read his article has the slightest chance of winning.

Exhibition Houses.

One of the most gratifying things about the Home Lighting Campaign is the energy that is being thrown into the task of bringing it to a successful conclusion. Over 100 circles have already been formed, and we hear that a large proportion of these have got down to the important task of organising one or more exhibition houses within their areas. As Mr. W. F. T. Pinkney points out in the article we publish elsewhere in this issue, there is probably no such ground of common interest to humanity as the home, and houses furnished and equipped for exhibition therefore exert a greater attraction than any other form of display. This statement is based on Newcastle experiences, of which Mr. Pinkney gives readers of The Electrician the benefit in some detail. He deals with all the points that the organisers of such an exhibition must consider, including securing the house, publicity, staff and staff work demonstration, equipment and dealing with the consumer. The latter is most important, and contact should be established by inspiration rather than injection. The visitor should be shown what there is to see and the salient points in the display emphasised, but she should then be allowed to go away and think it over. Second thoughts are often the best. In the case of the electric house they have the merit of being the same as the first. That is—it is worth while from the point of view of comfort and convenience to instal as much electrical equipment as possible. This view should be amply confirmed during the coming months.

Electric Heating and Coal.

Though in common with other trades the coal dispute is causing the electrical industry considerable inconvenience and expense, there is no doubt that its ultimate effect will be beneficial. There can be few electrical engineers who, either in their public or private capacity, have not, during the past few days, received inquiries as to the feasibility of using electricity instead of coal for heating the home. The interesting thing about these inquiries is that those who make them are convinced that in most areas and at present prices it will be cheaper to employ the former rather than the latter fuel for the purpose. This is an attitude that should be encouraged. We say this not because we believe that in deciding whether electricity should or should not be introduced into the home, price should be the sole determining factor, or because we believe that the relative prices of electricity and coal will remain the same as they are at present. But because we believe that when the householder has once found how convenient and adaptable electric heating is, he, and still more she, will not willingly do without it. The "Home Lighting Campaign" is not the only force which is working at present on the electrical side, and its capabilities should be employed to the fullest extent.

Latest News from the Front.

The opposing forces are both in battle array, and will meet within the next few hours. The electrical army has a plentiful supply of ammunition and an intensive barrage will commence at zero hour. The troops are in excellent fettle, and are confident of victory. Everything is being done to stimulate their enthusiasm and to counteract the effects of guerilla warfare and non-combatant snipers. These are more irritating than dangerous. They cannot influence the result. Outpost forces, or circles as they are called, have been established all over the country, and close connection is being maintained between them and the divisional headquarters. Army Corps' commanders have visited every part of the front, and assure us that every precaution has been taken to maintain a victorious advance. Propaganda is being energetically employed to weaken the enemy's forces, and enormous numbers of secessions to our side may be expected at any moment. The watchword is "No House without the Electric Light."

O! Pioneers.

Pioneers seldom receive credit for the work they have done for the good of humanity, and they must therefore generally be content with the inward glow of satisfaction which follows the adoption of their ideas by others. During the last few days the papers have been full of Mr. Henry Ford's astounding enterprise in establishing a five-day week in his factories. This step forward is generally regarded by our contemporaries as something new, but we recall that it is now eight years since the same system was started by Messrs. Benn Brothers, greatly to the benefit of their employees. Mr. Ford therefore is only following where we have led, and we hope his policy and ours will soon be more widely recognised as being the one in these modern times that should be followed because it is beneficial.

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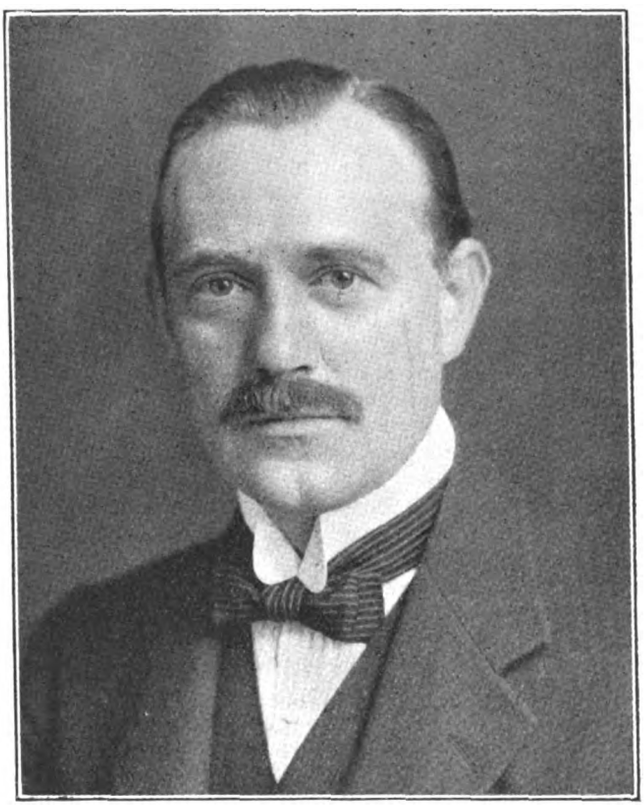
THE NEW PRESIDENT.

Dr. W. H. Eccles, F.R.S.: An Appreciation—Pioneering Work in Radio Communication—The Triode Valve and Mechanical Vibrations.

DR. WILLIAM HENRY ECCLES, F.R.S., who assumes office as President of the Institution of Electrical Engineers to-day, is the first purely wireless head that the Institution has had since Mr. W. Duddell occupied the chair in 1912–1914. With his devotion to the subject of radio-transmission, a subject which he has done much to illuminate and which has justly brought him a good deal of fame, has gone an almost equal devotion to the cause of education. At one period in his career indeed he oscillated between the two, though perhaps it is not too much to say that circumstances over which he has had no control will force him in future to pay more attention to the former. Dr. Eccles's biography is not an easy one to write. He has not made any of those spectacular discoveries, which are at once the joy of the journalist and would entitle him to admission to the serried ranks of those who have "invented" wireless. But his life has been one of useful and persistent effort, and his election to the presidency is a fitting recognition of what he has done.



Dr. W. H. Eccles, F.R.S., who becomes President of the Institution of Electrical Engineers to-day.

Becoming biographical we may begin by saying that William Henry Eccles was born in Furness near the Cumberland border in 1875, and received his early education at private and secondary schools at Barrow. His father was a structural engineer, and it is not, therefore, surprising that between leaving school and entering college his son spent some time in absorbing information on foundry work, forging and structural engineering. This pleasant method of education came to an end in 1894 when he entered the Royal College of Science, London, where for five years he specialised in physics and advanced mechanics. During the same period he also attended electrical engineering courses at the City and Guilds Central Technical College.

At the end of 1899 began Dr. Eccles's first connection with wireless. In that year he joined the Wireless Telegraph and Signal Co., a concern formed to develop Mr. Marconi's inventions, and he shortly afterwards commenced his scholastic career by becoming a demonstrator in electrical engineering and physics at the South-Western Polytechnic, Chelsea, where, later, he was appointed head of the department in physics and mathematics. In 1911 he became University Reader in Graphic Statics and lecturer in Structural Engineering at University College, London.

Meanwhile, however, he had kept touch with science and invention in wireless telegraphy by a series of researches published between 1905 and 1912 in the "Proceedings of the Royal Society," THE ELECTRICIAN, the "Journal of the Institution of Electrical Engineers," the "Proceedings of the Physical Society," the "Philosophical Magazine," and other journals. Much of this work was carried on in a private laboratory at the bottom of the chimney stack of the L.C.C. pumping station near Victoria Bridge, from the top of which descended, at different times, various fantastic forms of aerials. Other investigations were carried out during sea voyages, or on behalf of wireless firms.

When the war began Dr. Eccles was in Sydney, and shortly after returning home he became adviser to the Army Council on wireless matters. In 1915 he became a voluntary worker for the Board of Invention and Research of the Admiralty, and was employed on anti-Zeppelin devices and various forms of signalling. In 1916 he was appointed to succeed the late Prof. Silvanus P. Thompson in the Chair of Electrical Engineering at Finsbury Technical College. As the number of students decreased, owing to war conditions, the College Committee in 1917 offered the use of the laboratories to the Admiralty. An Admiralty staff was appointed and Dr. Eccles was made Honorary Director and tested many new anti-submarine and signalling methods and contrivances.

After the war the college returned to its normal functions, and in 1919 Dr. Eccles became Dean. In the same year he helped the late Mr. C. H. Wordingham, the President of the Institution of Electrical Engineers, to form the Wireless Section of the Institution, and became its first Chairman. He was also elected a Member of Council in 1919 and served as a Vice-President from 1920 to 1923. During these years he also acted as consultant to various wireless telegraph firms, to the Pacific Cable Board and other cable companies. In 1920 he became Vice-Chairman of the Wireless Telegraph Commission under Lord Milner as Chairman, a body, which it will be remembered, advised the Government on imperial wireless construction. He was later responsible, with the Engineering Department of the Post Office, for the design and erection of the world's largest wireless station at Rugby. He has also served on many Government Committees, including the Board of Agriculture's Electro-Culture Committee, the Imperial Wireless Committee, 1919–1920, the Broadcasting Committee 1923, the Imperial Wireless Committee 1924, and others in the Army, Navy and Air Force. He also acted for several years as Hon. Secretary to the British Association Committee for radio-telegraphic investigations, and as Hon. Secretary to the Physical Society. In 1914 he was one of the representatives of the Institution of Electrical Engineers at the International Wireless Conference at Brussels, and he is now President of the Committee on Atmospherics of the International Union of Radio-telegraphic Science. He is a Past-President of the Radio Society of Great Britain, and in 1921 his work was fittingly recognised by his election as a Fellow of the Royal Society.

Dr. Eccles can claim that he has made many inventions of apparatus for use in wireless telegraphy and electrical engineering laboratories. Of these, perhaps, the most

(*Concluded on page* 393.)

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"BEST SELLERS" IN HOME LIGHTING.

Opportunities for the Present Season—Selling New Equipment to Old Houses—Exploiting Kitchen Units—Internally Frosted Lamps—The Latest in Bedroom Fittings.

By W. E. BUSH.

NEVER before, during any period of electrical history, has such an opportunity occurred for doing big business in home lighting as presents itself during the 1926-27 season. Hundreds of thousands, probably millions, of people will have studied the celebrated competition book which forms an integral part of the E.D.A.-E.L.M.A. Better Home Lighting Campaign before next March, and countless numbers of householders will have sought advice as to how to bring their installations up to date. The industry, and particularly the contractors, must, therefore, be ready to meet any demand for information and equipment which may be made upon them. It would be a disastrous mistake to use this unique occasion to get rid of collections of obsolete stock or for arranging a special sale of electrical ironmongery. Rather should a concerted effort be made by the trade to sell equipment that will give unparalleled lighting service to the public.

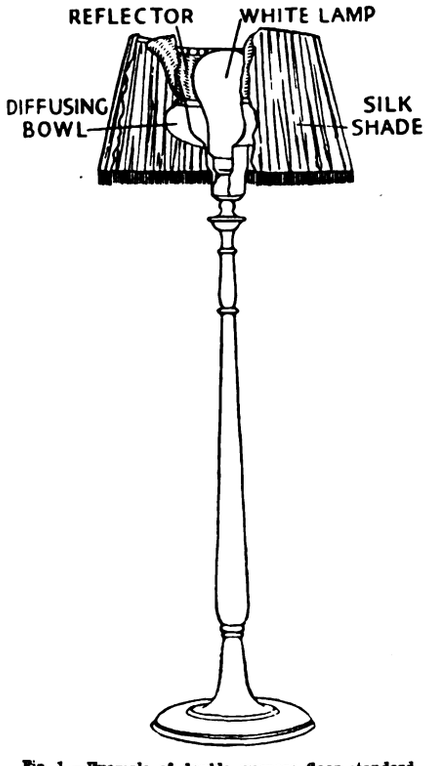

Fig. 1.—Example of double purpose floor standard (E.L.M.A.).

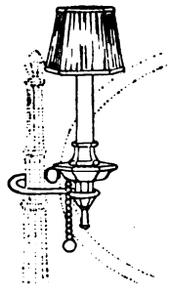

Fig. 2.—Dressing-table bracket (E.L.M.A.).

For some unaccountable reason, electric fittings rarely figure in the list of things required in a house that is being refurnished. Tons of old-fashioned furniture and furnishings pass into the hands of secondhand dealers every year, but antiquated electroliers, like old soldiers, never die. The cause is probably due to the lack of public education by the electrical industry. They have not been taught that Victorian fittings, in addition to their ugliness, are inefficient. That would not be so bad if the same type of lighting junk were not offered to-day for sale in many showrooms. Because the public have learned from bitter experience the undesirable features of earlier illuminants, they have become willing to accept almost any kind of electric lighting without complaint. Convenience, reliability, safety, and a reasonable cost are what they expect from electric lighting, and these amenities they undoubtedly receive.

Comparing the electric lighting in a home with a crude installation with that in another which contains more modern equipment, it is at once evident that, although the two installations are equally convenient, equally reliable, and equally safe, there is a vast difference in the comfort and appearance of the two by night. The public do not yet understand what an important factor lighting is in the furnishing of their homes. The principal difference between good and bad home lighting is mainly a question of modifying and controlling the raw light from the lamp. This can easily be effected by the use of sensibly designed fittings and shades.

I refrain from using the expression "scientific illumination." As applied to the home, it is out of place, but, nevertheless, it is important that the lighting equipment which is offered to the public should be designed on commonsense lines. It is no more correct to design fittings for the home solely from the standpoint of their appearance than it is to design

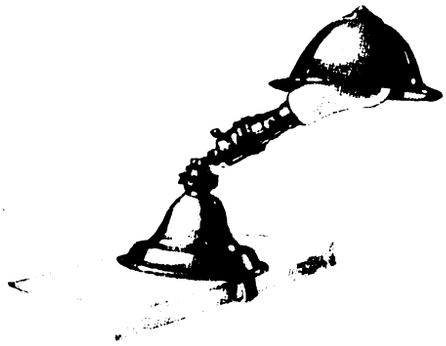

Fig. 3.—"Gecofix" table or bedside standard.

them exclusively from the standpoint of control. A well-balanced combination of these two factors will give the desired result—pleasing and comfortable illumination.

The market for new lighting business should not be restricted to new houses. There is room for improvement in the home of almost every existing consumer, but the public will remain ignorant of the shortcomings of their installations, unless the industry makes a serious effort to educate them. There is probably no better system of education, and certainly no more profitable one, than an intensive sales campaign. The Better Home Lighting Campaign is sound educational work, but it needs actively following up if definite business results are to be obtained. The following illustrated suggestions for building business in electric lighting specialities of proved value are offered to electrical retailers:

One of the surest methods of improving the illumination in a home is to instal a good light in the kitchen. This will act as a silent salesman, and, by degrees, improvements will be made in all the principal rooms. There is a large range of enclosed opal fittings on the market which have been specially designed for kitchen use. The metal work is usually finished in white enamel, and some of these fittings have special attachments for an electric iron.

The majority of homes have kitchen lighting which is little better than that provided in the outhouses, whereas the workshop of the home should be the best lighted room in the house. Kitchen lighting units will sell readily if they are offered to the public and their advantages fully explained.

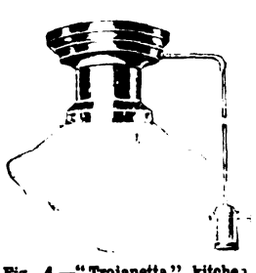

Fig. 4.—"Trojanette" kitchen lighting unit (S.T.H.Co.).

Fig. 5.—New enclosed kitchen unit (G.E.C.).

When they are used glare is eliminated and shadows are reduced to a minimum. When these units are offered on a sale or return basis experience proves that the majority remain in permanent use.

Judging by the crude arrangements for lighting the bedroom which exist in most homes, there should be a ready market for the specialities which have been introduced during the present year. The two-light rise and fall pendant for the illumination

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of the dressing-table is often relied upon to light the whole room. A second pendant suspended over the bed is sometimes provided in addition. Provided they are correctly located and properly shaded, this system is not too bad, but

Fig. 6.—Fitting comprising ceiling canopy and "Silvaray" glassware (Siemens & English Electric Co.).

it frequently happens that, as a result of the re-arrangement of the furniture, the lighting is in the wrong position, and this causes considerable inconvenience.

In order to overcome the difficulty, several manufacturers have placed on the market special lighting units. Various types of fittings which can be clipped to the bed rail are available. Some of these are provided with metal reflectors, and others have silk shades, which produce a pleasing lighting effect. Key switches or pull chain holders are usually incorporated in these fittings. Dressing-table brackets are quite a recent innovation. These are so designed that they can be easily screwed to the back of the wooden pillars supporting the mirror. Those which incorporate imitation candles are most popular, since they add considerably to the general appearance of the dressing-table. Silk, parchment or glass shades are usually provided. During a recent electrical exhibition there was a bigger demand for these two bedroom specialities than for any other piece of apparatus that was on show. This proves that there is a ready response from the public for lighting fittings that are designed to give good service. If electrical contractors would feature these two

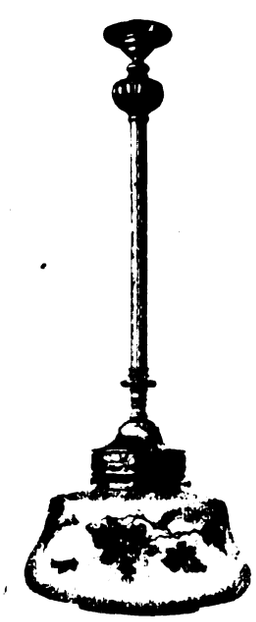

Fig. 7.—Example of decorative lighting unit (Siemens & English Electric Co.).

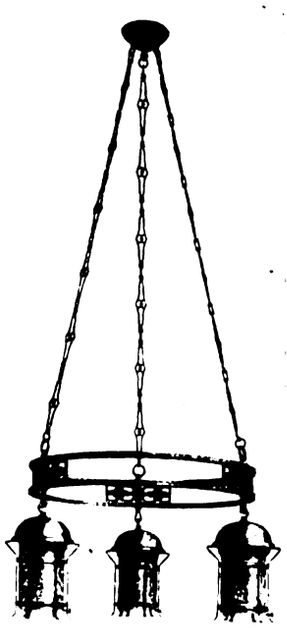

Fig. 8.—The "Kilry" three-light electrolier (Metro-Vick Supplies).

items in their window displays there is no doubt that good business would result from a good residential district.

For several years past the trade in portable lamps and floor standards has been rapidly passing into the hands of the large stores. The number of such fittings sold weekly, judging by figures that have been supplied to the writer, is amazing. This may be due to the fact that a good selection is not available for inspection in the provincial and suburban electrical showrooms. But it should be possible for any contractor to build up a good business for portable lamps. Original methods of salesmanship must, however, be employed.

It is difficult to understand why the excellent double-purpose floor standards do not sell in larger quantities. These units, which are equipped with a reflector, are an excellent means of lighting a small drawing-room or lounge. Some fittings are provided with small lamps under the reflector for reading and writing in addition to a large lamp in the reflector for the general lighting of the room. The illumination is soft and practically shadowless, and, when these standards are employed, it is not necessary, in most cases, to have a central light in addition. Specialities of this character, however, must be demonstrated before their utility can be appreciated. In good class districts it should be possible for a salesman to make a handsome profit by giving demonstrations in the homes of the residents.

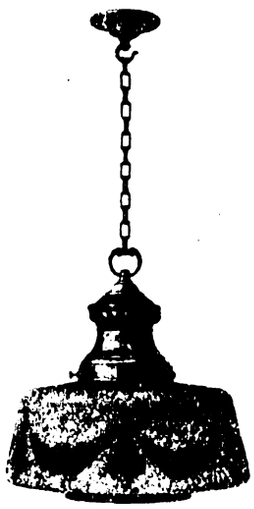

Fig. 9.—Another example of decorative lighting unit (Siemens & English Electric Co.).

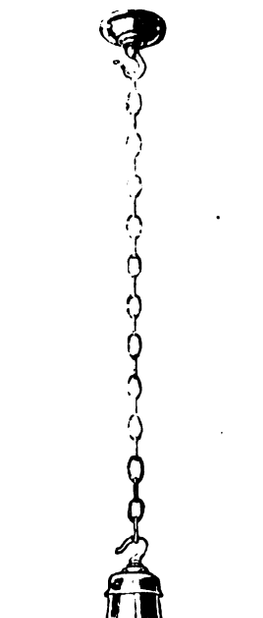

Fig. 10.—Totally enclosed pendant fitting (B.T.H. Co.).

Large glass dome pendants are now available in a large range of designs and colourings. These units form a good alternative to the silk flounce pendant for suspending over a dining-room table. Some of these fittings are provided with a small opening at the bottom which allows just sufficient direct light for the illumination of the table, but prevents the lamp filaments being visible. Others, that have a large opening, give a pleasing effect when fitted with white or flame tinted lamps.

Double-purpose pendant fittings with reflectors for general lighting and diffusing bowls or small lamps for table illumination are becoming increasingly popular, but here, again, demonstration is necessary to enable the public to appreciate the improved lighting service which such equipment will provide.

Every up-to-date showroom should have available a demonstration rack, where a full range of electric lamps, suitable for the home, can be exhibited. This may either take the form of a portable cabinet or it can be fixed to the counter. Each lamp should be provided with a separate switch, and some arrangement incorporated to show the number of hours for which the lamp can be burned for one unit. A lamp demonstrator, in addition to acting as a reminder to the public to buy lamps, enables a full variety of clear lamps,

(*Continued on page 392.*)

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EXHIBITION HOUSES.

Their Publicity Value—Hints on Their Establishment and Organisation—Interest, but Don't Press—Estimating the After Effects.

By W. F. T. PINKNEY.

THERE is probably no such ground of common interest to all humanity as the home, and it is for this reason that model houses, that is, houses furnished and equipped for exhibition, excite a greater interest than any other form of domestic exhibition. Goods exhibited in a homelike environment create more interest than the same goods on an exhibition stand, as has been demonstrated in recent years at Olympia exhibitions, where well equipped stands with

Fig. 1. An exhibition house which was a great success at Gateshead-on-Tyne.

few inquirers, and queues standing to gain entrance to a model house, have been seen side by side.

In Newcastle we have found, after many years of experience of small exhibitions, that the usual type of display with "stands" in a hall, attracts too many children and too many of the class of people who visit an exhibition in the hopes of securing free samples. The model houses do not attract these types at all, so that the visitors to the latter attain a higher percentage of "prospects," as our American friends would call them.

Again, there are more "after sales" from a model house than from an ordinary exhibition, due to the fact that appliances exhibited make a more lasting impression when shown in a homelike environment; and for some reason difficult to analyse, the "resistance to purchase," with which we are all imbued, seems at a lower ebb among the homelike surroundings. Model house exhibitions are fairly easy to organise, can be run at a relatively low cost, and they can be cleared up quickly.

When it is decided that the time is ripe, and obviously the spring and autumn or just before Christmas are the best times, we select a house, in course of construction if possible, the size depending upon what is available and the type of consumers in the district to whom appeal is to be made. The builder must be made interested in the project, but he is not likely to assist financially other than by lending his house. In pre-war days builders were more ready to co-operate than they now are, as new houses to-day do not require publicity in order to make them sell quickly.

Co-operation with a furnishing firm of good standing is necessary, and is easy to secure, but it should be recognised that the furnishing firm may make or mar the exhibition. Not only must the house be furnished tastefully, but it must not be crowded with furniture, nor must it be peopled with pushing salesmen. A firm with experience in these matters will recognise these points, and after one or two efforts the co-operating firms will work well together.

The ideal house would be the one with two doors to each room (like the excellent furnished rooms in the Croydon Corporation Showrooms), but this arrangement is not found in the ordinary house, so that care must be exercised in arranging the rooms with ample space, and steps taken, if necessary, to prevent overcrowding.

If possible, arrangements should be made with a decorating firm for wallpapers, etc., and a point of importance is to have the garden neatly laid out. If an electrical contractor has wired the house, he should be asked to co-operate by carrying out any extra wiring. Any wiring orders secured through the exhibition will of course be passed to him. He will realise that the Supply Authority is working in his interest, and there is no need for him to have any staff in attendance.

It is seldom that a house can be made to draw for more than three weeks at a time. We usually advertise a two or three weeks' exhibition, and then continue for a third or fourth week, using the extended period as a reason for more publicity. For example, a very useful "booster" campaign is to offer to any consumer who takes a piece of apparatus on trial during the last week a voucher for 10 free units "so that they may try it at our expense." This creates a new talking point, and gives opportunity for personal calls upon anyone who has made any sort of inquiry about apparatus. On a recent occasion apparatus to the value of £300 was sent out on trial in the last week of the exhibition, and the majority of the appliances were sold, easy purchased, or hired.

There is nothing to compare with exhibition houses for giving opportunities for publicity that really "gets home." There is a certain amount of publicity which is common to the furnishing firms and to ourselves which is shared equally between the two. This covers the press advertising, invitations to all householders within easy range of the exhibition, official luncheons (if any), etc. In addition each firm carries out special advertising.

It is a very good plan to have an official opening. Perhaps the Mayor or Chairman of the local Council may be invited to open the exhibition, followed by a little luncheon (cooked electrically). It is wise to find out if the chief guest has any strict views on the question of liquid refreshment, and to cater accordingly. The Press should be invited the day before the opening, and it is a pleasing courtesy to give them lunch also. In their case there is no necessity, however, to make the same careful inquiries on the question of catering!

Every householder likely to visit the exhibition should receive a neat invitation card in the joint names of the Supply Authority and the furnishers. This is more effective than separate invitations from the two firms, as it must be realised that every householder is interested in furniture, whereas the interest in electricity in a home has to be created.

So far as the Supply Authority is concerned there must be

Fig. 2.—An example of floodlighting at Monkseaton to attract attention to the exhibition house.

real effort for a day or two before the opening. The invitations have already been sent out, and in this case our canvassers, carefully selected, visit the immediate neighbourhood systematically, and in this way we get our biggest publicity. Much could be written on the method of approaching householders. The main point, however, is to create an impression in the mind of the householder that he or she as an individual is particularly welcomed at the house. Our canvassers ask for the lady of the house by name when calling and, after a few words, tactfully ask her to call at the house when he is on duty, so that he personally "may have the pleasure, etc., etc."

Floodlighting the house by units hidden by bushes in the

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front garden attracts a lot of attention and is well worth while.

Some one person must be in charge, and should represent the electrical interest, because it is only with the electrical apparatus that demonstration is necessary. But the manager in charge must have all information, such as the value of the house itself, all particulars of the furniture, etc., so that he can answer any question likely to be asked. The staff must be inconspicuous, but ever ready to demonstrate any apparatus in which any interest is shown.

Electric cooking and electric washing should be demonstrated at stated times, and in such a way that visitors may see these operations in comfort. Price cards, giving also hire and easy purchase terms, should be on every piece of apparatus, but they should be neat and not assertive. The same applies to any tickets on the furniture.

This is a matter of tactful salesmanship, but the visitor must not go away with the impression of having been harassed to purchase, and it is definitely a bad plan to ask visitors to put their names and addresses in a visitors book. They look upon it with suspicion. If the visit has been made a real pleasure, the visitor who is really interested in anything will give name and address readily.

A very important point is "finishing off." After the exhibition closes enthusiasm is inclined to flag, and a good deal of effort is necessary to "clean up," properly. All appliances which have been used should be set aside for the next occasion, so as to avoid always using brand new appliances. All inquiries must be followed up and brought to a conclusion, and the following up should be prompt and brisk. Some idea of the value of the exhibition can be gauged by the sales effected, and new consumers signed up, but only *some* idea, as a good deal of business will come in for months, perhaps years, afterwards. The writer has purchased furniture similar to that he saw in a model house two years previously, and the same must apply to many users of electricity.

Equipment.

A seven-roomed house might be equipped electrically as follows :—

HALL.
- Hall lantern with orange tinted lamp.
- Electric fountain.
- Small electric fire.

DRAWING ROOM.
- Lighting fittings to harmonise with furniture.
- Electric fire (Magicoal).
- Floor standard (Eyrestolite).
- Table standard.
- Piano fittings.
- Bronze figure.

Particular attention must be given to decorative lighting in this room, and every opportunity taken to draw attention to the fact that lighting may be used as a means of decoration as well as an illuminant.

DINING ROOM.
- Three-light Eyrestolite flounce fitting.
- Floor standard (or three-light candelabra).
- Suitable electric fire.
- Vacuum cleaner.
- Electric fan.

ON THE SIDEBOARD.
- Table grill.
- Plate warmer.
- Toaster.
- Kettle.
- Coffee percolator.

If possible, have the sideboard wired up so that the appliances can be demonstrated without long flexibles.

KITCHEN.
- Kitchen lighting unit.
- Cooker, with hot cupboard.
- Refrigerator.
- Iron and ironing table.
- Electric sewing machine.
- Kettle.
- Egg whisk.
- Kitchen aid.

SCULLERY.
- Trojanette fitting.
- Washing machine.
- Electric ironer.
- Wash boiler.

BEDROOM 1.
- Two-light fitting over dressing table.
- Single pendant over bed

or
- Adjustable light to clamp to bed.
- Suitable electric fire.
- Kettle.
- Hair dryer.
- Curling tongs.
- Bed warmer.

If the room has a cupboard it should be fitted with an automatic switch so that the light is switched on when the door is opened.

BEDROOM 2.
- Similar lighting equipment to 1.
- Suitable electric fire.
- Vibro massage equipment.
- Vio-ray set.
- Electric trouser press.

Fig. 3.—Illustrates the "homelike" effect which should be aimed at in the exhibition house.

BEDROOM 3.
Similar to 1 and 2, or may be fitted up as a child's bedroom, containing suitable appliances, such as milk warmer.

SMOKING ROOM.
- *This room should be used for all interviews, and should have wireless installed.*
- Bowl fitting.
- Table standard.
- Cigar lighter.
- Suitable electric fire.

GARAGE.
- Suitable lighting equipment.
- Electric glue pot.
- Soldering iron.
- Rectifier.
- Lathe motor.

If the house is a small one the garage may be better employed as a demonstration room for cooking or for the washing machine, in order to relieve congestion in the kitchen.

Cost of Running.

The cost of running an exhibition varies very greatly according to the district in which it is situated, the size of house, the amount of publicity carried out, and so forth. The following are two examples, one being about the average cost of running a three weeks' exhibition in a small six-roomed house, and the other of running a four weeks' exhibition in an affluent area in a house of a value of approximately £2 500.

SIX-ROOMED HOUSE, WHITLEY BAY.

	£	s	d
Press advertising	31	1	6
Direct mailing	33	9	3
Extra wiring	19	6	0
Incidentals	4	7	5
	£88	4	2

EIGHT-ROOMED HOUSE, GOSPORTH.

	£	s	d
Press advertising	130	18	2
Direct mailing	66	10	0
Extra wiring, etc.	25	3	8
Incidentals	10	3	5
Erection of special hoardings	15	15	0
	£248	10	3

(*Concluded on page* 390.)

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ELECTRICAL REFRIGERATION.

Definition and Classification—A Recently Developed Type of Mechanism—Prevention of Food Contamination—Problems to be Solved.

By RAYMOND J. MITCHELL, M.I.E.E., M.I.Mech.E., M.I.M.E., etc.

THE term electrical refrigeration, like storage battery and others used by engineers, is somewhat of a misnomer, since it is only in a limited sense that electrical energy enters into the operation of this class of apparatus. It is, however, in the writer's opinion, certain that the term electrical refrigeration already represents a well-defined class of apparatus, wherein a cold-producing mechanical system is

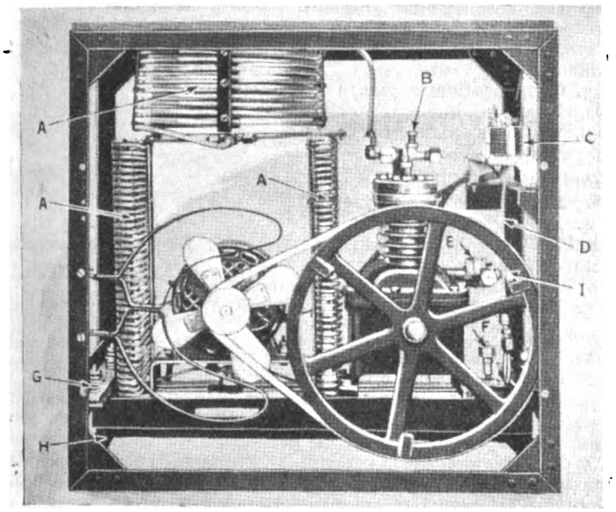

Fig. 1.—Showing principal parts of a 1/3 h.p. air-cooled compressor suitable for domestic use.

A. Condensing coils.
B. Discharge or charging valve.
C. Low pressure syphon.
D. Low pressure control line.
E. Suction line valve.
F. Liquid line valve.
G. Suspension spring.
H. Receiver.

operated by electrical power and in which—and this is vitally important—the absolute ease of control which an electrical circuit renders available is utilised to effect a close regulation of temperature within the cooled enclosure forming the working volume of such apparatus.

In these notes reference will therefore be confined to the recently developed type of *mechanism* in which a refrigerating medium is circulated in such a manner as to utilise its latent heat of evaporation in the production of a low temperature, a compressor pump being used for the dual purpose of assisting evaporation and of condensing the gasified refrigerant so that it may be used again. All these devices are essentially mechanical, being based on physical principles long since studied by physicists and embodied by engineers in refrigerating machinery of large scale.

The innovation is of interest in that *miniature* refrigerating units have been produced operating on powers as low as 0·25 H.P. and seldom exceeding 0·5 H.P. Some special and interesting problems have been encountered and surmounted by those responsible for these developments.

By far the main value of electrical refrigeration is that of food preservation in our homes. Milk, meat, fruit and fish are exceptionally open to the attack of certain bacteria which cause a complex decomposition of the protein content of such foods, in addition to other toxic products due to the excretory reactions of these minute organisms. Medical authorities who have specialised in the study of milk point out that its handling constitutes a serious menace to public health. For example, some years ago experimental work conducted by the surgeons of the Royal Hospital for Sick Children, Edinburgh, proved that at least 60 per cent. of all cases of surgical tuberculosis were due to infection from bovine bacillus. Other ills, such as foot-and-mouth disease, can be communicated through milk to man, and similarly typhoid and cholera have been so traced. The two following tables should be self-explanatory :—

Bacterial Infection in Milk Collected with Great Care in Sample of one-third of Teaspoonful.

Time	Kept at temperature of			
in hours.	39° F.	41° F.	55° F.	66° F.
24	2 500	3 100	18 800	450 000
48	3 600	12 000	3 400 000	
96	218 000	1 480 000		
168	4 209 000	80 000 000		

Bacterial Infection in Milk under Ordinary Conditions in Sample of one-third of Teaspoonful.

Time	Kept at temperature of			
in hours.	39° F.	41° F.	55° F.	66° F.
24	38 000	42 000	187 000	4 000 000
48	56 000	360 000	38 000 000	
96	4 300 000	12 200 000		
168	38 000 000	300 000 000		

The tendency is for bacteria to multiply in geometrical ratio. Cell fission is a very quick process. Since a period of from 20 to 30 min. can suffice for the process, it is obvious that the only reasonably practical method of dealing with an attack on mankind of this nature is to devise a means of immobilising the vast legions awaiting the assault on our food supplies, thereby counteracting their effect. Temperatures of 40 deg. F. and below are found to be the most effective means to adopt. Other factors are a dry atmosphere and exclusion of dust from the outside air.

The problem to be solved by the designers of electrical refrigerating machines is therefore that of producing an air-tight compartment in which foodstuffs may be stored at a temperature of about 40 deg. F. or below (according to special requirements), the mechanism of the system being entirely automatic and operated electrically. This is the line of

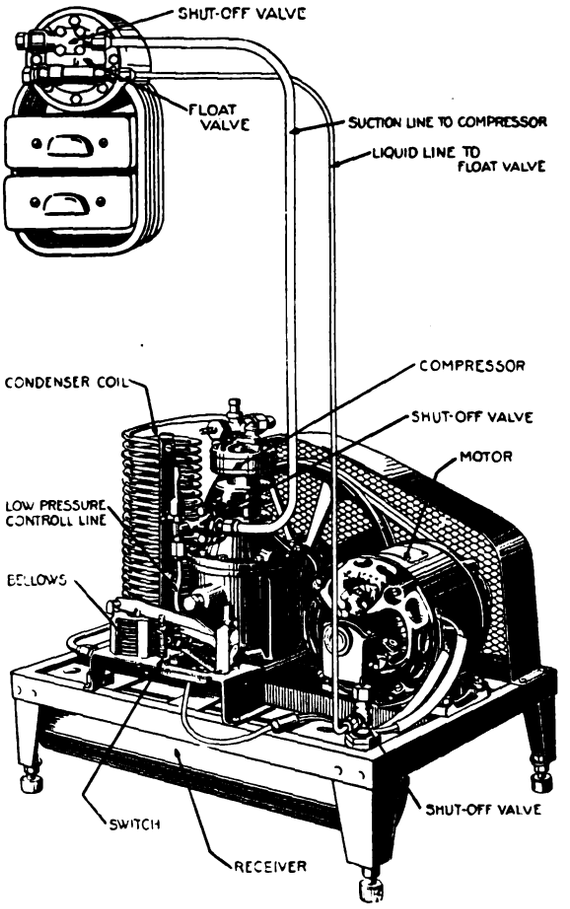

Fig. 1a.—Single cylinder air-cooled Frigidaire for domestic use.

endeavour along which makers of this class of apparatus have already achieved a marked degree of success.

All practical refrigerators utilise the principle of heat absorbtion by evaporation of a liquid or the expansion of a gas,

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such as air. Electrical refrigerators without exception use the former principle, as experience has proved that a cheaper, safer and more compact type of plant can be thus produced. The evaporation of 1 lb. of sulphur dioxide absorbs at 14 deg. F. nearly 170 B.Th.U. of (heat) energy, say 50 Wh. This heat absorbtion is naturally arranged to take place at a rate such that the temperature of the " boiler " or cooling unit shall fall to as low a value as can be ensured, thus giving the maximum difference of temperature between the air inside the enclosure to be cooled and the cooling unit, and hence encouraging a rapid exchange of heat between the cooling unit and the air of the chamber. This further enables the cooling unit to be conveniently small, occupying a minimum proportion of the working volume of the cabinet in which the refrigerator is installed.

Provision must obviously be made to recondense the refrigerant, also to abstract its sensible heat due to this process and finally to expand the refrigerant again. This is the cycle of operation of every machine of this class.

So far only sulphur dioxide has been mentioned as a working substance. Theoretically quite a wide range of liquids and some gases could be employed, if the problem were no more than to choose a substance with a high latent heat of evaporation which could be condensed to liquid at atmospheric

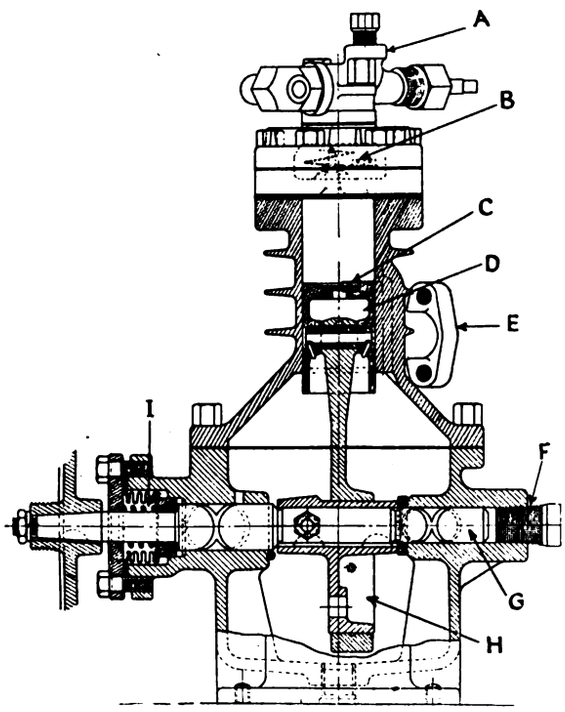

Fig. 2.—Sectional view of single cylinder compressor.

A. Charging or discharge valve.
B. Flapper valve.
C. Piston disc valve.
D. Piston.
E. Place of attachment for suction line valve.
F. Entrance to eccentric shaft. Drive shaft from this end when removing.
G. Eccentric shaft.
H. Eccentric.
I. Stuffing box.

or nearby temperatures. We shall see that in practice there are, however, not many suitable substances, and of the few which can be employed each possesses peculiarities involving certain difficulties in their utilisation.

The perfect refrigerant would be non-poisonous, have a boiling point not far below average room temperature, and in addition would be neutral chemically to iron, gunmetal, aluminium and copper. It would also be cheap, not inflammable, chemically stable, miscible with mineral oil over a wide range of proportions, and would possess a high latent heat of evaporation and a low gaseous specific heat.

No substance meets this specification ideally, but sulphur dioxide approaches it. It is non-poisonous, non-inflammable, and non-explosive. Its boiling point is 14 deg. F., giving the advantage of a low operating pressure. Moreover, sulphur-dioxide is chemically stable, has no action on metals, and mixes with mineral oil freely. These are extremely useful properties and give it a premier position technically for use in refrigerating units in the field under discussion.

Other refrigerants are used to some extent. Their principal properties are as follows, regarded from the standpoint of their technical convenience of use in the miniature automatic plants under discussion :—

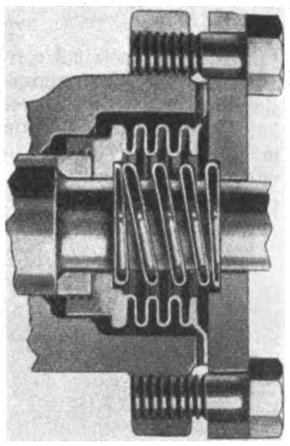

Fig. 3.—Stuffing box assembly.

Methyl Chloride (CH_3Cl).

1. Odourless. Leaks difficult to detect.
2. Inflammable.
3. Lighter than oil, hence lubricating system not easy to design.
4. Boiling point —10 deg. F. involves considerable pressure in low pressure side of compressor, hence gland leaks difficult to prevent.
5. Condensation pressure 80 to 90 lb. per sq. in. Higher than SO_2, which is about 60 to 70 lb. per sq. in.

Ethyl Chloride (C_2H_4Cl).

1, 2 and 3 same as above.
4. Boiling point 55 deg. F. involves very high vacuum to obtain freezing temperatures. Not a " vigorous " type of refrigerant.
5. Low condensation pressure—only 15 to 20 lb. per sq. in.

Ammonia (NH_3).

1. Not chemically stable—tends to dissociate.
2. Corrosive in action on copper.
3. Oil does not mix with it—involves use of a special oil separator.
4. Low boiling point —28 deg. F. Gland leaks on low pressure side of compressor difficult to prevent.
5. High condensation pressure 150 to 200 lb. per sq. in. Massive construction entailed. Too expensive for small electrical automatic plants.

Carbon Dioxide (CO_2).

1. Odourless. Leaks difficult to detect.
2. Boiling point —140 deg. F.
3. Very high working pressures of from 800 to 1 000 lb. per sq. in. render such apparatus dangerous unless made extremely heavy, which involves prohibitive expense of construction for small plants.

The complete refrigerating unit of a modern food-keeping cabinet is shown in Figs. 1 and 1a. Situated in the lower part of the cabinet and behind louvres is the power plant, consisting of a motor, low pressure control switch, compressor, and condensing coils. The cooling unit or " boiler " is built into a small compartment of the cabinet with airways arranged so as to facilitate a symmetrical slow current of air, as it circulates inside the cabinet, downwards from the cold coils. Considering the action of the equipment from its first installation the following sequence of operations occurs: The receiver (see Fig. 1a), being charged with liquid SO_2, is under pressure which forces a stream of SO_2 up the liquid line (pipe) into the " boiler " or cooling unit, which would become full but for the action of a float valve, which closes the liquid line entry at a definite level. Meanwhile the SO_2, being at a temperature well above its boiling point, is exerting considerable pressure down the suction line (pipe) to the compressor, a bye-pass to which is connected to a copper bellows (see Fig. 4), which expands and through a linkage operates a quick-acting switch,

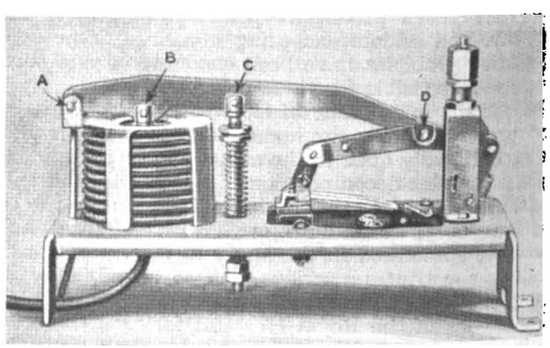

Fig. 4.—Control switch used on air-cooled compressors.

which puts the motor on circuit and starts the compressor working. A fall in pressure in the cooling unit accelerates the boiling of the SO_2 liquid, which, therefore, falls in temperature and gradually boils less violently. Meanwhile, heat has

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been absorbed from the air in the cabinet and the foodstuff stored, so that ultimately the copper bellows, instead of being under a *positive* pressure, are now subjected to a *negative* pressure, hence they contract and *open* the electrical circuit.

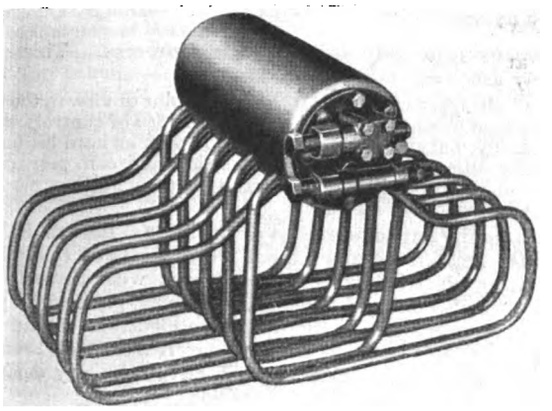

Fig. 5.—Horizontal "H" coil without fins or trays for special commercial refrigeration.

This process repeats itself at intervals or whenever heat has leaked in through the walls of the cabinet sufficiently to raise the temperature of the SO_2 in the cooling unit to the point where its vapour pressure is roundabout 10 lb. per sq. in.

The compressor, it will be noted, performs a dual function: it maintains a partial vacuum above the liquid SO_2 in the boiler, then compresses the gas into the condensing coils which dissipate the heat of compression to the atmosphere, thus redelivering the SO_2 into the receiver in a liquid form. It will be noted that the SO_2 flows and circulates in a closed cycle, the only point at which any possibility of leaks taking place being at the stuffing gland surrounding the driving shaft of the compressor. A special design of gland deals effectively with this problem, which in any case is not so difficult as might be imagined, since the crankcase is practically at atmospheric pressure or below for a large part of its working time. Great care is taken in the design of these compressors to provide ample bearing surfaces at every working surface, and particularly by making the "big-end" of the connecting rod of the sheave type engaging with an eccentric by which a very large wearing surface is available. These precautions, together with the mixing of oil with the SO_2 ensure an absolute minimum of wear in the compressor parts. As the oil naturally tends to fractionate out of the refrigerant in the "boiler," means must be taken to ensure its return to the receiver. This

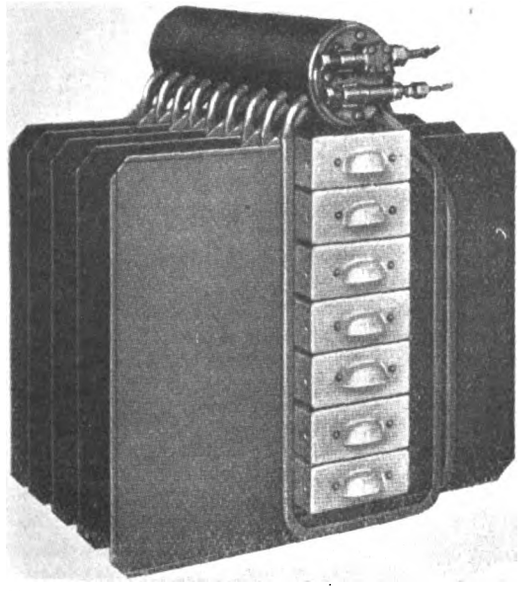

Fig. 6.—Vertical coil with fins and trays for hotels, cafetarias, etc.

is provided for by gravity return through a small hole inside the "boiler" communicating with the suction line of the compressor, a simple arrangement which is extremely effective, as the position of the hole is above the liquid level of the SO_2, hence acts as an exit for removing the layer of oil which accumulates and floats on the surface of the SO_2 during the operation of the boiler.

Originally most refrigerating domestic cabinets were made of wood and many are still so constructed. A recent development is the substitution of steel cabinets finished externally in white "Duco" and internally fitted with a one-piece lining of vitreous (porcelain) enamel, all corners being carefully rounded to make cleaning more simple. Special care is taken with the door mountings to ensure that when closed they shall be air-tight. This is important, not only to prevent heat leakage, but also to exclude dust, the arch enemy of pure food.

By far the most important technical item, however, in cabinet construction is that relating to insulation. Numerous tests have shown that although some materials are better than cork when perfectly dry, yet nothing surpasses or indeed can equal cork when properly applied in *board* form and faced with waterproof cement. The cork is cut accurately in slabs so as to fill up completely all the space between the inner and outer shells, excepting a thin outer layer of air between the outer shell and the outer surface of the insulation. By these precautions the consumption of electrical energy in a well-constructed food cabinet of 10 cub. ft. capacity can be reduced to as little as 2 200 Wh of energy to the motor, the average temperature being maintained at 47 deg. F. inside when the room temperature was 71 deg. F. A new form of insulation,

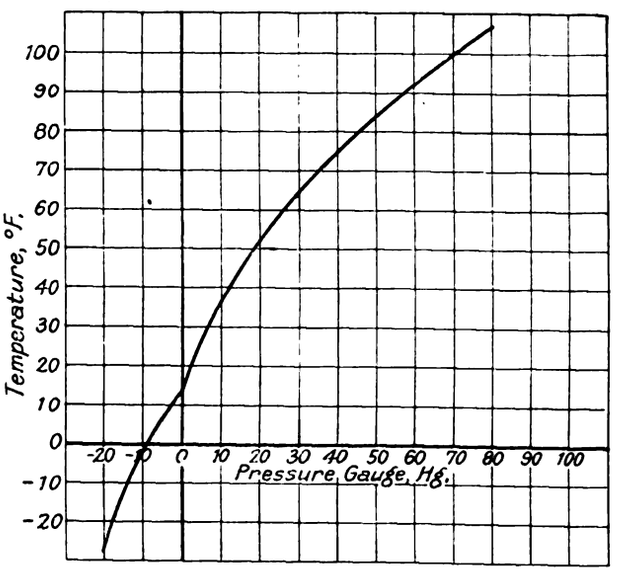

Fig. 7.—Chart showing SO_2 pressure and temperature curve.

consisting of sponge rubber with an extremely fine cellular form, has been the subject of experiments in this field. It is, however, too early to state that any advantage over cork has been indicated for this material.

A considerable number of designs of electrical refrigerator have appeared on the market. These are all based on substantially the same basic physical principles, but differ in mechanical details.

Although he would be a bold prophet who claimed finality for current practice in this field, yet it is in the writer's opinion certain that present day electrical refrigerators are in every way a reliable engineering job capable of rendering efficient and trouble-free service for many years without appreciable expense for renewals and repairs.

Illustrations of the various portions of the refrigerating plant are shown in Figs. 2, 3, and 5 and 6, and a pressure temperature curve for SO_2 is given in Fig. 7.

Tennis Court Lighting.

Considerable progress is being made in the use of artificial lighting of tennis and badminton courts, though a number of problems yet remain to be solved. Experiments on the lighting of badminton courts are now being conducted at Alexandra Palace, London, and elsewhere, while at Queen's Club the illumination of the covered lawn tennis courts is being closely studied. As badminton is primarily an indoor game, the need for good artificial lighting is evident.

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INDUSTRIAL ELECTRIC HEATING.

Poplar and Propaganda—More Publicity Needed—Baking and Other Important Applications—Saving Space.

By J. H. CROSSLEY.

SOME three years ago a Poplar baker purchased an establishment which had consistently refused to prosper under its previous ownership. The new proprietor, being a progressive type of individual with a keen appreciation of the value of publicity, foresaw the advertising value of electric baking, and decided to instal a large electric oven in the shop itself, in full view of anyone passing along the street. That

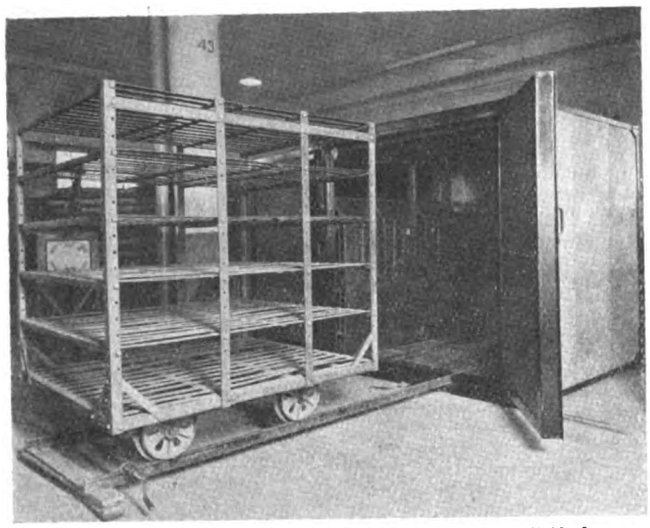

Fig. 1.—View of a truck-loaded industrial electric oven suitable for baking and drying operations.

was a good start, but even well begun is only half done. It is no use having something better than your competitor unless you broadcast the fact and capture his customers. During the week following the installation of the electric oven, therefore, everyone purchasing electrically baked bread was given a numbered receipt, two of which numbers had previously been sealed up, and two prizes—the first a £5 note and the second a large live pig—were offered to customers who secured the luckily numbered receipts. This particular shop, it should be remarked, is situated in a narrow street lined with hawkers' stalls. On the Saturday evening, just after the sealed envelope had been opened and the winners declared, the pig escaped—quite by accident, of course. The good people of Poplar know how to appreciate the joys of pig-hunting in a street market, and, to cut a long story short, the electric bakery was duly advertised in every backyard and house of refreshment in Poplar. Everyone discussed the exploits of the pig that escaped from the shop, and it is not surprising that the turnover of a concern under such enterprising management has increased twelvefold during its three years' existence.

It is not suggested that electric manufacturers who wish to further the development of the electric heating industry should buy themselves pigs and rely on their escaping at suitable moments, but, whatever the method adopted, it is essential, as was recently emphasised by Mr. Monkhouse, of the Newcastle Electric Supply Co. in THE ELECTRICIAN, that more publicity should be given to the various types of electric heating apparatus already on the market, and to the results already achieved in the British Isles by the application of electric heat. This article gives a very brief description of several types of industrial heating apparatus already available in this country.

Although baking is only one of many industrial processes which readily lend themselves to electrification, it has hitherto received more attention from manufacturers of electrical apparatus than any other heating process. This may be largely ascribed to two reasons :

First, electric heat is ideal from every point of view in the preparation of food, owing to its cleanliness and ease of control ; and

Secondly, bakers as a body have not been as hard hit financially as many other manufacturing industries, and can perhaps afford to spend more on development at the moment than most purely industrial concerns.

It is significant to note that at the annual Bakers' Exhibition recently held in London, there were no fewer than six firms exhibiting electric ovens, as compared with three last year. Last year also only one electric oven was exhibited by a firm of bakery engineers, as distinct from electrical manufacturing companies ; this year electric ovens were shown on their stands by three such firms, including the largest bakery engineers in the country.

Early propaganda is beginning to bear fruit ; electric baking is fairly launched, and although improvements will undoubtedly be made as experience shows where modification is necessary, first-class equipment of various types and size is already available.

Fig. 2 shows a modern type of oven, a 50 kW whole-sack conveyor oven, which is equally suitable for a wholesale confectionery business, for bread or for a mixed trade. The particular oven shown is in the bakery of Jas. Duckworth, Rochdale, but similar ovens are in use in Manchester, Dublin, Preston, Bournville, Blackpool, Welwyn Garden City, Birmingham, Liverpool and Carlisle. Referring again to Fig. 2, the comparison with the cumbersome coke-fired oven, of approximately the same output, is particularly striking. Every supply engineer desirous of building up a heating load should make a point of inspecting electric baking ovens of various types in use. Printed publicity is excellent, but practical demonstration is far better.

As regards the reliability of electric ovens, the following letter, which appeared in the "Bakers' National Association Review," June 18th, 1926, is sufficiently convincing :

It has been brought to my notice recently that one or two of my friends in the trade who had under consideration the installation of an electric baking oven have been deterred from going further into the matter owing to advice given not to invest in these as "the elements are always burning out."

I think I can justly claim to be one of the pioneers regarding the use of electric ovens in this country in connection with the bakery trade, and therefore I am in a position to most emphatically deny this statement.

During the three and a half years I have been using electricity I have not had a single element give out, and I am informed this is the experience of others.

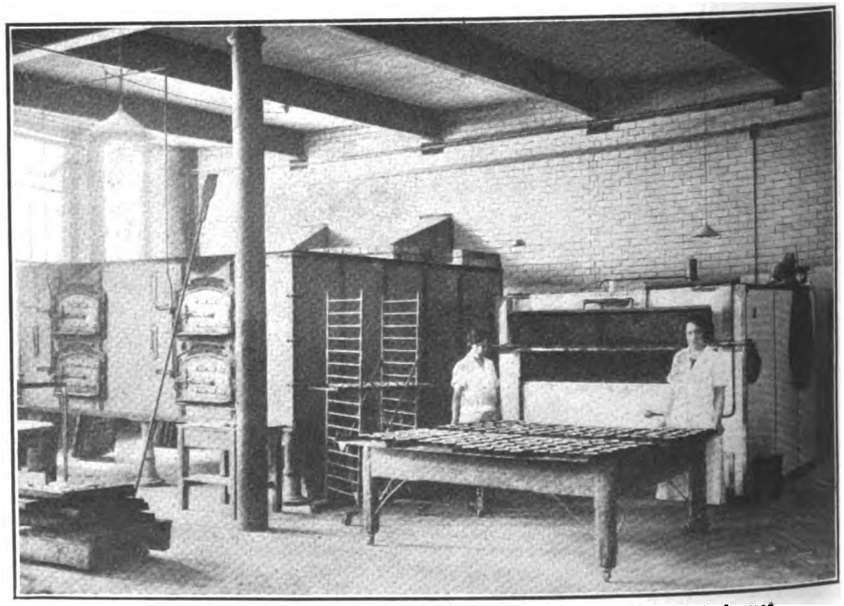

Fig. 2.—50 kW conveyor type electric baking oven which is being increasingly used all over the country.

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I will admit at first I was a bit dubious upon the same point, but a simple explanation by the makers proved that my fears were groundless. They pointed out that with an ordinary electric radiator the element runs at a high temperature, but the exact reverse appertains in a baker's oven owing to the length available. The elements of the oven I have installed do not even " glow " at " full heat " ; therefore a possibility of a breakdown is extremely remote, even after a number of years.

I am very keen upon electricity for all purposes where it can be employed for baking, dough-mixing, etc., and its convenience, superiority and perfect control over other methods cannot be denied. It is for this reason I am writing as I can sympathise with the inordinate difficulties the various manufacturers have to contend with in introducing comparatively new apparatus of this description in this country, although I am given to understand in America and Switzerland other fuels for baking are more the exception than the rule.

The baker who wrote the above letter is using electric ovens supplied by two different British concerns.

It has been stated that more attention at present is being paid to baking ovens than to other heating applications. There is a danger, however, that in concentrating upon the industry appearing to offer the best prospects of early capitulation to electric heat, we may neglect the development of equally important—perhaps more important—applications, of less obvious value to both manufacturers and power engineers as immediate producers of revenue. One foreign manufacturing company has published a list of over a hundred industries in which important operations are being effected by electric heat. Below are a few of them, selected at random :

Baking armatures and coils.
Hardening hack-saw blades.
Baking carborundum wheels.
Boiling linseed oil.
Heating varnish and gum.
Curing rubber.
Annealing springs.
Melting solder and babbit metal.
Stoving enamel.

Ovens and furnaces suitable for some of the above processes are described below.

Fig. 1 shows a larger oven of the truck-loaded type, fitted with a forced ventilating system, and suitable for any baking or drying operation requiring temperatures up to 600 or 700 deg. F. Ovens of this type are available in any desired size.

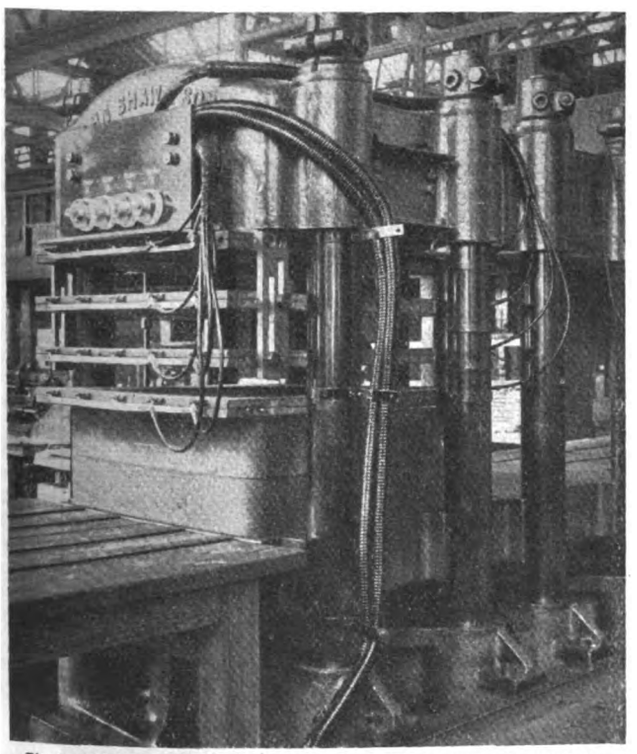

Fig. 3.—250-ton press fitted with electrically heated platens. The simplicity of the equipment compared with that shown in Fig. 4 should be noted.

To digress for a moment. In the article by Mr. Monkhouse, already referred to, it was pointed out that power engineers will frequently be asked to submit proposals for the conversion of existing gas or solid fuel furnaces and heating appliances, in preference to the installation of complete new equipment, and that manufacturers should be prepared to accept work of this comparatively unattractive nature. This is perfectly true, but whilst manufacturers are willing and anxious to quote for heating elements and switchgear for installation in existing ovens, it is essential, in each instance, to ensure that the existing equipment is efficiently insulated or can, at reasonable expense, be so insulated. Many fuel-fired ovens and furnaces are very crudely insulated, particularly the older ones, which are usually the very ones it is desired to convert. The user rarely appreciates the great loss of heat through oven walls, and if the manufacturer adopted a policy

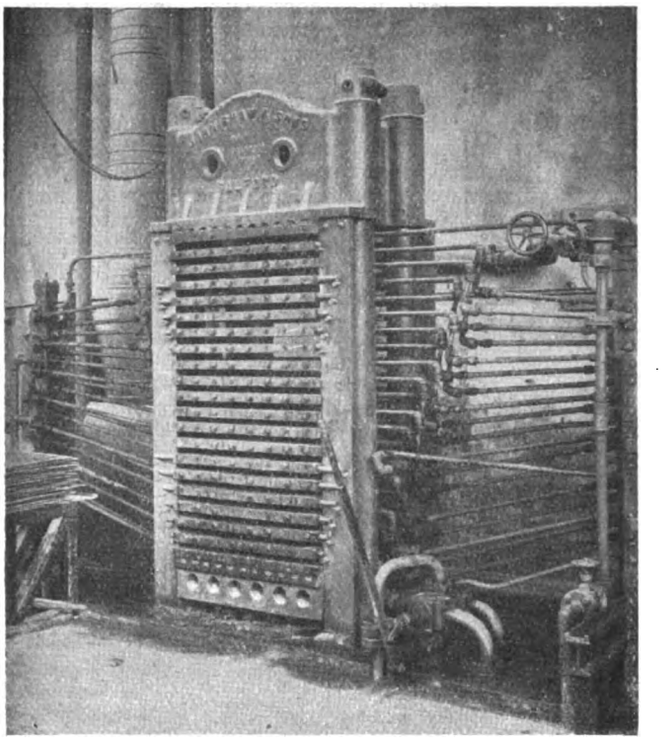

Fig. 4.—Steam heated press (Messrs. Shaw, of Salford). This should be compared with the electrically heated press shown in Fig. 3.

of supplying elements to all and sundry for installation in any kind of crude equipment, the heavy cost of operation would soon sound the death knell of industrial electric heating. In their own interest, manufacturers cannot afford to convert old equipment or carry out new installations unless there is every prospect of the customer being satisfied with his installation, particularly as regards its effect on his pocket.

Whilst manufacturers naturally prefer to market standard apparatus where possible, the variety of electric heating applications makes this almost impossible, and they are quite prepared to go into the question of converting old equipment, provided existing conditions offer prospects of reasonable economy in operation.

Fig. 5 shows a battery of large solder pots, fitted with automatic temperature control gear, each of about 750 lb. capacity, and rated at 15·6 kW. Growing interest is being evinced in furnaces suitable for temperatures ranging between about 1 000 and 1 800° F., and at least three manufacturers in this country are already prepared to quote for electric furnaces.

A 50 kW oven is at present being erected in the factory of Messrs. Kunzle, Birmingham, for roasting nuts for chocolate. This oven is being fitted with automatic temperature control apparatus, which, combined with the scrupulous cleanliness and ease of operation of the oven, will make it ideal for that particular process.

Fig. 3 shows a 250-ton press manufactured by Messrs. John Shaw and Sons, Ltd., Salford, and fitted with MV heating elements. Each of the four platers (41 in. by 56 in.) is fitted with five 1 kW elements. Three-heat temperature control is provided, the maximum plate surface temperature available being 175° C. The simplicity of the heating equipment is in striking contrast to the usual collection of leaky steam pipes.

By way of contrast Fig. 4 shows a steam heated press. This indicates the relative spaces occupied by electrical heaters and steam pipes.

In the majority of industrial heating propositions, the manu-

(*Concluded on page* 392.)

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PRACTICAL ELECTRICAL WELDING.

Some Workshop Advantages—Mass Production and Special Types—Localising Heat—The Space Question.

By STEPHEN HALAS, Engineer, A.E.G., Berlin.

ELECTRIC welding continues to find an ever-widening sphere of application; many firms, both in Europe and America, have made exhaustive investigations of this work with the object of developing machines to meet all practical requirements. Other methods of welding are being slowly eliminated from all workshops, even autogenous welding, which in the abstract is adequate for the demands of modern practice. But, contrary to expectations, circumstances have shown that even the smallest repairing shops in the colonies, for which the autogenous welding process would appear to be most suitable, prefer electric welding apparatus. The reason for this may be found in the fact that electric current can be generated continuously even in the smallest workshops, whereas oxygen is absolutely necessary for autogenous welding, so that one is dependent on outside sources of supply.

The following article is intended less to describe the design of the various electric welding apparatus, or to determine the actual earning capacity of electric welding, than to deal with the practical and commercial advantages, which do not lend themselves to calculations.

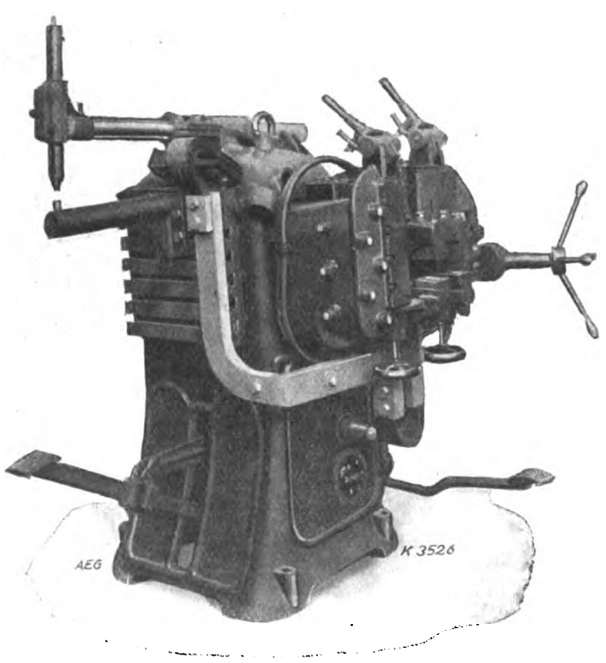

Fig. 1.—Combined spot and butt welding machine.

The earning capacity of electric welding machines has already been the subject of exhaustive investigations. As with all other apparatus in which electrical energy is converted into heat, their capacity to compete with heating apparatus consuming fuel is only dependent to a small extent on the prices of calories generated electrically or from fuel. Other factors, such as coefficient of utilisation of the heat generated, consumption of material, wages and loss of metal play a far larger rôle.

Calculations of earning capacity which have been carried out so far have shown the superiority of the electrical method, but all these calculations present no clear picture of the superiority of electric welding.

Taking into account the different practical procedure of the two usual electric welding methods—resistance and arc welding—it is proposed to discuss these separately.

It may be stated that the machining of welded work was only rendered possible by the introduction of electric resistance welding machines. Previously, welding was done by hand, and the mechanic had, wherever possible, to avoid welded work, whereas at the present time special types of welding machines are designed, under certain circumstances, for new manufactured parts.

To-day even the smaller workshops are forced to employ the various electric welding processes, as otherwise they are not able to hold their own in competition. In order to enable even such small factories to introduce the many different kinds of welding, relatively inexpensive machines were constructed which, by the simple interchange of various devices, can also be employed for spot, longitudinal seam, round seam and butt welding work. Fig. 1 shows a machine of this kind for

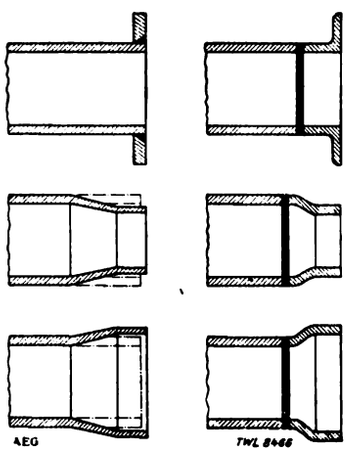

Fig. 2. Welding a flange by means of the fusion process.

small repair shops, with which spot as well as butt welding work can be carried out. The spot welding electrodes may be straightaway replaced by rollers for seam welding work.

Even if previously a good deal of finishing off work was necessary on the welds, the fusion process marked a new departure. This process is an amplification of the usual resistance welding process. The two parts to be welded are carefully approached until the current sparks over. As the parts are slowly pushed towards one another the flow of current becomes more and more active. The welding surfaces are only heated superficially by means of the quasi-arc passage of current. At this moment the surfaces to be welded are pressed together quickly so that any fluid particles of metal still present in the section are squeezed out. But no pad is produced as in the old butt welding process, but merely a pearly upset ridge.

The introduction of the fusion process indicated an entirely new direction to the designers of the machines; the more or less expensive welding machines paid for themselves in a very

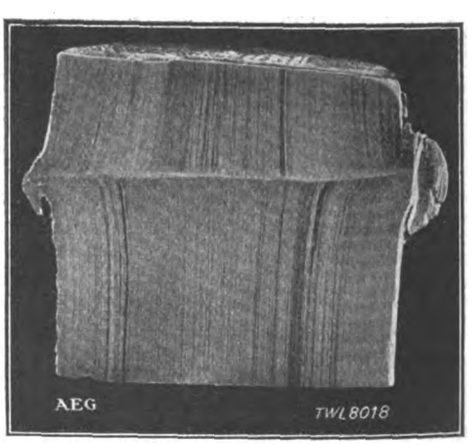

Fig. 3.—Section of weld, 16 sq. in. dipped,

short time. In order to give examples of the diverse applicability of the fusion process, some comparisons of complicated pieces of piping are shown in Fig. 2.

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BEFORE.	NOW.
Flange ring, turned out conically inside and butt welded autogenously or in the furnace, is secured by means of autogenous welding. The end of the pipe is heated up over a large length and is contracted or expanded.	Ring bent out of angle iron and butt welded by the electric fusion process, is welded to the pipe by means of the same process. An inexpensive stamping is quickly welded on to the pipe by means of the fusion butt welding process.

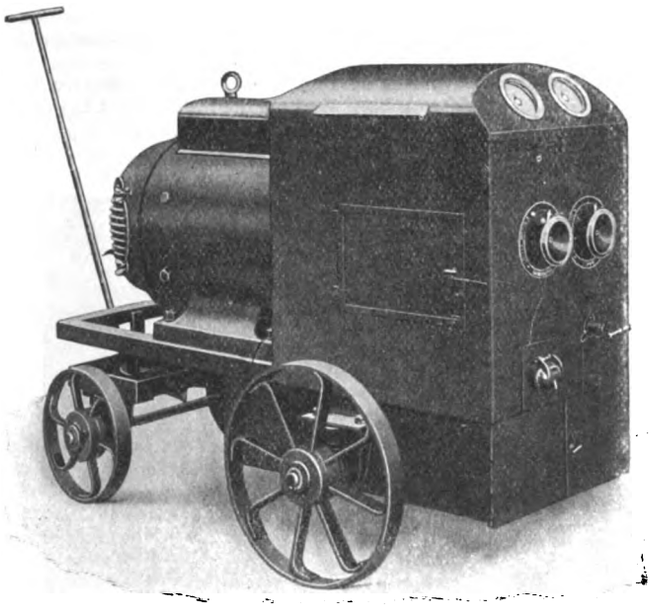

Fig. 4.—Portable arc welding converter with switch case.

Whereas small works must have machines capable of as many operations as possible, mass production is only economical with special types for each process.

Hence machines up to the largest sizes resulted, with water-cooled clamping jaws and the clamping equipment actuated by means of electric motors. With machines of this kind, surfaces of more than 15 sq. in. can be welded together, and the welded joints are absolutely homogeneous. The strength of the material at the joints is practically equal to that of the unwelded material (Fig. 3).

The chief advantage of electric welding is thermal, the heat being only developed at that point where it is used. Other parts are not heated or only very slightly. This circumstance, combined with quicker and easier operation and shorter time occupied by the operation, provides the basis for the usual calculations of earning capacity.

The aforementioned advantages are chiefly of interest to the economising works manager; but to the works engineer the introduction of electric welding machines presents other advantages. These are as follows:—

Less waste, no more burning or overheating. Crooked joints are impossible on account of mechanical clamping.

Uniformity of structure, hence less complaints from other departments or from customers.

The cost of inspection is reduced owing to the absolutely reliable method of construction of the electric welding In a large works, for instance, inspection which previously accounted for about 10 per cent. of the working hours for the production of welded work could be almost entirely dispensed with.

The cost of finishing off is less. This relates, in particular, to the fusion process, with which practically no welding ridges occur.

The cost of machining is less, as the joints have exactly the same hardness as the rest of the material. When machining welded work, e.g., turning, planing, etc., no special attention need be given to the joints.

Less space occupied. As much more work can be done with a welding machine, the latter takes up much less room and the operations are more easily surveyed.

As against these advantages, the cost of maintenance of resistance welding machines is very small. Repairs and therefore stoppage of work are seldom necessary, particularly in the case of the heavy machines, the first cost of which is somewhat higher.

It will be assumed that the technical principles of arc welding are known. The development of the apparatus took quite another direction than was the case with resistance welding machines. Arc welding is specially suitable for repair jobs, welding of large pieces, etc. Light, transportable apparatus were evolved which could be set up at any part of a works where their services were required.

From the foregoing it should not be understood that arc welding machines cannot be adapted to mass and series production. Thus, arc welding automatic machines have been constructed, especially on the other side of the Atlantic, where automatisation of works is most advanced. These machines are eminently suitable for the manufacture of tubes, cisterns, sheet iron containers and the like.

Automatic arc welding machines are of extremely simple construction, consisting as they do of a framework with guide rails, on which the work to be welded glides. The welding electrodes are kept at the correct distance from the work, by means of a device based on the same principle as that employed for arc lamp carbons.

Welding with alternating current, in spite of its obvious advantages (easy transformation to the welding voltage), has not found so extensive an application as direct current welding especially on account of the fact that it is not possible to carry out every kind of welding work with the alternating current arc. It is well known that the electrons travel in the arc in a definite direction. Hence, with direct current, welding can even be done vertically upwards, whereas only horizontal work can be welded with alternating current.

Fig. 4 shows a small, transportable arc welding set. In order to keep the weight down, the driving motor and direct current dynamo are mounted in a common casing. In order to be able to stand the heavy short-circuits, which are unavoidable with arc welding, the direct current dynamos must be built for constant current (compound or Krämer winding).

Fig. 5 shows a casting which was repaired by means of arc welding. It can be clearly seen from the illustration what a complicated kind of fracture can be electrically welded and how accurately this kind of work can be carried out. Previously, a cylinder with a fracture of this kind was of no further use.

No one will venture to doubt that electric arc welding is considerably cheaper than the old method of heating by means

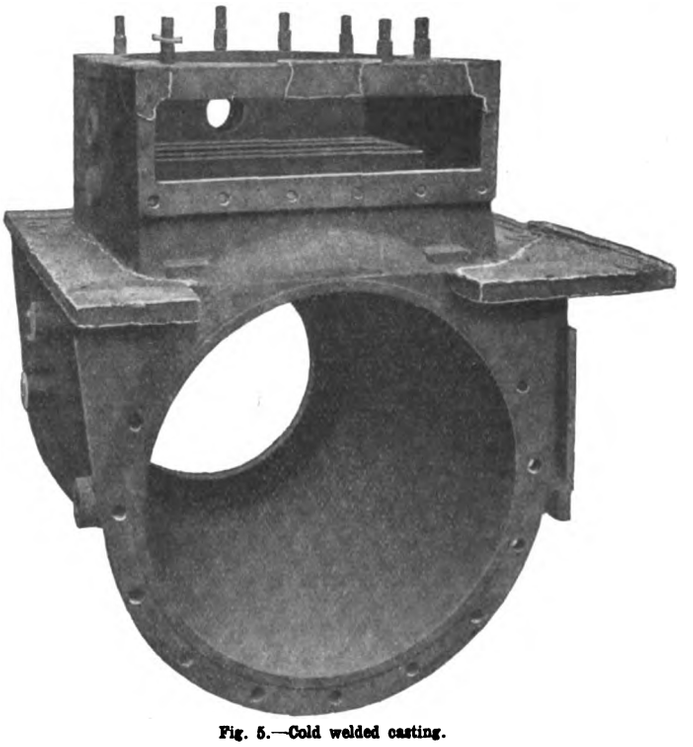

Fig. 5.—Cold welded casting.

of coal. It is of interest, however, to show curves of comparative cost of autogenous and electric welding. The curves were plotted on the basis of the following costs:—

	s.	d.
1 working hour	0	10
1 cub. m. Acetylene	1	4
1 cub. m. Oxygen	1	5
1 kWh	0	3

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The strength of arc welded seams depends, of course, on the skill of the operator. The strength of the welding current and the composition of the electrodes are also of importance. In the case of operations which approximate to perfection, the actual strength of the plate can be attained by means of welding on both sides, whereas a butt weld has only about 80 per cent. of the strength of the plate.

Arc welding can be employed for other kinds of operations, in addition to the welding of plates and of fractured parts. A works engineer who previously found a shaft reduced at the bearing, or worn slide rails, etc., had generally to arrange for replacement. It was, therefore, necessary to maintain a large stock of spares of all such parts subjected to heavy wear and tear, involving a heavy expense.

Worn out machine parts such as these may be put into workable condition again by applying metal by means of the metal arc.

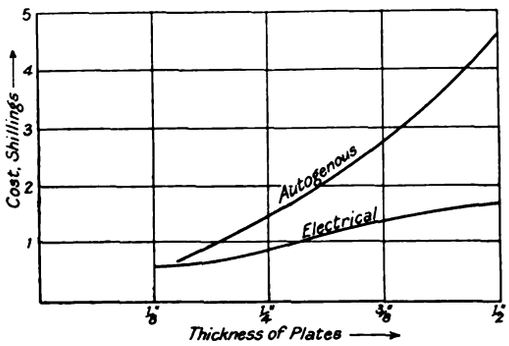

Fig. 6.—Comparison of cost of autogenous and electric welding.

This process has been of enormous advantage to works where the wear and tear is very heavy, such as rolling mills and smelting works. Large sums are saved annually in such places on spare parts, by making the worn out parts of machines usable again.

The electric arc welding process also permits of selecting a filling-up metal having a degree of hardness equal to that of the worn out parts. For instance, it is possible, in the case of shafts made of standard Siemens-Martin steel, to fill up the worn out parts straightaway with specially hard metal (hard steel electrodes).

It has already been stated that the cost of electric arc welding is less than that of other welding processes. A further advantage worth mentioning is that, owing to the purely local heating, strains in the metal are reduced to a minimum. Hence, the parts to be welded become much less distorted than is the case with other welding methods. For instance, very delicate work can be done without any hesitation—such as repairing broken teeth of circular saws, without distortion of the saws.

The purely mechanical or thermal efficiency actually affects the earning capacity of these machines very little. The efficiency depends, besides, not so much on the construction but on other factors, e.g., period of working, stoppages, etc.

When purchasing an electric welding equipment, the buyer must take the following points into consideration :—

(1) Earning capacity, based on a comparative calculation for heating, wages and depreciation.

(2) Labour saving, obtained by better operation of the electric machines.

(3) Other general advantages, such as :—

Saving the cost of transporting coal from the dump to the place of consumption. A coal dump, transport arrangements and a supply of coal are not necessary, so that working capital is saved. There are no products of combustion, such as ashes and slack, to be removed. The workshops are cleaner and the ventilation better with electric welding, and this all conduces to a better output capacity of the workpeople. Without doubt it is only a question of time before electric welding, as well as other electrical methods of heating, will drive the old ovens out of all factories, in spite of the apparently higher initial expenses and the cost of current.

At a conference at Margate last week, Chief Officer Dane, of Croydon Fire Brigade, suggested that electrical engineers carrying out or supervising installation work should keep in touch with officers responsible for fire safety.

Exhibition Houses.

(*Concluded from p.* 382.)

Every house must be treated differently, and anyone organising such an exhibition, as has been outlined, will have individual ideas on how it should be done. The writer would like, however, in closing to stress a few of the points mentioned and give a few general hints based upon experience.

Avoid overcrowding with furniture.

Keep the whole atmosphere restful, but not depressing.

Good illumination, but not garish.

Good furniture, but not ornate.

Avoid restrictive touches such as pieces of rope across the chairs to prevent visitors sitting down.

Let the staff be courteous but not servile, attentive but not "pushful," self-confident and enthusiastic about the value of their commodity, but ready to listen to the other point of view.

Fig. 4.—Electric cooker in place of the usual kitchen range.

Have readily available all information likely to be asked for, from the price of the house to the hire rental of the cheapest piece of apparatus.

Make visitors feel on arrival that their presence is conferring a favour, and on leaving that their visit has been a pleasure.

Just as every picture requires a point of emphasis in order to concentrate interest, so it is with an exhibition. Make some special feature, and emphasise it. It may be "Decorative Lighting," or "Kitchen Lighting Units," or "Wired Furniture," or "Refrigeration." Whatever it may be, let it be the chief talking point for the time being.

See that every piece of apparatus is in working order. People like to see such things as hair dryers working.

Let everyone remember that the most important persons in the house are the visitors. They have come to be taught the value of electricity *as a service*.

There is something wrong in the organisation of an exhibition of this nature if the amount of revenue from energy sold per annum which results does not exceed the cost of running.

Electric Lighting on Chicken Farms.

Poultry farmers in the Knott End and Preesall District, which is situated on the River Wyre opposite Fleetwood, in Lancashire, are installing electric lighting in their hen coops and sheds. The installations will be controlled by a time switch, so that the lights will be switched on at an hour equivalent to dawn in June. Specially low terms have been granted by the supply authority for the lighting used at this period. It is expected that in this way the output of hens will be much increased.

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AN "ALL-ELECTRIC" SEWING MACHINE.

Some Details of the Latest Singer Model—Accessibility and Convenience its Strong Points—Speed Control Arrangements.

THE housewife is already having so much done for her electrically that it is natural that she is demanding that more shall be effected in this convenient way. This is where the electrically operated sewing machine will come in, for when carpets can be swept by electricity there is no logical reason why the manufacture and repair of clothes should not be similarly carried out. All-electric sewing machines already exist, one of the most interesting of which is that made by the Singer Manufacturing Co., Ltd., Clydebank, Scotland. This is simply a neat combination of a first-grade sewing machine with a reliable fractional horse power motor. It is claimed that all the advantages which accrue from such a combination have been made use of. The motor is fitted into the machine head as shown in Fig. 1, and the transmission of the power from the motor to the sewing machine is accomplished through gearing from the armature spindle to the arm shaft of the sewing machine. The latter shaft is set in the arm of the machine and gives motion to the needle. Another shaft is set in the base of the machine and rotates the shuttle. An upright shaft connects the two and when the motor is revolving keeps them in simultaneous action.

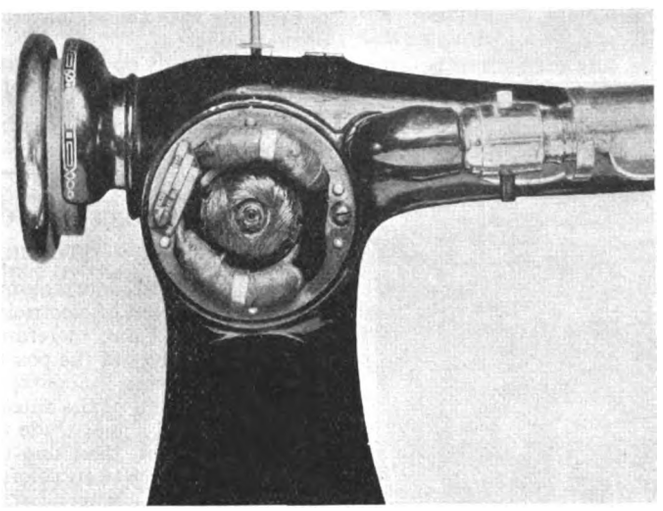

Fig. 1. Showing arrangement of the motor in head of a Singer Sewing Machine.

To make the motor and sewing machine one unit the first essential feature is that the former must be reliable, since the use of the pedal as an auxiliary means of drive is eliminated. The motor used in the Singer machine is a small universal series wound commutator motor having a speed of approximately 4 000 revs. per min. and a loading of less than 60 W, whether it is connected to an a.c. or a d.c. supply, with the sewing machine stitching at its fastest speed of about 1 100 stitches per min. Incidentally the power factor of these motors varies from over 0·8 when the motor is running at its full load speed to over 0·9 when running at lower speeds on a.c. circuits. The armature is supported by its shaft which revolves in two bearings at the inner end of the motor shell. Between these bearings there is a small geared pinion which meshes with the cushion clutch mechanism on the arm shaft of the sewing machine.

The lubrication of the machine and motor requires very little attention. The motor bearings are lubricated by means of grease cups which contain wicks fitted with springs to ensure a constant supply of grease from the cups. The lower mechanism of the machine is provided with an oiling arrangement whereby the oil is fed from a reservoir.

The accessibility to all moving parts is worthy of note. The motor can be completely removed from the machine by the simple operation of releasing one screw in the machine arm. This permits of complete access to the mechanism in the arm of the machine. Access to the lower mechanism is obtained by removal of the detachable bed plate. Some other special points are that the motor forms part of the arm of the machine. It is covered by a well finished dome shaped pressed steel detachable cover, which at once makes the sewing machine and the motor a neat and attractive unit. The inertia effect of the motor armature permits a smaller balance wheel to be used on the machine and its design tends to give the machine a slightly elongated appearance (see Fig. 2). The absence of the necessity of providing for foot power drive makes the machine easily adaptable to the folding top cabinet table with which it is supplied (see Fig. 3). The finish of the table can be decided by the purchaser so as to blend with other furniture in the room. When not in use the machine and the control lever can be entirely concealed and the table used as a flat topped occasional table. On the inside panel of the table is fitted the controller for controlling the speed of the machine. The controller is operated by means of a lever, so attached that the sewing machine operator can vary the speed of sewing by pressing or releasing it with the knee. In so doing the speed of the machine can be varied from about one hundred stitches per minute to about eleven hundred in very easy stages. The machine is connected to source of electricity supply by means of a flexible lead. In addition an electric lamp known as a "Singerlight" is so fitted to the arm of the machine that it illuminates the work at the needle. The light can be used when necessary by switching it on by means of a switch which is part of the Singerlight equipment.

Fig. 2. The "All-Electric" Sewing Machine ready for use.

Fig. 3. The same out of the way, forming a convenient work table.

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Industrial Electric Heating.

(*Concluded from page* 387.)

facturer will approach the user through the power engineer. It is essential, therefore, if the country is to be systematically combed for heating applications, that one engineer at least in each power supply company should be familiar with the fundamentals of the design of electric heating apparatus, and, on their part, the manufacturing companies will do everything possible to assist in this direction. Why, for instance, should not a power engineer who proposed to cultivate the heating load spend about a week in the industrial heating department of a manufacturing company? He would not learn enough to set up a rival concern, but he would learn enough to discuss the majority of heating propositions with reasonable assurance, and to calculate the approximate power for various applications.

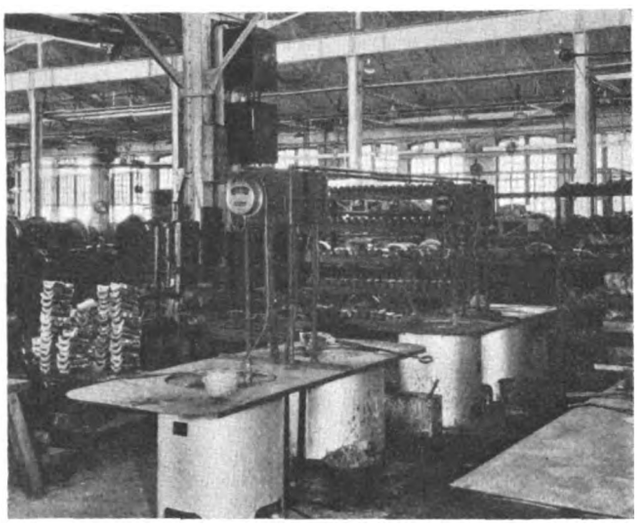

Fig. 5.—Electrically heated solder pots, fitted with automatic temperature control gear.

Sooner or later an Electric Heating Association will inevitably be formed in this country. It has already been suggested that a conference should be arranged, at which various aspects of electric heating could be discussed and possibly different types of industrial heating apparatus examined in operation, and it is to be hoped that this suggestion will materialise in the near future. Such a conference would undoubtedly stimulate the progress of electrification, in this country, of industrial heating processes.

Best Sellers in Home Lighting.

(*Concluded from page* 380.)

white lamps, colour sprayed lamps, and inside frost lamps to be exhibited, the latter, being a new innovation, should be ready sellers. In addition to their advantages of low absorption (about 2 per cent.), reduction of glare, and facility of cleaning, they have a very pleasing appearance when unlighted. When used with silk shades the colour is reflected from the polished surface, giving a mother-of-pearl effect.

The specialities that are mentioned above can be made the best sellers for home lighting if electrical retailers will demonstrate their many advantages to their clients. A better margin of profit is assured by the sale of these lines than the inferior range of cut price electroliers, with which the market has become saturated. This is the year of home lighting opportunities. The E.D.A.-E.L.M.A. Campaign is paving the way for the lighting salesman, and electrical retailers are advised to be ready to meet the public demand which will be created as a result of the electric lighting competition.

The Steel Band Conveyor and Engineering Co., Ltd., Barker Street Works, Parade, Birmingham, has issued a folding sheet of illustrations showing the application of steel driving bands to various classes of machines. The pulleys for use with these bands are thinly faced with cork, and the fact that the cork is not torn off proves that there is no appreciable slipping of the bands.

CORRESPONDENCE.

WIRELESS WITHOUT BATTERIES.

[To the Editor.]

Sir,—Visiting the recent Radio Exhibition at Olympia, I observed that there is a tendency to introduce apparatus for the elimination of batteries, in other words, to take current from the electric lighting mains to use for wireless sets. Most of the apparatus exhibited for this purpose would to my mind be unsafe for this purpose, and it would appear that the designers have very little knowledge of regulations which control any apparatus that is for connection at such voltages as we use in our homes. I think a note of warning should be given, and no apparatus should be allowed to be connected whose design does not comply with the regulations which exist for the protection of the public.

There was only one design at the exhibition in which, seemingly, the designers had in mind the above point of view.—I am, etc.,

N. W. Prangnell.

Acton.

CONTRACTORS AND CO-OPERATIVE BUYING.

[To the Editor.]

Sir,—Electrical contractors complain with some justice of the competition of electricity supply undertakings and the big stores, and I am, therefore, surprised that they have not availed themselves of the possibilities underlying the principle of quantity buying by contractors in each neighbourhood for the mutual benefit of the allied firms.

In the oil and colour trade this policy has met with marked success and more than one of the grocers' associations has worked the scheme so successfully that no member could afford to be outside the arrangement.

The practice in one trade is for the wholesaler to deal with only one member of each co-operative group for a certain class of goods, this member being authorised to buy for his associates. There must not be any distribution costs; otherwise the scheme becomes unworkable. Those taking part make a deposit, and all goods are bought for cash.

It seems to me that the idea sketchily outlined above is worthy of consideration by electrical traders, and the views of other readers of The Electrician would be appreciated. Possibly the E.C.A. might interest itself in the formation of groups of its members for co-operative purchasing purposes.—I am, etc.,

Retail Trader.

Blackburn.

HIRE-PURCHASE FINANCE.

[To the Editor.]

Sir,—During the early part of the year it was suggested that the Electrical Contractors' Association was considering the possibility of making arrangements to finance on behalf of its members the hire-purchase of electrical appliances for home use.

In view of the great assistance which such an arrangement would provide to electrical contractors in making the most of the E.D.A.—E.L.M.A. Better Home Lighting Campaign it would be interesting to hear what progress has been made in the direction of financing this business on sound lines.—I am, etc.,

H. L. W.

Liverpool.

The New President.

(*Concluded from page* 378).

widely known is the method of using a triode valve for sustaining mechanical vibrations, which is the basis of tuning fork and of quartz crystal control of the frequency in numerous wireless stations all over the world.

To-day, when wireless is becoming a part of the equipment of so many homes, it is fitting that the Institution of Electrical Engineers should have a President whose work has helped to render that state of things possible. We wish Dr. Eccles every success in that honourable office.

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NEWS IN BRIEF.

Big Technical Publishing Merger—French Telephone Canard Denied—E.T.B.I. Festival Date Changed—Proposed Showrooms for Rawtenstall.

WE learn as we go to press that Ernest Benn, Ltd., have acquired the whole of the capital of T. Fisher Unwin, Ltd., and thus brought about the biggest publishing merger of recent times.

The new Chesterfield and Staveley automatic telephone exchange was put into operation last Saturday.

The International Union of Producers and Distributors of Electric Power opened its congress in the Capitol, Rome, on September 22nd.

"A Note upon the Obligation of the Ironfounder to Diesel Engine Users" is the title of a paper by Mr. H. J. Young, to be read and discussed at a meeting of the Diesel Engine Users' Association on October 15th.

The Government of the Falkland Islands requires a superintendent of wireless telegraphs and telephones (salary £500 a year) and a telephone linesman (salary £200). Applications to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1.

A rumour that the French telephone system would soon be acquired by a foreign firm is denied by the French Ministry of Posts and Telegraphs. The canard was probably due to the fact that the Government has been studying foreign automatic systems.

Sir Ernest Benn will give an address on "How Labour-saving Devices in the Home Help the Nation" at a luncheon which is being arranged at the Holborn Restaurant on October 12th by the Household Appliances Section of the London Chamber of Commerce.

Mr. Sam Ratcliffe, of the Metropolitan-Vickers Electrical Co., Ltd., Manchester, is to give the third in a series of four lectures to be delivered at Reading during October under the auspices of the Reading Chamber of Commerce and the Workers' Educational Association on the subject of "Practical Experiments in Promoting a Better Understanding between Employers and Workpeople." Mr. Ratcliffe's main subject will be "Works Committees: Their Scope and Function."

Electric irons are now being hired out by the Preesall (Lancs) Council at a charge of one shilling per quarter.

Blackburn Guardians have decided to invite tenders for alterations to the electric lighting system in the board room.

Owing to unforeseen circumstances, the date of the annual festival dinner of the Electrical Trades Benevolent Institution has been changed from November 17th to November 10th. It will be held at the Trocadero Restaurant, London.

A sub-committee of Rawtenstall T.C. has been visiting electrical showrooms in other Lancashire towns, with a view to obtaining information which will be of service to the Corporation when establishing its own showrooms, a step which the sub-committee recommends it to take.

During Liverpool Civic Week there will be built and on view on the St. George's Hall Plateau, Lime Street, a reproduction all-electric subsidy house with a complete equipment of electrical fittings. This dwelling, which will be open to public inspection, will be packed with useful electrical suggestions.

Members of the Irish Centre of the I.E.E. visited the Shannon electricity works at Ardnacrusha last week.

Mr. G. S. Francis addressed Reading Rotary Club last week on "Electricity as a Factor in National Economy."

It is understood that a report on the Dolgarrog dam disaster has been submitted to the Government by the Aluminium Corporation.

The West Midlands District Industrial Council states that no alteration in wage rates will be made during the next three months.

The Birmingham and Midlands Wireless Exhibition opens at the Drill Hall, Thorpe Street, Birmingham, on October 5th until October 16th.

Members of the Sussex and East Kent branches of the E.C.A. recently visited the Osram lamp and glass works and the G.E.C. research laboratories.

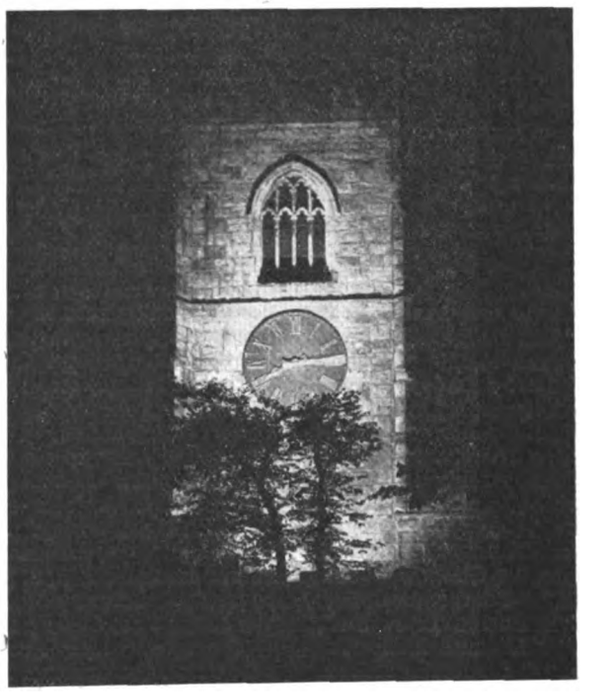
The second general meeting of the Meter Engineers' Technical Association was held in London on September 23rd, when Mr. G. F. Shotter delivered his presidential address.

St. Helen's Cables, Slough, Football Club are drawn away to Denham Juniors in the preliminary round of the Berks and Bucks Junior Cup. If successful they will be at home to Stoke Rovers in the first round.

Reporting on the South Shields assisted wiring scheme, Mr. James Edgar says that in addition to benefiting the Electricity Department, it has resulted in much work being placed in the hands of local wiring contractors.

Next Tuesday the N.A.S.E. session will open with the reading by Mr. A. M. Sillar of his presidential address. During the evening Mr. J. S. Highfield will present certificates to winners of prizes in the various competitions of the Association in 1923, 1924 and 1925.

The Electricity Commissioners have approved the construction and pattern of and the means provided for fixing the Electrical Apparatus Co.'s type E induction watt-hour meter, rated sizes 2·5 A to 20 A, 200 to 250 V, at 50 cycles per sec.; the Ferranti type F.H. c.c. mercury motor ampere-hour meter and the Ferranti type C single phase a.c. meter, rated sizes 2½ A to 20 A, and the prepayment mechanism in the two last mentioned.



AS interior lighting of the clock face on the tower of Skipton (Yorks) church was not possible, the required illumination has been provided by floodlight projectors fixed on the roof of the south aisle. The tower is now a landmark visible for a considerable distance at night.

It is reported that Prof. Ehrenhaft, of Vienna, has discovered a smaller electrical elementary body than the electron.

Wolverhampton Trades and Labour Council was given an outline of the programme of the West Midland Joint Electricity scheme by Mr. S. T. Allen.

At the opening meeting of the twenty-eighth session of the Bradford Engineering Society, on October 4th, Ald. J. W. Longley (president) will deliver an inaugural address on "The Evolution of the Factory Power Plant." Other lectures to be delivered during the session include: "The Conversion of Textile Mills from Steam to Electric Driving," by Mr. B. C. Johnson; "The Parsons 50 000 kW Steam Turbo-Alternator," by a representative of C. A. Parsons and Co., Ltd.; and "Impressions of a Visit to the United States," by Mr. Thos. Roles.

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"WIRING THE HOMES OF BRITAIN."

Special Reports from "Electrician" Correspondents show how Campaign is Progressing—Advertising to Forty Million People.

THE first shot in the E.D.A.–E.L.M.A. Better Home Lighting Campaign will be fired on Sunday when the "Sunday Pictorial" will carry the first public announcement of the All-Electric Home Competition to millions of homes.

The work of the organisers of the campaign is now virtually over, and it rests with individual members of the trade to carry on the work to its logical conclusion. Everything that could possibly be provided to make the scheme an unqualified success—booklets, posters, window display material, advice, and Press advertising on a tremendous scale—has been produced by the E.D.A. and the E.L.M.A., and traders have had ample time afforded them in which to obtain every sort of help they required before the public opening of the campaign.

Now the trade must get the inquiries—and the business.

Watch the Advertisements.

Apart from the demand for competition booklets which will be created throughout the country by the advertisements in national newspapers, there will be similar advertisements in most of the important provincial papers, and the dates of these advertisements should be closely watched and made to coincide with extra special local efforts on those days.

Following the initial Better Home Lighting Campaign announcement in the "Sunday Pictorial" on Sunday, next week will see advertisements on Monday in the "Paisley Daily Express," and on Tuesday in the "Daily Mail," "Daily News," "Birmingham Post," "Western Daily Press" (Bristol), "Eastern Morning News," "East Anglian Daily Times," "Leeds Mercury," "Lincolnshire Echo," "Manchester Guardian," "North Mail," "Nottingham Evening Post," "Oldham Evening Chronicle," "Sheffield Independent," "Belfast Evening Telegraph," "Glasgow Evening Times," "Bedfordshire Times," "Gloucester Echo."

On Wednesday the campaign will be advertised in the "Bristol Evening Times," "Cambria Daily Leader," "Yorkshire Evening Post," "Manchester Evening Chronicle," "Northampton Chronicle," "Sheffield Daily Telegraph," "Leicester Mercury," "Edinburgh Evening News," "Glasgow Herald," "Bath and Wilts Daily Chronicle," "Eastbourne Gazette," "Halifax Courier," "Dorset Daily Echo," "Wolverhampton Express and Star," and "Worcester Daily Echo."

Announcements for Thursday will be in the "Birmingham Evening Dispatch," "Yorkshire Observer," "South Wales Echo," "Yorkshire Evening News," "Liverpool Post," "Lancashire Daily Post," "Daily Dispatch," "Newcastle Daily Journal," "Nottingham Journal," "Portsmouth Evening News," "Belfast News-Letter," "Glasgow Daily Record," "Aberdeen Evening Express," "Evening Tidings" (Penzance), "Cheshire Daily Echo," "Dundee Advertiser," "Guernsey Evening Press," "Western Morning News," and "Cumberland Evening News."

Friday's Message.

On Friday next the electrical message will appear in the "Daily Chronicle," "Daily Express," "Bolton Evening News," "Northern Daily Telegraph," "Western Mail," "Birmingham Gazette," "Northern Echo," "Derby Daily Express," "Hull Daily Mail," "Grimsby Daily Telegraph," "Yorkshire Herald," "Yorkshire Post," "Liverpool Courier," "Lincolnshire Chronicle," "Manchester Evening News," "Newcastle Evening Chronicle," "Nottinghamshire Weekly Guardian," "Northampton Echo," "Oldham Evening Standard," "North-Eastern Daily Gazette," "Yorkshire Telegraph and Star," "Staffordshire Sentinel," "Leicester Mail," "Portsmouth Times," "Northern Whig," "Scotsman," "Glasgow Evening News," "Aberdeen Press and Journal," "Bournemouth Daily Echo," "Brighton Evening Argus," "Burton Daily Mail," "Northampton Evening Telegraph," "Midland Daily Telegraph," "Devon and Exeter Gazette," "Gloucester Citizen," "Northern Daily Mail," "Cambridge Daily News," "Midland Daily Tribune," "Shields Daily News," "Kent and Sussex Courier," and "Greenock Telegraph."

To conclude this great week of electrical publicity, advertisements will go out on Saturday in the Ashton-under-Lyne Reporter," "Hastings and St. Leonards Observer," "Newport and Market Drayton Advertiser," and "Worthing Herald."

This formidable list represents only one week's effort, and Sunday, October 10th, will initiate a similar cycle, which will be repeated with slight modifications each week during the period of the campaign.

The combined circulation of the newspapers mentioned above is in the vicinity of 14 000 000, and it is therefore practically certain that over 40 000 000 people will be reached each week by newspaper advertising.

The following special reports from correspondents of THE ELECTRICIAN show what is being done in the provinces. The interest already aroused in the campaign in the Manchester district was demonstrated last Friday night when the Milton Hall, Manchester, was packed with traders anxious to hear full details of the scheme from Mr. W. E. Bush of E.L.M.A.

It was evident from the number of questions asked at the meeting that a large section of the trade had given the scheme thoughtful interest, and whilst there was a certain amount of criticism, this was largely of a friendly type, and some obvious misunderstandings were removed by Mr. Bush. In the first place, some speakers did not appreciate why traders should pay £4 10s. per 1 000 for the competition books; but when figures were given showing that the supply undertakings and others were paying for the whole of the national advertising of the campaign, the meeting conceded that the contribution of the trader was comparatively very small, and certainly just. Orders for books, Mr. Bush said, were coming into headquarters very well, and a large increase was expected this week. The orders varied from one dozen to five thousand, showing that the smallest trader need not hesitate in the matter.

Demonstration Houses.

The work of the Lighting Service Bureau about to be established in Manchester was the subject of some inquiry, and both this and the work of the District Circles were fully explained. Owing to the large population and the huge area covered by the North-Western Division, of which Manchester is the centre, every effort is to be made to have a large number of demonstration houses opened up, and to this end Local Circles will be formed as soon as possible.

Mr. R. C. Hawkins, who is in charge of the campaign in the North-Western area, and who is also superintending the new Lighting Service Bureau, to be opened by the Lord Mayor of Manchester on October 5th, informed a representative of THE ELECTRICIAN that up to Monday he had been advised of 40 000 applications for competition books in the North-Western area, but that during the week there would probably be many more. He expressed pleasure at the way things were going, and felt that both the Manchester meeting and the one held at Liverpool on the previous day had been most successful. "Of course," added Mr. Hawkins, "we would like to do better, but we cannot grumble at the interest the traders are showing throughout the area."

Traders in the Manchester district appear to be vastly impressed with the scheme, and there seems to be an evident desire to co-operate in every way. It is rather early to judge window displays yet, but in another week it is to be hoped the district will have staged some really attractive shows.

The Newcastle correspondent of THE ELECTRICIAN reports that all branches of the electrical industry in the North-East Coast Section are enthusiastic in their support of the National Campaign, and are displaying marked activity and resource in laying plans to enable then to reap maximum benefits from the scheme. A joint committee of the local E.D.A. and E.L.M.A., comprising 14 members, with Mr. J. Edgar, of South Shields as chairman, Mr. R. Robson, Newcastle, as vice-chairman, and Mr. E. S. Evans, of the Lighting Service Bureau, as resident secretary of the area, has proved the mainspring of the North-East Coast push.

The area, which extends from Berwick to Whitby, and across into Cumberland, has been divided into 20 Local Circles to co-ordinate local effort and to arrange for running exhibition houses. Local Circles are being formed at Newcastle, Sunderland, Stockton, South Shields, Middlesbrough, Darlington, West Hartlepool, Durham, Carlisle, Alnwick, Bishop Auckland, Ashington, Saltburn, Keswick, Tynemouth, Berwick, Annfield Plain, Whitby, Whitehaven, and Workington.

The scheme is being developed with zeal throughout the area, and the section claims with justifiable pride that the first official ceremony in connection with the campaign will

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take place in its area. This is at West Hartlepool, where the Local Circle, under the chairmanship of Mr. J. H. Parker, has already provided and fitted up an excellently appointed demonstration model electric house. This will be opened on the day following the beginning of the campaign proper, at a ceremony to be attended by the Mayor and Corporation of the borough. The North is very proud of this enterprising move and anticipates that good results will accrue. Mr. Parker has been largely instrumental in giving this valuable lead. Steps are also being taken by the Newcastle Circle, which includes Gateshead, Blaydon, Wallsend, Gosforth, Ponteland, Hexham, and other places, to arrange model exhibition houses. Mr. W. F. T. Pinkney is the chairman of this Circle.

Adequate measures are also being adopted to derive full publicity value from the campaign. This side of the scheme is being undertaken by Mr. Pike, of the N.E.S. Co. So far as possible the national publicity will be supplemented by advertisements from local traders, and special full pages in the local Press will contain displays from contractors and lamp manufacturers, together with an attractive "write-up."

In addition many contractors are arranging for other individual advertising. For example, Robson and Coleman, Ltd., of Newcastle, are sending out 7 500 advertising cards explaining the competition. Each of these has a reply post-card portion attached enabling recipients to send in requests for competition booklets. They are also making special window displays with window pelmets designed by a local artist in keeping with the window bills and house posters issued by the E.D.A. Further, all correspondence leaving the office bears a campaign stick-on stamp. These arrangements are typical of the elaborate preparations which North Country traders are making. Up to last week-end between 11 000 and 12 000 booklets had been handed out by the committee for use in the area.

Sussex Contractors' Efforts.

In Brighton and district the large majority of the electrical contractors are throwing themselves whole-heartedly into the National Campaign, but (states an ELECTRICIAN correspondent) the effort will in the main be a detached one. That is to say, it has been decided that each contractor taking part shall act independently, and each in his own way. There will, of course, be special window displays, and Messrs. H. J. Galliers, one of the leading firms of electrical contractors in the town, are promoting, at the Corn Exchange, from October 6th, an attractive exhibition of home lighting, while arrangements are being made at their electric shop in Castle Square for the presentation of model electrically-lighted flats.

The Electricity Department is taking a prominent part in the campaign and it is possible that it will arrange a model home exhibition, which practically all the contractors of Sussex have agreed to support.

Interviewed by THE ELECTRICIAN correspondent Counc. H. J. Galliers said the campaign involved an outlay of about £30 000, and if it was to be properly exploited the trade itself should expend a further sum of at least £60 000. His view was that the atmosphere of failure would attach to the effort if, in the issue, it did not result in an increase of expenditure for the current year by the consuming public of something approaching one million pounds sterling above the normal, in wiring, purchase of apparatus, and so forth. The industry was entitled to look confidently for such an increase in patronage as he had suggested.

There is no area in the country where the National Electricity Campaign will have a greater pull than in the very populous district of East Lancashire, writes another representative of THE ELECTRICIAN, who reports considerable activity in co-operative efforts to make the campaign a success.

Incidentally (our correspondent states) the coal strike has helped forward the movement tremendously, for apparatus is being installed with feverish anxiety in all the towns, in anticipation of cold and frosty days ahead. Experience in Blackburn, Blackpool, Preston, Bolton, Accrington, Burnley, and other centres, indicates that this national effort could not have come at a more opportune time.

One Lancashire official sounded a note of warning in conversation with our correspondent. "This boom can be turned to tremendously good account," he said, "but it will prove only partially successful if the apparatus sold is not properly installed. Unless careful attention is given to this, we may have the market flooded with second-hand apparatus from dissatisfied consumers, and this would be very undesirable."

There was general agreement among the half-dozen leading electrical firms at Plymouth, when questioned on Monday by a representative of THE ELECTRICIAN, that the campaign would be productive of good results, though in the case of one firm it was stated that they had received no official intimation of the scheme, and knew of it only from what had appeared in the trade Press. In three other cases no ballot forms were yet to hand.

Plymouth Contractors' Views.

W. G. Heath and Co. vouchsafed the verdict that the campaign would prove a great boon to all engaged in the electrical industry. Messrs. W. J. Corse regarded the scheme as a grand one, which should do much to advance electric lighting and the sale of all electrical appliances. Mr. W. Hodge said the campaign was an excellent one, and the advertising was bound to bring results. Axworthy and Co., who are canvassing their district and co-operating to the fullest extent with the E.D.A., think the campaign will fill a long-felt need, and will be advantageous to the trade generally, to the supply authorities, and also to the public.

The campaign has been taken up wholeheartedly in the North-Midland area, and an ELECTRICIAN correspondent states that already between twenty and thirty centres have been established. Mr. H. Girdlestone, the District Officer of the Area Committee, is receiving encouraging support from representatives of municipal undertakings and private contractors. At Halifax a strong and representative local committee has already made preparations for the launching of the scheme. The matter has been taken in hand by the supply authorities of Halifax, Hebden Bridge, and Elland, with the support of the Yorkshire Electric Power Co., and meetings in conjunction with electrical contractors have been held.

The Halifax and District Committee comprises Mr. W. M. Rogerson (engineer and manager, Halifax Electricity Department), Mr. H. H. Sutcliffe (Hebden Bridge District Council), Mr. Vowles (Wholesale Electric Supply Co.), Mr. H. Birkhead, Mr. J. Harrison (Harrison and Co.), Mr. C. Jowett, Mr. E. Hunt (Warburton and Co.), Mr. J. S. Akroyd (Thomas and Akroyd), Mr. F. H. Wilcock (showroom manager, Halifax Corporation), Mr. T. M. Blackburn (Yorkshire Electric Power Co.), Mr. Stillingfleet (Stillingfleet and Harper), Mr. E. Brear and Mr. A. E. Elson (Halifax Corporation). Mr. Birkhead is Chairman of the Committee, Mr. Hunt vice-president and Mr. Wilcock the secretary and treasurer.

It is the intention to hold demonstrations in various parts of the district as to the possibilities of electricity in connection with work in the home, and in order that the appeal shall be as widespread as possible, it is proposed to have demonstration houses in the various districts covered by the area circle. The opinion was expressed that it was not necessary to confine activities to new houses, as there is scope for work in old houses which have not previously been wired. Already there has been one house of a suitable type offered to the committee, and this will be ready for wiring about the beginning of November.

The proposal is that the house selected shall be used for demonstration purposes for a month, and when one house is vacated another will be ready in another district.

Enthusiasm in Birmingham.

Inquiries made by a representative of THE ELECTRICIAN amongst traders in the Birmingham district reveal a good deal of enthusiasm for the campaign, and there is abundant evidence that in this centre the campaign is going to be pushed to its utmost. The personnel of the South-Midland Area Committee is an indication of the united manner in which the trade locally is supporting the campaign, for on it all sections of the industry—supply undertakings, manufacturers, contractors, and wholesalers—are represented. Mr. R. A. Chattock is chairman, and Birmingham Corporation is lending the full weight of its support to the local propaganda. Evidence of this will be forthcoming on the opening day of the campaign, when the windows of the Corporation electrical showrooms, in Paradise Street will be devoted to special campaign displays.

The Committee is composed of: Messrs. F. J. Moffett, J. T. H. Legge, T. P. Wilmshurst, W. H. Fletcher, W. A. Baxter, S. T. Allen, E. J. Jennings, F. Boyes, J. Orringe, W. Donovan, W. H. Wilcox, and E. Morgan. Mr. J. L. H. Cooper, of the Electric Lighting Service Demonstration Bureau, is the district officer.

Of this committee, a sub-committee has been appointed, the business of which it will be to promote the arrangements for

(*Concluded on page* 398.)

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

MR. A. W. B. Wilson has resigned his position with Fuller's United Electric Works, Ltd., of Chadwell Heath, where for many years he was London sales manager, to take up an appointment as sales manager to the London Battery and Cable Co., Ltd., of Hesketh Road, Forest Gate, London, as from to-day (Friday).

Mr. E. R. Morton.

Mr. E. R. Morton has resigned, as from September 30th, his appointment as manager of the electrical appliances, radio and publicity departments of the Sun Electrical Co., Ltd., to take up the position of sales manager with Kelvinator, Ltd., manufacturers of electrical refrigerators.

Mr. W. Godfrey, for 26 years a member of the staff at the Tunbridge Wells electricity works, is retiring, and on September 23rd he was presented by the borough electrical engineer, Mr. R. N. Torpy, on behalf of the staff, with an illuminated address.

Mr. T. P. Wilmshurst, on September 22nd, tendered to the Electricity Committee of Derby Corporation his resignation as borough electrical engineer, a post he has held for 28 years. He has been offered and has accepted an important electrical appointment under the Government, and will enter on his new duties in London on November 1st. Mr. Wilmshurst, whose portrait is reproduced on page 405, received his professional training under the late Sir Charles Bright, who laid the first Atlantic cable. Later, he joined the staff of the Taunton Electric Light Co. In 1889 he became chief assistant, and in 1890 chief engineer and manager to the Exeter Lighting Co. He was appointed borough electrical engineer of Halifax in 1893, and borough electrical engineer of Derby in 1898. He is a past-president of the I.M.E.A.

The late Mr. Charles Storey Gilman, who was for some years a director of the Westminster Electric Supply Corporation, left unsettled property valued at £98 268; net personalty £97 866.

Mr. R. G. Parrott, manager of the Metropolitan-Vickers Electrical Export Co., for the Argentine, Chile, Peru, etc., sailed by s.s. "Almanzora" from Southampton on September 24th, for his headquarters at Buenos Aires, after a four months' business and holiday visit to this country and the Continent. Mr. Parrott is chairman of the Argentine Local Section of the I.E.E. for this year, and is also acting on the Electrical Trade Committee of the British Chamber of Commerce in the Argentine.

Obituary.

The following deaths have been announced:—

MR. JOHN CHARLES WHITE, electrical manufacturer, of the Electrodrome, Bridge Street, Manchester, on Sunday, after a brief illness, in the forty-first year of his age. Mr. White, who was at his office until five days before his death, was the patentee and manufacturer of the J.C.W. wiring system. The funeral was at Altrincham Cemetery, Hale, on Wednesday.

MR. ARTHUR LLOYD HOLMES, aged fifty years, in the Leeds Infirmary, following two severe operations and the unsuccessful transfusion of blood. He was a director and the secretary of the Keighley Electrical Engineering Co., Ltd., of Strawberry Street, Keighley, with which firm he had been connected for the past thirty years. During much of that time he had personally supervised the motor department.

MR. LEO KAMM, of Kamm and Co., Ltd., in his sixty-sixth year. A member of the Royal Institution and an associate member of the Institution of Electrical Engineers, Mr. Kamm founded the business of L. Kamm and Co., engineers and electricians, many years ago, and was for some time chairman of Kamm's Zerograph Syndicate (1905), Ltd. At an early age Mr. Kamm invented his cyclo-telegraph, consisting of a bicycle with equipment for laying a telegraph wire, by which telegraphic communication with the cyclist could be maintained. Mr. Kamm's later inventions included a portable searchlight, and the Zerograph, a device which enabled a typewritten message to be automatically received at a distance.

BUSINESS ITEMS.

Changes of Address, Representatives, and other Developments.

RADIO Instruments, Ltd., have appointed Mr. G. H. Stevenson, of 40, Union Street, Glasgow, as their Scottish representative as from September 20th.

An agent in Amsterdam desires to include agencies of British makers of electrical fittings. Particulars from the Department of Overseas Trade. (Reference No. 390.)

A site with a frontage of 60 ft. in High Street, Wembley, has been acquired by the North Metropolitan Electric Power Supply Co., for the erection of new electricity showrooms.

An inquiry appears in the "Board of Trade Journal" for makers of tools and machinery for the manufacture of wireless valves. Apply to Department of Overseas Trade. (Reference No. 13 725/26.)

British makers of electric cranes, steam engines and boilers can be represented by an engineer and machinery merchant in Rangoon. Details from the Department of Overseas Trade. (Reference No. 374.)

Mr. W. H. Price has resigned the managing directorship of Price's Electrical Supplies, Ltd., and has formed a new company, W. H. Price and Newey, Ltd., at 57, St. Paul's Square, Birmingham.

The Midland Electric Power Installation Co., of Old Mill Street, Wolverhampton, have disposed of the sole selling rights of the "Mepic" automobile radiator heaters to J. W. Pickavant and Co., Quikko Works, Lombard Street, Birmingham.

The Lancashire Dynamo and Motor Co., Ltd., has appointed Mr. A. Powell as its manager in the South Wales area, and from his office at 8, Ty-Glas Road, Llanishen, Cardiff, he will deal with both "Lancashire" and "Crypto" machinery. The telephone number is Llanishen 156.

Kent Brothers Electric Wire Co. and E. N. Phillips, Ltd., announce that Mr. Arthur Iven, of 98/100, Queen Street, Cardiff, has ceased to act as their representative and that they have appointed the Sloan Electrical Co., 44, Victoria Street, Bristol, as their representatives for South Wales and the West of England.

Manchester Notes.

Electrical Illuminations and the Lighting Restrictions.

[FROM OUR OWN CORRESPONDENT.]

SINCE my remarks last week on the subject of the lighting restrictions we have had a very interesting time in Lancashire. Blackpool's illumination display, exclusively described in THE ELECTRICIAN last week, was in danger of being cancelled, as last week the Chief Constable startled the authorities by declaring that the illuminations were contrary to the regulations. The Mayor and Town Clerk went off to London at once, and on Thursday of last week, two days before the official light-up, when I called at the Publicity Department everyone was in suspense. However, the Mayor returned from London, and what he was told never transpired, although the lights went up on Saturday night for a restricted period. A special meeting was held this week, and it was decided to discontinue the illuminations except for a short time on Saturday night.

The argument used by Blackpool was that the coal used was not of a quality fit for household use, and could not therefore be considered as infringing the spirit of the regulations.

Points of View.

Interesting Pronouncements on a Variety of Topical Electrical Subjects.

HAND out the power and we will soon find use for it.—*Mr. S. T. Robinson.*

* * *

England has either to follow the lead of America or go under—to electrify or to elect to die.—*Mr. Shaw Desmond.*

* * *

We are beginning to realise that the political and financial conception of developed power as something to regulate and jockey with is anti-social.—*Mr. Henry Ford.*

* * *

The costs of electrical undertakings are continually coming down owing to the load factor, and a most significant thing is the success meeting their attempts to secure the heating load and the cooking load.—*Mr. Thomas Glover.*

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"ELECTRICAL CONTRACTIONS"—IV.

More About Concealed Wiring—How a Closed Loft was Wired from Below—A Satisfied Customer as Salesman.

By "FEEDER BOX."

ALL wiremen are, or should be, familiar with the proper removal and replacement of floor-boards. The minimum number only should be interfered with, chiefly on account of the displacement of awkward, delicate or heavy furniture and floor coverings, of which mention was made in my last article.

Important points which need to be borne in mind during the handling of floor-boarding, especially in a private house, are as follows: No board must be damaged or be allowed to foul the wiring run laid beneath. Replacement should preferably be made with countersunk screws, but if nailed, the nails should be taken well down with the aid of a punch.

Screwed floor-boarding is nearly as quickly fixed and makes a subsequent removal much more convenient, besides indicating the presence of a system beneath.

Great care should accompany wiring operations in a loft, where persons with clumsy feet may soon do several pounds' worth of damage. It is safer for only one man to operate in a loft, remaining there until all loft wiring is complete, thus lessening the risk of damage and avoiding unnecessary fingering of the paintwork around the trap door.

Besides disliking forms of wiring in which the cables are not protected with a rigid metallic protection (with which concealed work is impossible without cutting away), many contractors do not attempt to make use of the opportunities for concealed wiring presented in an old house. The reason for this in many cases seems to be a loft having no trap door or means of entrance, and therefore apparently no way in which the top floor wiring can be concealed behind the ceilings.

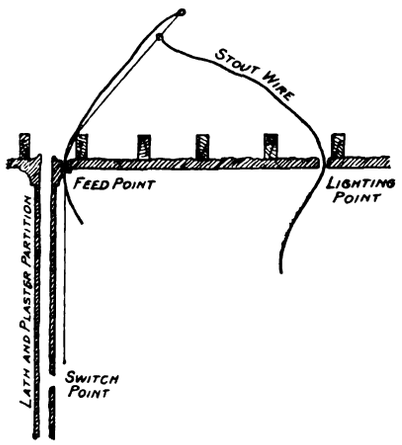

Fig. 1.—Inserting the draw cords.

THE three diagrams on this page illustrate how two ingenious wiremen wired a loft in a London house without personal access to the loft. The operations are described in the accompanying article.

It is, however, possible, and, indeed, a comparatively simple matter to lay wiring runs in a loft of this description without the necessity of entering it.

The writer had the opportunity quite recently of seeing two ingenious wiremen display their skill and regard for the customer's interior decorations, by successfully concealing all wiring in a London house where it was impossible to gain personal access to the loft except by the removal of slates from the roof, a procedure which would have necessitated a long ladder, a considerable amount of time, and a risk of personal injury.

The top floor of the house in question contained two large rooms (one was a billiards room) and a spacious landing. The concealment of the wiring in lower floors was completed by the use of the hollows in the lath and plaster partition walls and a moderate amount of common sense.

A pair of cables which arrived via the hollow wall on the inside of the top landing terminated at the fuseboard or junction position as shown in Fig. 3. The proximity and the lay of the ceiling joists in relation to the partition walls were ascertained by inserting in the ceilings a very fine long bradawl or spike, which left an almost invisible and easily repaired mark on the ceiling. Holes of about ½ in. diameter were then made in the ceiling at the positions A, B, C, D, E, F, and G, as shown in Fig. 3.

A and B are lighting point positions and the others are what the wiremen termed "feed points." A stout and pliable iron wire of about 12 or 14 s.w.g. and several feet long was then inserted into each of the holes C and B. The wire in hole C

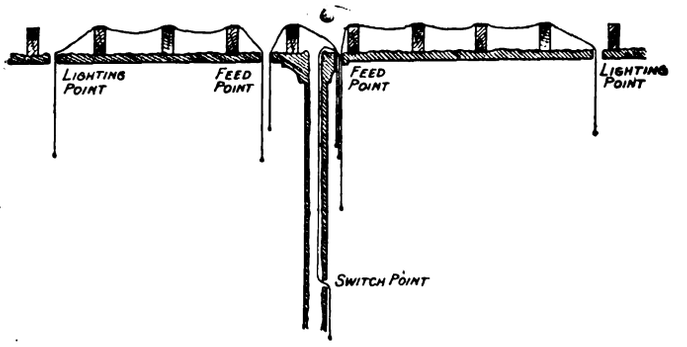

Fig. 2.—Draw cords in position.

had a cord attached to the inserted end, and was manipulated so as to point up but towards hole B. The wire in hole B was then manipulated until a small hook bend in the inserted end fouled the cord on the other wire, as shown in Fig. 1.

The wire in hole B was then withdrawn, bringing with it the cord which had been hanging out of hole C, and the wire in hole C was withdrawn, bringing with it the attached cord, which was then detached.

This operation was then repeated in much the same manner between all holes until cords connected all holes after the manner shown in Fig. 2. The entire series of operations was completed in about half an hour. Cables were then attached to the proper cords and one at a time drawn into the loft and out to their respective positions. The switch points, of course, necessitated a subsequent operation of inserting weighted cords in the feed points immediately above. These cords descended down the hollow spaces and were fished out with a short wire provided with a hook at the end.

Then the "feed point" holes were very easily and neatly made good with a remainder of paper similar to that with which the ceilings were papered, leaving the concealed wiring complete and ready to receive the lighting pendants and switches. The whole procedure, including fixing of switches and ceiling plates, etc., and the making good occupied the remarkably short time of under three hours.

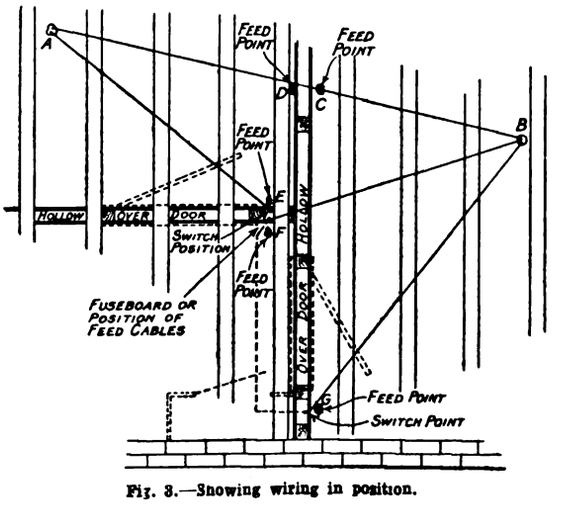

Fig. 3.—Showing wiring in position.

Conduit or surface wiring would have taken a much longer time and would have disfigured, however slightly, the somewhat ornate decoration of the room. C.T.S. cables were used for all concealed runs and "Maconite" and its casing for certain runs in the basement, where solid walls did not permit

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of any other method, cutting away being barred; otherwise every bit of cable was concealed.

For the purpose of inspection only, builders' men who were at work on the outside of the house removed some slates from the roof and made an entry. Each cable ran from hole to hole in a straight line (Fig. 3), so that all runs were of the minimum length, certainly a saving as against surface wiring where right angle bends would certainly have used more cable.

There is nothing particularly difficult or complicated about the operations involved, but great care seems necessary to make quite sure that no cord is withdrawn until it has fully functioned and the last lead is in position. In the case mentioned fresh cords were sometimes attached to the ingoing cables to replace the withdrawn ones, and to allow for the possible next cable.

Fig. 3 helps to make it clear that for every switch drop a feed point hole will be required immediately above, in the wall close to the ceiling or in the ceiling, depending upon the running direction of the joists; 10 ft. appears to be about the longest span which can be bridged by two wires, and longer spans necessitate the use of an intermediate feed hole. The lead shown by a dotted line in Fig. 3 represents the switch feed for the switch operating on lighting point B, and was taken by way of the partition wall down to and under the flooring, and thence via the cupboard to the switch position. In this case the cupboard made this route quite short and easy.

Practice, of course, makes perfect, and readers who have by chance adopted these methods in similar cases will agree that after some little experience the operations become quick and easy. Sometimes, but not frequently, cables are unable to take the shortest path, since a projecting upright or a diagonal cross tie diverts the original feeding wire. In the case of a greatly diverted cable, removal and a repetition of the operation may have a better result, but in any case no great strain must be put on either the cords or the cables, in case the ceiling should give way about the feed holes.

Needless to say, the customer in the case described was greatly mystified as to the manner in which the wiring had been placed in the loft, but was certainly very gratified to find that no damage had been done, and that none of the disfiguring pipes and runs he anticipated were to be seen.

More ingenuity and care of this kind would do much to encourage householders to have their houses wired. The contractor who carried out this job received an order to carry straight on with the house next door, thus proving the value of satisfying the customer.

Home Lighting Campaign.

Special Progress Reports from "Electrician" Correspondents.

(*Concluded from page* 395.)

equipping and staffing the demonstration houses. Arrangements have been made for the opening of several demonstration houses in Birmingham as soon as the campaign opens, and the number will be increased whenever possible.

Preliminary meetings of traders have been arranged, with a view to establishing local circles, at Stoke (forthe Potteries area), Walsall, and Nottingham. At Burton-on-Trent a circle has been formed under the chairmanship of Mr. T. Hall, the borough electrical engineer, and a number of contractors form the committee. A similar committee is in process of formation at Derby, under the chairmanship of Mr. T. P. Wilmshurst, who is also a member of the Central Area Committee.

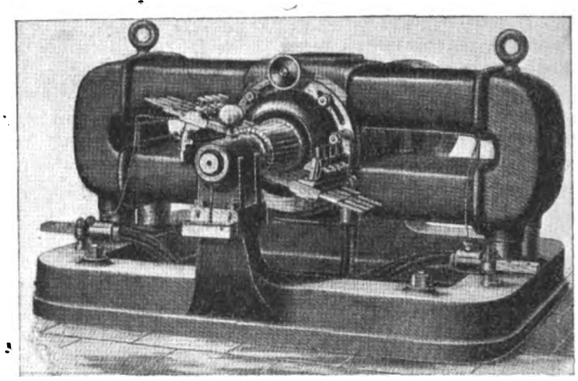
Orders for the Competition booklets have been received from all parts of the area, and orders for window display material are coming in this week with steadily increasing frequency.

In Birmingham, one of the most enthusiastic supporters is Mr. H. E. Walker, of Walker Bros., Temple Row, who regards the campaign as the finest thing the trade has yet undertaken. "It should go far," he said in an interview with THE ELECTRICIAN'S correspondent, "not only to fulfil the purposes which it sets out to accomplish, but also to stabilise the trade itself by giving success to the firms which deserve it." Upon one point Mr. Walker was emphatic—that a reduction in the cost of electricity for both lighting and power was essential throughout the whole country—a substantial reduction—before the trade could hope fully to enter, and serve, the vast field of activity which is before it.

FORTY YEARS AGO.

Interesting Gleanings from "The Electrician" of October 1st, 1886.

A GRAPHIC illustration of the changes in electrical machinery design is provided by the accompanying drawing, reproduced from THE ELECTRICIAN of October 1st, 1886—exactly forty years ago—of a "dynamo machine of a new type" which had been designed and constructed by



THIS forty years old Chamberlain and Hookham dynamo is reproduced from a woodcut illustration in "The Electrician" of October 1st, 1886.

Chamberlain and Hookham, and was shown at a Birmingham exhibition.

Other pages of this forty-years-old issue recall that:—

An Australian inventor produced an electrical machine-gun claimed to be capable of firing 120 rounds every few seconds.

* * *

The entire electric lighting plant at Colchester was sold at auction for £345, about one quarter of the original cost of the cables alone.

* * *

Experiments were being made with electric light as an aid to submarine photography.

* * *

Shareholders of the Direct Spanish Telegraph Co. agreed to the abandonment of the company's original cable, as it was impossible properly to repair it.

* * *

It was stated at a meeting of the Maxim-Weston Electric Co. that it cost the old board 17s. 6d. to make an incandescent lamp, but that the cost had since been reduced to about 3s.

E.D.A. Conferences.

Interesting Syllabus for Sixth Series of London Area Meetings.

FOR its sixth annual series of London conferences the Electrical Development Association has arranged an interesting programme. This year the meetings will be held in the rooms of the Royal Society of Arts, John Street, Adelphi, and light refreshments will be served in the intervals between papers and discussions. Commencing on October 15th the conferences will be held on the third Friday of each month, up to March, and will start at 7.30 p.m. As usual, all electrical men are cordially invited, and admission is free.

At the opening meeting Mr. V. W. Dale will speak on "Wiring the Homes of Britain," and on this occasion Mr. H. J. Miles, president of the E.C.A., will preside.

For November, "Shop Window Display," by Mr. E. Willson, is the subject, and Major H. Clifford Palmer will be in the chair. "Secrets of the Selling Art" will be divulged by Mr. G. S. Francis on December 17th (Mr. P. J. Pybus in the chair), and "Industrial Heating" will be dealt with by Mr. S. E. Monkhouse on January 21st (Mr. R. W. L. Phillips presiding).

Mr. W. F. T. Pinkney will deal with "Assisted Wiring Schemes" on February 18th (Mr. E. Slater in the chair), and finally, on March 18th, Mr. L. R. Morshead will speak on "Refrigeration" (Ald. Duncan Watson presiding).

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TRADE WITH PORTUGAL.

British Consul at Lisbon Gives Views on Electrical Prospects.

INTERVIEWED in London by a representative of THE ELECTRICIAN, Mr. S. G. Irving, H.M. Consul at Lisbon, made some interesting remarks regarding foreign trade with Portugal in electrical apparatus and material, and the progress and prospects of electric power and traction developments in the country. Dealing with the opportunities for exporting electrical goods to Portugal, Mr. Irving said there was not at present a very big market for such goods. The United States, France and Britain supply the bulk of the electrical and wireless goods at present imported, and some also come from Sweden. The imports of British electrical goods and apparatus in 1924 were valued at just over £50 000. Electric lamps, however, are supplied chiefly by Germany and Holland. Philips and Osram lamps are much in evidence.

Continental electrical goods enjoy a considerable advantage over British goods, especially the lighter classes, by reason of the fact that, although the import tariff is the same for all the principal countries, there is a 4 per cent. consular duty on imports by sea, which is escaped by consignments overland across the Spanish frontier. Also some of the continental countries, being nearer, have smaller freight charges to pay on account of the shorter distance, and Mr. Irving believes that the charges of some of the continental railways are lower than they are here.

"There have not been any very important water power schemes carried out so far" (Mr. Irving said), "although several schemes have been considered. There is considerable water power available in the north of Portugal, especially on the River Douro. The difficulty is that the river is partly Portuguese and partly Spanish, so that political questions arise. The principal falls are there, and it would be of great advantage to both countries if they could be developed." Mr. Irving has heard since he arrived in this country that steps have been taken to harness the falls on the Spanish side. How that will affect the Portuguese falls remains to be seen. The development of water power would be of special value to Portugal, because most of the fuel used in the country is imported, in normal times from England, but at present largely from Germany.

Questioned about the electric traction position, Mr. Irving said the railway from Lisbon to Esteril, along the north bank of the Tagus, a distance of 17 miles, is being electrified by the Allgemeine Elektricitäts Gesellschaft, of Berlin, and the locomotives and rolling stock are being supplied under a reparations agreement made between Portugal and Germany. This will be the first railway to be electrified in Portugal, and it should be completed this year. A scheme is under consideration by the Companhia Portuguesa which operates the railway from Lisbon to Oporto and the Lisbon-Cintra line, to electrify the latter, and it is probable that within a few years the busy triangle connecting Lisbon, Esteril and Cintra will be all-electric.

The electric tramways in Lisbon are operated by a British company, and give a very efficient service on a difficult track, the streets being hilly and winding. The tramway service in Oporto is municipal, and is not so good. No tendency is yet noticeable in Portugal to substitute railless trolley vehicles for tramcars.

It is reported that companies in the Sidro group, in which, it will be remembered, M. Loewenstein has a considerable interest, are now considering a scheme for supplying electricity in Lisbon.

Employment in August.

Latest Ministry of Labour Statistics for the Electrical Industry.

THE following are the numbers of unemployed insured persons usually employed in electrical work, but unemployed on August 23rd, 1926:—In the electrical engineering industry: males 5 002, females 1 077, total 6 079; percentages of total unemployed, 8·2, 7 and 7·9 respectively. Electrical wiring and contracting: males 1 847, females 39, total 1 886; percentages 15·8, 3·9 and 14·9. Electric cable, wire and electric lamp manufacture: males 3 789, females 2 227, total 6 016; percentages, males 7·4, females 7·3. Tramway and omnibus services: males 5 567, females 298, total 5 865; percentages, males 4·8, females 5·5.

IN LIGHTER VEIN.

Electro-Farming, or a Rural Phantasy in Two Phases.

FIRST PHASE (BLUE): Wumbledon was the sleepiest village in Wopshire. It was midday, but Wumbledon was not dead—only unconscious. The deep silence was broken by the sound of the eddy currents in the mill-stream circuit leaking through an air-gap in the fields.

A swan slept on a sod by the side of the stream. Willie Wattum, pioneer in electricity in the village, by virtue of his electric torch, sat deep in thought. Like his famous battery he was exhausted. He had mangled his wurzles, and drilled his turnips in the hope that they would form fours, but they were too deep. His wheat left him in a maze, and his oats were wild. His gas engine had given up the ghost; there were flies on the flywheel, the plugs were plugged, and the throttle throttled. The chaff-cutter chaffed the churn, for even a churn will turn. Willie could not make ends meet. The more he hoed the more he owed.

Willie Wattum.

* * *

NEUTRAL: A dull droning sound came through the air, increasing in volume, until with a wild roar Mr. Mororless Mark whizzed through the village in his 20/91·5 kW. (B.E.S.A. rating) high frequency car. There was a slight tremor as the balloon tyres floated over a brace of ducks and an old hen on their way (unconsciously) to the next world, and, as if by way of compensation, a large bundle of E.D.A.-E.L.M.A. Campaign literature fell off the back of the car.

Several hours later Willie Wattum, on his way to unmilk the cows, stumbled over the package. Deep into the night he sat fascinated, forgetting his fowls, his farm and his failure. Here at last was his chance; he, Willie Wattum, Wumbledon's pride, would show the world. Stabbing at the chart with a pin, he soon filled in and dispatched the form.

MR. William Wattum of Wumbledon, Wopshire, the winner of the All-Electric House. Score: 3 magpies and a bull. He stuck to Chatterton's Compound whilst training, and wears steel braces.

SECOND PHASE (RED): Mr. William Wattum sat in his now famous all-electric house. Electricity to the left of him, electricity to the right of him, electricity all round him.

Wumbledon was now alive, thanks to the enterprise of Mr. Wattum. On every hand work was on foot. Bees buzzed and drones droned as they drifted for the dole. A bull (fully charged) was trying to loop in a photographer who was taking the line of least resistance (a short circuit from the field).

The cornfields had been shingled (electrically), given a good crop, and the barns bulged. The cows were packed so closely in the shippon that they were giving condensed milk. Thanks to artificial sunlight, the grass grew in the night and was ready for eating the next day.

Inside the house electric fires glowed and electric light gleamed; the only chilly note was the refrigerator.

Aided by electricity, Mr. William Wattum was now not only able to make ends meet, but to make them overlap so far that he could tie them together.

* * *

The moral of this story is hard to find. Perhaps it is: "Cast your propaganda on the waters, and it gets there just the same."

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ELECTRICITY SUPPLY.

Commissioners to Hold Inquiry at Skipton—Cardiff and Newport Interlinking Suggestion—Southend's Proposed New £649 000 Station.

PWLLHELI Corporation has entered into an agreement with the North Wales Power Co. for the electric lighting of the town.

Coventry Electricity Committee recommends the Corporation to apply for sanction to a loan of £3 459 for a high pressure main.

The gross profit on the Derby electricity undertaking for the past year was £98 000 (increase £7 000) and the net profit £24 000 (decrease £2 000).

Louth R.D.C. has informed the Grimsby Electricity Committee that the Council is not prepared to accept any scheme for the supply of electricity in its area.

Aylesbury T.C. has decided to increase its charges for electricity for domestic, business and power purposes by 10 per cent. as from the end of September.

THE FIRST SHOT.

ON Sunday the first shot in the Better Lighting Campaign will be fired. The "Sunday Pictorial"—closely studied by people interested in prize competitions—will contain details of the All-Electric Home Ballot Competition. Some 2 350 000 copies of this paper will be circulated. Have YOU *enough Competition Books to meet Monday morning's demand?*

The general principle of the installation of electric light in Council houses by the tenants, where they desire to do so, has been approved by Plymouth Housing Committee.

Warsop U.D.C. has consented to the application of the Derbyshire and Nottinghamshire Electric Power Co. for a Special Order to supply in East Notts, including Warsop.

Wolverhampton Electricity Department made a gross profit of £91 502 on the past year's working, and a net profit of £25 860, of which it is proposed to place £10 000 to the relief of rates.

To comply with the requirements of the Coal Emergency Act, Doncaster Corporation has had to cancel its offer of free electricity to be used by traders for outside lighting during the Doncaster Shopping Week.

During the year ended March, 1926, electric radiators and cookers amounting to 1 113 kW were connected to the Southport Corporation mains, and during the same period other domestic electric appliances aggregating 96 kW were also put in service.

The Electricity Commissioners will hold an inquiry on October 21st at Skipton into the applications of Electrical Distribution of Yorkshire, Ltd., for powers to distribute electricity in Craven, and of Silsden, Barnoldswick, and Earby Councils for Special Orders.

The Minehead Electric Supply Co., Ltd., has applied to the Electricity Commissioners for a Special Order to generate and distribute electricity in Watchet urban district and parts of Williton rural district. Objections to the Electricity Commission by October 12th.

Chester Electricity Committee has received an application from residents at Bridge Trafford for a supply of electricity. The Committee recommend that, subject to the prospective consumers entering into a guarantee of revenue of not less than £50 per annum, application be made to the Electricity Commissioners for an Order to give the supply.

Preston T.C. has received sanction to borrow £19 996 for additional boiler plant, £13 970 for mains, transformer kiosks and equipment, and £79 000 for mains and services, land and buildings, etc. The Electricity Committee recommends mains extensions at a cost of £2 200 in Pope Lane, Penwortham, £2 150 in the Ribbleton area, and £1 300 in Frenchwood area.

It was reported at last week's meeting of Lurgan U.D.C. that the erection of the overhead cables from the town to the pumping station would be commenced during the present week, and that all the cable work was expected to be finished in about a month. The number of applications received for the position of clerk of works in connection with the town's electricity scheme is 44.

The Minister of Transport proposes to confirm the Porthcawl Electricity Special Order, the Wrexham Electricity (Extension) Special Order and the Horley and District Electricity (Extension) Special Order. Any objections must be sent to the Ministry of Transport by October 14th. The Minister also proposes to confirm the Seaham Harbour Electricity Special Order. Objections to the Ministry of Transport by October 14th.

Application is being made by Portsmouth Corporation for Special Orders to supply electrical energy in bulk to a company proposed to be formed for supplying and distributing electricity in Midhurst and the adjoining parishes, and for similar supplies to the Petersfield Electric Light and Power Co., Ltd., and the Bordon and District Gas Co. The cost of the extension to Midhurst from the present mains at Chichester is estimated at £15 000, while the Petersfield extension from the present mains at Horndean by overhead lines across the Downs is estimated to cost £9 000.

At a recent meeting of Newport (Mon) T.C. the Mayor (Mr. C. T. Clissitt) said it had occurred to him that the developments now taking place in the Newport and Cardiff electricity works might be used to the advantage of both. Both Corporations were proposing to instal 10 000 kW sets, and he suggested that the engineer should report as to the possibility of linking up the Cardiff and Newport stations. He supposed it would cost between £15 000 and £20 000. It was decided to ask the borough electrical engineer (Mr. A. Nichols Moore) and the consulting engineers to prepare a report.

Southend T.C. has decided, in view of the large capital outlay which would have to be incurred in the installation of the receiving and transforming plant, estimated to cost £238 000, not to accept the offer of the County of London Electric Supply Co. for a bulk supply from Barking. The Council is recommended to adopt the scheme prepared by Mr. J. H. Rider, for the erection of a new generating station at South Fambridge at an estimated cost of £649 000. The Electricity Commissioners have asked if the Council is prepared to consider the question of affording a bulk supply to Burnham-on-Crouch and neighbouring parishes and in the rural district of Maldon. The Council has replied that it is considering proposals which might enable supplies for these districts to be provided.

The Electricity Bill.

Association of Chambers of Commerce to Reconsider Suggested Amendments.

IN a recent issue of THE ELECTRICIAN we published an abstract of a resolution which the Leeds Chamber of Commerce had decided to submit to the Association of British Chambers of Commerce. The resolution—which was moved by Ald. Hugh Lupton, on behalf of the Leeds Chamber, at the meeting of the Association last week—is to the effect that the Association is of opinion that the management of stations by efficient undertakings and the supply by them of electricity to the consumers in their own area should not be interfered with; that the provision of a supply for other areas could be assured by an obligation on these undertakings to supply the Board in bulk on fair terms; and that consumers in industrial areas should be safeguarded against any burden arising from supply in unprofitable areas, and from the cost of the standardisation of frequency.

Ald. Lupton said the objects aimed at in the Bill were being already accomplished. The great companies and municipalities were concentrating their loads upon their best stations and taking in the small places in their districts.

Mr. Walter Raine, M.P., on behalf of the Newcastle and Gateshead Chamber, seconded the resolution.

Mr. Arthur Neal (Sheffield) thought that in a matter so involved with technique it was perhaps undesirable to pass so drastic a resolution.

Ultimately an amendment, moved by Sir Wm. Clare Lees, was passed referring the resolution to the Executive Council, and recommending that, in any representations made to the Government, consideration should be given to the points raised in the resolution.

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APPLIANCE SALES WITH A DIFFERENCE.

Suggestions for Buying for the Housewives' Requirements—Making Use of the E.D.A.-E.L.M.A. Better Lighting Campaign.

THIS year the lighting and heating season starts off under auspices that are extremely favourable for a very much larger volume of sales than has ever been possible before. Thousands and thousands of people will be visiting electric shops, some of them, possibly, for the first time, but all with a lively interest in electricity and what it can do for them.

Naturally, the retailer will look for greatly enhanced sales of lighting fittings, lamps, etc., but in anticipation of this demand he must see to it that his stock is entirely adequate.

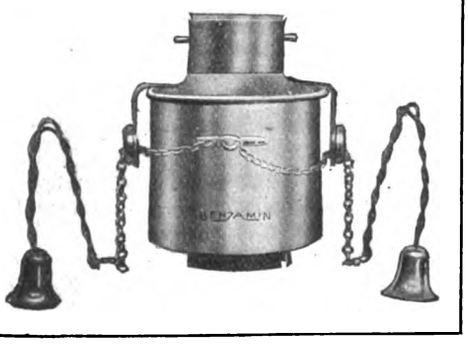
Having concluded a lighting sale with the aid of the E.D.A.–E.L.M.A. Better Home Lighting Competition, the electrical salesman can the more easily arouse customer-interest in the other electrical home aids which should also be prominently displayed in the shop or showroom.

With a view to assisting retailers in the selection of their stocks of lighting and other electrical apparatus we commence below the first instalment of a series of brief descriptions of apparatus which is worthy of consideration in this connection. The range of appliances available is so wide that it is obviously impossible to cover the whole field in one or even a dozen articles, but it is hoped that the information given from time to time throughout the duration of the campaign will be found of use as a guide to what the manufacturers concerned consider to be the most appropriate apparatus upon which to concentrate during the coming months. While many of the lines to be dealt with are entirely new, attention will also be directed to some appliances which are already on the market.

Special reference is made elsewhere in this issue to lighting fittings and their possibilities in connection with the E.D.A–E.L.M.A. Campaign. A useful device for use in connection with lighting fittings is the " Dim-a-Lite " adaptor (Benjamin Electric, Ltd.) illustrated below, which enables the user to obtain four different intensities of light from one lamp by simply pulling a cord ; the different cord positions give full, half, dim, and nightlight intensities. A compact fireproof rheostat, the device is furnished in polished brass and is supplied for high and low voltages for use with ordinary d.c. lampholders.

A portable lamp which clips on to tables, chair backs, shaving mirrors, etc., and fitted with the " Dim-a-Lite " adaptor is another useful home fitting.

New model electric fires are numerous this season. The G.E.C. range of " Magnet " fires has been increased by the addition of a new ornamental cast iron model for standing in a fireplace. It has a standard loading of 2 000 W with two-heat control. A new sheet metal fire (H2 504), in matt black



A light regulator which will appeal to domestic users. Manipulation of the cord gives four different intensities of light.

and real bronze finishes, has either two or three 1 000 W new pattern elements and the top of the casing forms a convenient trivet. A third model is a reflector fire of ornamental sheet metal finished in real bronze or oxidised silver, the heating element of which is fitted with a specially designed trough reflector. It is made in two sizes, for loadings of 2 000 W and 3 000 W. A new " Magnet " pedestal heater, with 12 in. copper reflector, has a heavier and more ornamental base than the earlier model, and can be had with 600, 750, or 1 000 W elements.

Fires finished in black and gold in place of the usual copper finish appear in the Bastian Meter Co.'s new range, which includes an improved pattern " Imp " fire and an " Imp-de-Luxe " model, both of which can be used for boiling kettles, etc. The last-named has removable copper reflectors to facilitate cleaning. The " Salisbury " fire, which also has a removable reflector, is now available in an improved finish, and its loading has been increased to 2 000 W maximum. A useful introduction to electric heating is afforded by the " Pygmy " heater for keeping foods, etc., hot, but not for boiling liquids from cold. Its loading is 250 W, and it can be used on a lighting circuit.

Seven new model fires have been prepared by H. W. Sullivan, Ltd. These are the " Successa," " Desira," " Salamanda," " Endura," " Porta," " Lighta " and " Sola." They are all

An imitation coal type "Angelus" fire by C. Joyner & Co. Other new fires for the season are illustrated overleaf.

fitted with " Uniglow " elements, and in several models the top element may be raised by means of a lever to heat water placed on the top of the casing.

In the " Magicoal " series of fires made by Berry's Electric, Ltd., the " Newberry " is the latest model. Besides the usual features it introduces for the first time a particularly realistic flame and smoke effect. The heating, too, is arranged on entirely new lines, coming from above the fire, and being projected both horizontally and downwards. Other new designs in striking and period styles include models 13, 14, 15, 16, 17, 18, 52, 61, 113, 136 and 410.

Mosaic electric fires in which elements consisting of hexagonal shaped rosettes can be built up into any desired pattern are being supplied by Girlings, Ltd., in several new patterns, all of which are designed to give illuminated elements symmetrically arranged in all positions of the switchgear. The special elements are also supplied separately in a form for attachment to existing lamp-type radiators.

New " Heatrae " fires to be introduced by Electric Fires, Ltd., include the " Columbine," an " imitation coal " type model, in which the fire bars are situated vertically, one at each side of the imitation coal, and so merged into the design as to be inconspicuous. This fire is available either with or without a fire back, the latter construction facilitating the recessing of the fire into existing grates. There are also several double-purpose fires, providing at the same time an electric fire of moderate current consumption and a boiling ring. The two fire bars are each separately controlled by switches, and the boiling ring, quite independently, by a third switch. A fire which can also be used as a breakfast cooker (shown on p. 402 in use as a fire) is another useful " Heatrae " production. For cooking purposes it is turned on its back. It has an 8 in. by 7 in. drip pan and grid, and on it grilling or toasting and boiling can be done simultaneously or independently as required.

The new range of " Angelus " fires produced by C. Joyner and Co., includes the Angelus " Coalfly," illustrated on this page. It has a back element of 1 500 W and a 100 W front heating element. The model depicted is finished in art black, but the same design is available in Florentine bronze

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finish. The firm's new "Sunbeam" portable bowl fire has a 750 W element, a strong guard, and is made to swing over for heating a light kettle. The reflector is of polished spun copper.

Double-purpose fires figure prominently in the "Creda" range offered by the Credenda Conduits Co., Ltd. One of these, the "Handy" fire, is a particularly attractive model with body of sheet steel finished black, and a polished copper reflector. It has a hinged trivet for boiling operations, and this can be swung inwards out of the way, by means of a cool handle, when not required. The "Graceful," a decorative fire of slightly heavier construction than the "Dainty," is one of several attractively designed fires, and is at the same time a very powerful heater.

An Electric Toilet Mirror.

A useful domestic appliance in the shape of an electric toilet mirror for shaving and other purposes is being marketed by Berry's Electric, Ltd., 85–86, Newman Street, London, W.1. Intended for table use, it has a removable stand which, when placed in the reversed position provides a guard for the lamp, protecting it from damage when the appliance is packed away. When the appliance is in use the direction of the light is adjustable by means of sliding prongs on the stand. As the glass is slightly warmed by the lamp, condensation of steam or breath on the mirror is prevented. Finished in nickel-plate, the mirror, excluding lampholder and lamp, is listed at £1 7s. 6d.

CURRENT RUMOURS.

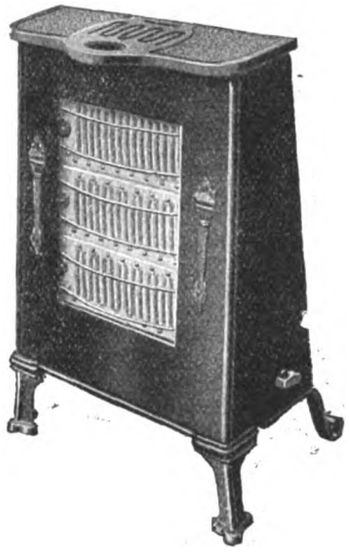
Talk of Important Government Position for Municipal Electrical Engineer.

EXTRAORDINARY rumours have gained currency this week to the effect that one of the Electricity Commissioners is resigning to take up an important position with one of the London electricity supply companies, and that Mr. T. P. Wilmshurst, who—as stated in another column—has resigned his position as borough electrical engineer at Derby, is to fill the vacant place. A certain amount of colour is lent to this story by the statement in local newspapers that Mr. Wilmshurst is taking up "an important appointment under the Government."

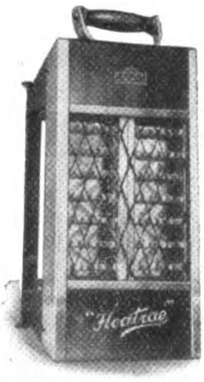
Another View.

On the other hand, a question asked in Parliament on Monday by Mr. D. Herbert has been taken to suggest that Mr. Wilmshurst's new appointment will be for special work in connection with the administration of the provisions of the Electricity Bill. In support of this view the "Derby Daily Telegraph" openly refers to Mr. Wilmshurst's "appointment to a high position under the Government's new electricity scheme." In response to inquiries by a representative of THE ELECTRICIAN this week, Mr. Wilmshurst said he could give no information at present, as the exact nature of "the appointment must first be announced by the Government Department concerned."

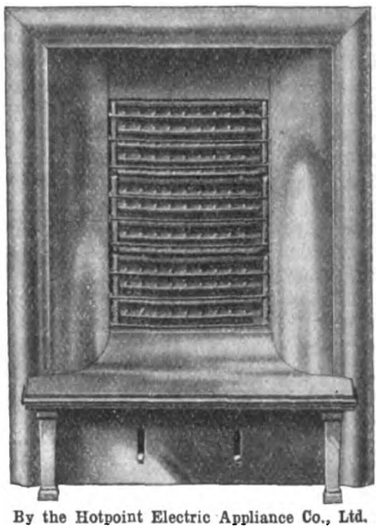
NEW SEASON'S ELECTRIC FIRES



By the Arora Co.



By Electric Fires, Ltd.



By the Hotpoint Electric Appliance Co., Ltd.

By Electric Fires, Ltd.

By the General Electric Co., Ltd.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given.

ABERDEEN.—Electric wiring and fitting of eight houses at Tanfield Walk, Aberdeen. Schedules from Tawse and Allen, 10, Bon Accord Square, Aberdeen.

SMELTER WOOD COLLIERY CO., LTD.—Installation of electrically-driven air compressor and haulage winch. Particulars from Mr. Jarvis, Smelter Wood Colliery, Richmond, Handsworth, Sheffield.

TENTERDEN (KENT) CORPORATION.—Electric light installation in 24 new houses. Particulars from Mr. F. C. Gibbons, Electrical Engineer, Ashford, Kent.

DUNFERMLINE CORPORATION, October 1st.—Electric lighting installation for 20 houses at Garden Place, Townhill, and eight houses at Kingseat. Specifications, etc., from Mr. R. Muir Morton, Burgh Engineer, City Chambers, Dunfermline.

INDIA STORE DEPARTMENT, October 1st.—Two 125 kVA 3 300 V crude oil engine alternator sets, with water-cooling plant, switchboard, etc., and transformers for Cauvery Metur project. Specifications (5s.) from the Director-General, Branch No. 36, Belvedere Road, Lambeth, London, S.E.1.

PORTSMOUTH TRAMWAYS COMMITTEE, October 1st.—Six months' supply of insulating materials, lamps and motor windings (section Q) and overhead line materials (section R). Specification, etc., from the General Manager and Engineer, Guildhall, Portsmouth.

PORTSMOUTH CORPORATION, October 1st.—Six months' supply of insulating materials, lamps and motor windings (Section Q) and overhead line materials (Section R), etc., for the Tramways Department. Specifications, etc., from the General Manager and Engineer, Guildhall, Portsmouth.

GRIMSBY CORPORATION, October 4th.—Supply of creosoted wood troughing, for the Electricity Department. Specification from Lt.-Col. W. A. Vignoles, Borough Electrical Engineer.

SOUTHEND CORPORATION, October 4th.—Supply of 2 500 pairs of fuse boxes and 1 250 troughs. Particulars from Mr. R. Birkett, borough electrical engineer and manager.

WATFORD CORPORATION, October 4th.—Wiring 11 houses. Particulars from the borough electrical engineer, Mr. A. W. Barham.

HULL CORPORATION, October 5th.—Supply of 20-ton overhead travelling crane (Contract 108). Specification, etc., from Mr. H. Bell, city electrical engineer and manager, Electricity Works, Sculcoates, Hull; deposit £1 1s.

LIVERPOOL CORPORATION, October 5th.—Two sets of pneumatic crude sewage ejectors and electrically-driven air compressors. Forms of tender from the City Engineer, Municipal Buildings, Dale Street, Liverpool.

PUDSEY CORPORATION, October 5th.—Supply of about four miles of l.t. cables, joint boxes, feeder pillars, etc. Specification, etc., from the Borough Electrical Engineer, Electricity Works, Pudsey, Yorks.

TICEHURST GUARDIANS, October 6th.—Electric light installation at the institution at Flimwell. Particulars from the clerk, Mr. William Bennett, Wadhurst.

PORT OF BRISTOL AUTHORITY, October 7th.—Electric lighting of old and new portions of Shed X, Welsh Back, Bristol. Specification, etc., from Mr. T. A. Peace, Engineer, Port of Bristol Authority, Avonmouth Dock.

MANCHESTER CORPORATION, October 8th.—Two 25 000 kVA three-phase transformers and one 1 250 kVA three-phase transformer (specification B.49); and one 100-ton electrically operated crane (specification B.50) for Barton power station. Specifications (deposit £2 2s. for each) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester.

MANCHESTER GUARDIANS, October 11th.—Twelve months' supply of electric lamps. Forms of tender from the Clerk, Union Offices, All Saints, Manchester.

THAME GUARDIANS, October 11th.—Electric lighting installation at the Institution. Specification and form of tender from the Master of the Institution.

BARNES URBAN DISTRICT COUNCIL, October 12th.—Supply and erection of one 40 000 lb. water-tube boiler, coal and ash handling plant, chimney, bunkers, etc. Specification, etc., from C. S. Davidson, Electricity Works, High Street, Mortlake, London, S.W.14; deposit, £1 1s.

MANCHESTER CORPORATION, October 12th.—Supply of tramway permanent way special track work. Specifications, etc., from Mr. Hy. Mattinson, general manager and chief engineer, 55, Piccadilly, Manchester; deposit £1 1s.

SHEFFIELD CORPORATION, October 14th.—Supply of one 10 000/12 500 kW turbo-alternator, to be erected at Neepsend generating station. Specifications and forms of tender from Mr. S. E. Fedden, general manager and engineer, Electric Supply Department, Commercial Street, Sheffield; deposit £2 2s.

DURHAM COUNTY COUNCIL, October 16th.—Electrical works in connection with the conversion of Earl's House School and other buildings into a tuberculosis hospital. Plans and specifications can be seen at the offices of M. and T. R. Milburn, 19, Fawcett Street, Sunderland; deposit, £2 2s.

ANOTHER view of the Basle illuminations for the World Power Conference. Taken through the arch of an illuminated railway bridge, the photo shows the floodlighted buildings fronting the river.

DUBLIN BOROUGH COMMISSIONERS, October 18th.—Supply and erection of four water-tube boilers, with stokers, economisers, feed pumps and accessories, for the Electric Supply Department. Specification from the City Electrical Engineer, Fleet Street, Dublin; deposit £5 5s.

DUBLIN BOROUGH COMMISSIONERS, October 18th.—Supply and installation of a complete 5 000 kW generating set (including steam turbo-alternator and exciter, condensing plant, etc.), at the Pigeon House generating station. Specification, etc., from the City Electrical Engineer, Fleet Street, Dublin; deposit £3 3s.

EDINBURGH CORPORATION, October 18th.—Two motor-driven circulating water pumps, drainage pump valves and pipework for Portobello generating station. Specification from Mr. E. Seddon, Electricity Department, Dewar Place, Edinburgh; deposit £1 1s.

BARRY URBAN DISTRICT COUNCIL, October 25th.—Underground mains, sub-station, transformers and meters. Specification, etc., from Mr. T. Franklin, Gas and Water Offices, Barry, Glam., or from A. H. Seabrook and Partners, 146, Bishopsgate, London, E.C.2; deposit, £3 3s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, October 4th.—Pole oil switches. (Reference B.X. 2 795.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, October 5th.—Supply of one four-motor overhead travelling crane and runway for the Waikaremoana Electric Power Development, Section 30. (Reference A.X. 3 517.)

POSTS AND TELEGRAPH DEPARTMENT, Melbourne, October 5th.—Switchboard cords. (Schedule No. 115.) (Reference B.X. 2 747.)

PRETORIA MUNICIPAL COUNCIL, October 7th.—Transformer and switchgear for abattoir sub-station. (Reference B.X. 2 851.)

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ANATOLIAN RAILWAY ADMINISTRATION, HAIDAR PACHA, October 9th.—Sand-blowing plant mounted on motor-driven truck on which is also to be mounted electric arc welding apparatus. October 11th.—Four wagon jacks and six jacks, electrically or hand operated.

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, October 11th.—Ironclad switchgear and single phase transformers. (Reference B.X. 2 793.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, October 11th.—One d.c. generator and one internal combustion engine, for Helwan-les-Bains electric power station. (Reference B.X. 2 883.)

AUSTRALIAN POSTMASTER-GENERAL'S DEPARTMENT, October 12th.—Automatic telephone exchange equipment.

A CONTRACTOR'S ADVICE.

"THE 'Wiring the Homes of Britain' Campaign is one of the finest advertising campaigns ever produced, and it behoves every electrical contractor, dealer or shopkeeper to take advantage of it. They are getting something for nothing, and they should make the most of it. £30 000 spent in the way it is being spent under the E.D.A.-E.L.M.A. arrangements will benefit the contractors and dealers far more than anyone else, and if they do not use it to their own advantage they are very short-sighted. Personally, I am making the very most of it, and am quite sure that I shall reap enormous benefits."

(Mr. R. Robson, in conversation with a representative of "The Electrician.")

INDIAN STORES DEPARTMENT (ENGINEERING BRANCH), SIMLA, October 16th.—Supply of four electrically-driven horizontal centrifugal or turbine pumping sets, with transformers. (Order No. N/4 870.) (Reference A.X. 3 590.)

NEW PLYMOUTH (N.Z.) HARBOUR BOARD, October 16th.—Supply, delivery and erection of 30 cwt. portal electric horizontal luffing jib crane, fittings and accessories. (Reference A.X. 3 458.)

SYDNEY COUNCIL, October 18th.—Two 100 ton electrically-operated overhead travelling cranes. (Contract 1 033.) (Reference A.X. 3 467.)

CHRISTCHURCH (N.Z.) DRAINAGE BOARD, October 19th.—Supply and erection of three sets of electrical centrifugal pumping plants. (Contract 26 329.) (Reference A.X. 3 215.*)

VICTORIAN RAILWAY COMMISSIONERS, October 20th.—Supply and delivery of rail motor equipment. (Contract No. 39 614.) (Reference A.X. 3 449.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Telephone plugs and sleeves. (Schedule C.120.) (Reference B.X. 2 799.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Lamps, lamp caps, and lamp sockets. (Schedule C.124.) (Reference B.X. 2 800.)

SYDNEY ELECTRICITY DEPARTMENT, November 1st.—Supply, delivery, erection, setting to work, testing and maintenance at Bunnerong power station of boiler feed pumps. (Reference A.X. 3 470.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Supply of 110 000 V transformers for Waikaremoana power scheme (section 17). (Reference B.X. 2 744.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Indoor control gear and switchgear for Waikaremoana electric power development (section 14). (Reference B.X. 2 675.)

CAPE TOWN MUNICIPALITY, November 3rd.—Two automatically-controlled, electrically-driven sewage pumps, etc. (Reference A.X. 3 617.)

VICTORIAN RAILWAY COMMISSIONERS, November 3rd.—Supply of 77 miles of seven-strand h.d. copper cable.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE.—November 4th.—Supply of primary battery material. (Reference B.X. 2 900.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 4th.—Supply of one electrically-operated 40-ton goliath crane. (Reference A.X. 3 657*)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, November 8th.—Diaphragms, cords, etc. (Reference B.X. 2 860.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone transformers. (Reference B.X. 2 797.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone protective apparatus. (Reference B.X. 840.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, November 10th.—Supply and erection of steam turbine-driven centrifugal boiler-feed pump. (Contract No. 770.) (Reference A.X. 3 534.) November 10th.—Supply and erection of motor-driven centrifugal boiler-feed pump. (Contract No. 771.) (Reference A.X. 3 536.)

SYDNEY CITY COUNCIL, November 15th.—Supply of 33 000 V cable and pilot cable. Specification (No. 1 047) from the Constructional Engineer, Electricity Department, Town Hall, Sydney.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 16th.—Supply of timing clocks for indicating the duration of telephone trunk line calls. (Reference B.X. 2 827.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 23rd.—Lightning arresters and transformers. (Reference B.X. 2 792.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 26th.—Primary battery material.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 30th.—Supply of 110 kW transformers. (Reference B.X. 2 874.)

SOUTHLAND ELECTRIC POWER BOARD, INVERCARGILL, N.Z., December 1st.—Supply of a 3 000 H.P. horizontal Francis turbine and 2 350 kW generator. (Reference B.X. 2 822.)

VICTORIAN RAILWAY COMMISSIONERS, December 1st.—Rotary converter or rectifier set, with switching equipment for its automatic operation.

STATE ELECTRICITY WORKS, MONTEVIDEO, December 6th.—Diesel-electric generating sets.

NEW ZEALAND GOVERNMENT RAILWAYS, December 10th.—Electric motors. (Reference B.X. 2 861.)

In Parliament.

An Appointment in Anticipation of the New Electricity Act.

IN the House of Commons on Monday, Mr. D. Herbert asked whether the Electricity Commissioners had written to electricity undertakings informing them that the Commissioners had appointed an individual to assist in the performance of certain work under a clause of the Bill in anticipation of the enactment of that measure, and whether a Government department was entitled thus to assume that a Bill introduced by the Government would be passed by Parliament with or without alteration.

Colonel Ashley (Minister of Transport) replied that the action taken by the Commissioners was taken with his approval. It was not unusual in the case of a Bill before Parliament for Government departments to take preliminary steps to facilitate the administration of the Bill when passed.

Mr. Herbert intimated that he would raise the matter as one of privilege and as in the nature of an insult to Parliament.

Popular Talks.

How Hackney Electricity Department Interests Public in Electrical Matters.

FREE popular talks arranged by Hackney Electricity Department for the coming season include: "History of the Underground Railway," by Mr. R. H. Bailey; "Economical and Hygienic Value of Good Lighting," by Mr. L. Gaster; "Modern Shop Lighting," by Mr. W. J. Jones; "The Threshold of the Electric Age," by Mr. G. S. Francis; "Smoke and Sunlight," by Mr. V. W. Dale; "History of the Hackney Electricity Undertaking," by Mr. J. R. J. Bowden; "Pathway of the Telephone Call," by an official of the London Telephone Service; and "The Lighting of Factories and Workshops," by Mr. W. E. Bush.

The meetings are held on Tuesday evenings, from November 2nd onwards, at the Hackney Electricity Department's Demonstration Hall, Clapton Road, London, and all the talks will be accompanied by cinema films, lantern slides, or exhibits.

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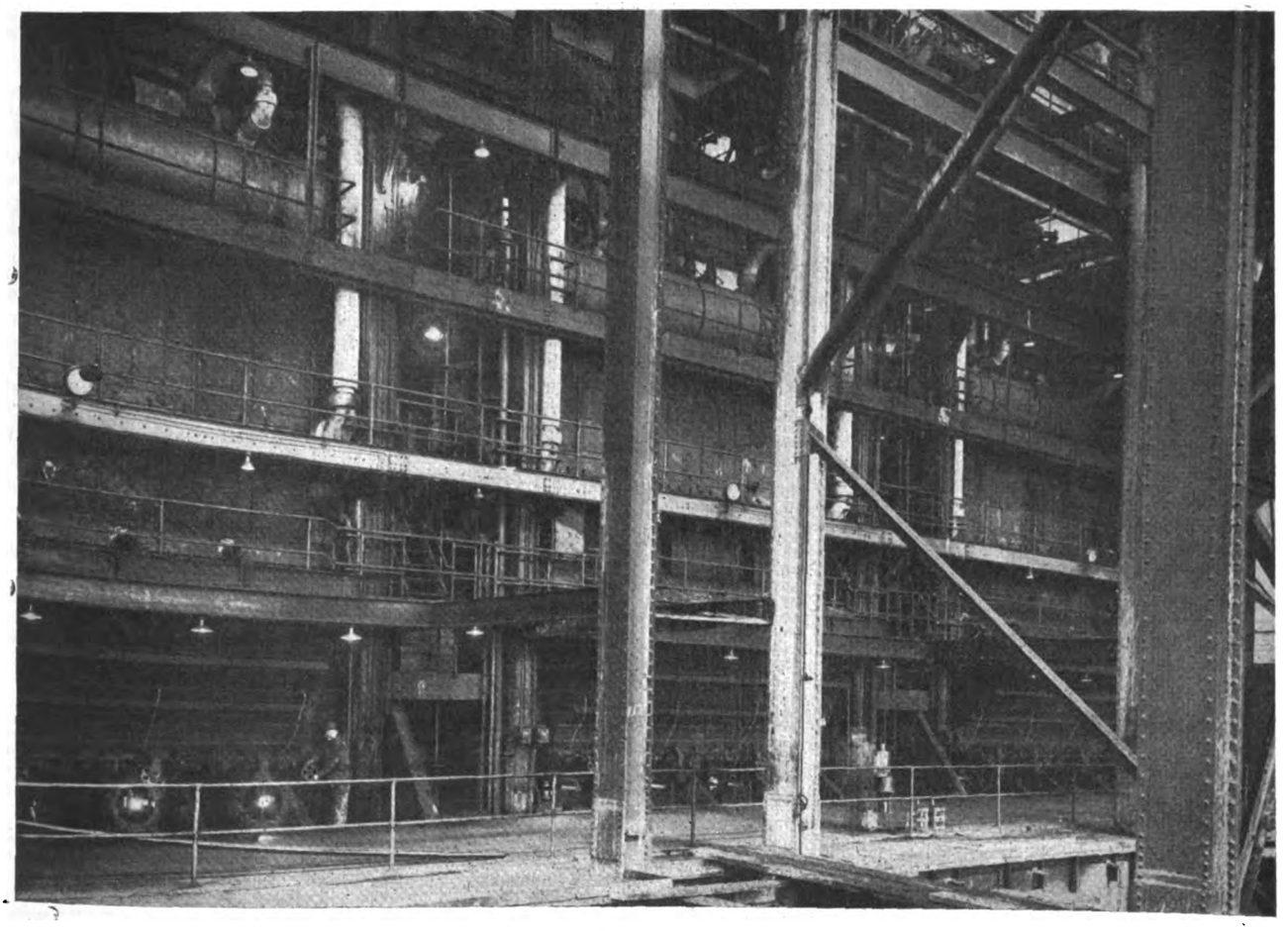
NEWS IN PICTURES

An ELECTRICIAN snapshot of Mr. T. P. Wilmshurst, who, as announced on page 396, has resigned his post as Derby's borough electrical engineer to take up "an important electrical position under the Government."

A novelty at the World's Radio Show at New York is the fountain loud speaker seen in the picture above.

An electric crane, used in the building of the exhibition structures at Basle, was converted for use as an amusement device, and is shown above carrying a load of passengers eager for the latest thrill.



A small section of one of the six groups of six boilers in the Hell Gate station of the United Electric Light and Power Co. of New York, which is claimed to be the largest power station in the world. Ultimately there will be twelve groups of boilers in this gargantuan boiler house.

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COMPANY NEWS.

Share Market Quiet with Few Price Changes—Rises in London Companies' Shares—Ferranti's Good Year—Edison Swan Offer Accepted.

THE market for electrical shares—supply, transport, telegraph and manufacturing—has become comparatively quiet, and our usual comparison of price quotations this week shows fewer changes. St. James's shares, which are of £5 denomination, show a rise of 7s. 6d. as compared with a week ago, while the £1 ordinary shares of the Westminster company are 1s. 3d. better. Bournemouth and Poole shares have eased slightly. British Electric Traction stock has maintained its higher level of a shade over 140, but London United Tramways debenture stock at 44½ is 2½ points lower, and Metropolitan Railway ordinary stock and 3½ per cent. debenture stock are ½ and 1 down respectively. In the manufacturing group, Callender's Cable ordinary shares have advanced another 7½d., to 67s. 6d.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
	Electricity Supply.				
10	Brompton & Kensington Ord.	31/3	31/3	45/-	24/-
4	Central Elec. Supp. 4% Deb..	90	90	100	67
15	Charing Cross Elec. Ord. (£1)..	44/4½	44/4½	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/0	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	49/4½	49/4½	52/6	20/3
6	,, ,, 6% C.P. ..	23/-	23/-	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	58/1½	58/1½	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	13½	13½	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	32/-	32/-	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	36/10½	36/10½	41/6	8/-
4½	,, ,, 4½% C.P....	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/0	22/0	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord (£5) ..	16½	16½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	45/-	43/9	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/0	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
	,, ,, 6% C.P...	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	140½	140½	183	24
6	,, ,, 6% Pf. Stk.	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69	69	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	78½	78½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	50½	50½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	78½	78½	89	65
4	Lon. Un. Trams. 1st Deb. ..	44½	47	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	64½	64½	101½	49
5	,, ,, 5% Deb. ..	68½	68½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	61½	62	84½	19
3½	,, 3½ Pf. Stk.	63½	63½	88½	40½
3½	,, 3½% Deb.	68½	69½	92½	51
3½	Met. Dis. Rly. Ord. Stk. ..	51½	51½	58	12½
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb.	65	65	73½	48½
—	Underground Elec. Rlys. Ord.(£10)	3½	3½	5½	21/3
5	Yorks. (W.R.)Trams. Ord. ..	11/6	11/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	70/-	70/-	62/-	26/6
6	,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	23/-	23/-	23/4	19/7½
7	,, ,, 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	26/3	26/3	29/-	10/-
‡15	Callender's Cable Ord... ..	67/6	66/10½	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref...	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)..	12/9	12/9	28/9½	1/11
7½	,, ,, 1st Pref...	21/3	21/3	26/-	5/-
10	Elec. Construction Ord. ..	31/10½	31/10½	30/4	6/7½
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	16/3	16/3	29/3	7/3
6	,, ,, 6% C.P... ..	18/-	18/-	21/3	10/6
—	Ericsson Telephones 7% Pref.	21/3	21/3	21/-	12/7½
6	Ferranti 6% Pref.	19/4½	19/4½	18/6	16/9
7	,, 7% 2nd Pref... ..	18/-	18/-	19/-	13/9
5	,, 1st Mort. Deb. Stock..	91½	91½	96½	80½
7½	General Elec. Ord.	30/9	30/9	59/-	13/6
20	W. T. Henley's Ord.	82/6	82/6	86/6	23/3
17½	Johnson & Phillips Ord. ..	66/3	66/3	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	25/7½	25/7½	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	47/6	47/6	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	31/3	31/3	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	29½	29½	56/2/6	19½
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	75	75	87½	60
10	Eastern Ord. Stk.	190½	100½	213½	113/2/6
3½	,, 3½% Pref. Stk.	65½	65½	84/17/6	49
4	,, 4% Deb. ..	79½	79½	103½	60
10	Eastern Extension Ord. (£10)..	10½	10½	21½	10/12/6
4	,, ,, 4% Deb. ..	78½	78½	97½	60
22	Gt. Northern Telegraph (£10)..	27½	27½	42/12/6	19
‖10	Indo-European (£25)	47½	47½	59½	25
—	Marconi's Wireless T. Ord. ..	13/9	13/9	9/16/3	20/9
7½	,, Int. Mar.	20/-	20/-	5/11/3	14/11
10	Western Tel. Ord. (£10). ..	18½	18½*	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	78½	78½	10	60/2/6

‡ Plus share bonus. ¶ Plus 3 p.c. in respect of 1921. ‖ Including bonus.

SHANGHAI ELECTRIC CONSTRUCTION CO.—First intm. div. of 4 p.c.

GATESHEAD AND DISTRICT TRAMWAYS CO.—Intm. div. at rate of 4 p.c. per annum, less tax.

CHADBURN'S (SHIP) TELEGRAPH CO., LTD.—Dirs. regret inability to announce div. on 6 p.c. cum. pref. shs.

ISLE OF THANET ELECTRIC SUPPLY CO., LTD.—Div. for half-year ended September 30th on 6 p.c. cum. pref. shs.

BRUCE PEEBLES AND CO., LTD.—Div. at rate of 7½ p.c. p.a. on 7½ p.c. cum. participating pref. shs. for half-year ended June 30th.

BURNDEPT WIRELESS, LTD.—At an extraordinary meeting of the holders of pref. ord. shs. on Tuesday, a resolution was passed authorising dirs. to borrow not exceeding £50 000 for general purposes of company, in addition to sums owing to bankers by an issue of debentures aggregating that amount.

FERRANTI, LTD.—Net pft. for year ended June 30th, £59 765, plus £33 312 brt. in. After provision for divs. to June, 1926, on the 6 p.c. cum. pref. shs. and on the 7 p.c. second pref. shs., blce. is £83 558. After placing £35 000 to gen. res., a div. of 20 p.c., tax free, on ord. shs. is proposed; fwd., £36 558.

CELLULOSE HOLDING AND INVESTMENT CO., LTD.—At an extraordinary genl. mtg. last Friday the shareholders approved proposals to change the name of this company (of which M. A. Loewenstein is a director) to "International Holding and Investment Co., Ltd.," and to increase the capital from £55 000 to £500 000.

EDISON SWAN ELECTRIC CO., LTD.—It is stated that shareholders who have accepted the offer of Lescher, Stephens and Co., on behalf of clients, to purchase the ordinary shares of the company at 13s. each recently received a notification that the requisite number of acceptances had been received and that cheques would be posted during the present week.

VENEZUELA TELEPHONE AND ELECTRICAL APPLIANCES CO., LTD.—Dirs. recommend shareholders to approve agreement for sale of coy's. undertaking to a purchaser in Venezuela for £425 000, payable in cash in London on November 1st. It is expected that there will not be less than 27s. 6d. for each £1 sh., both ord. and prefce. Div. 8 p.c. has been paid on prefce. shs. for year ended June 30th last, and it is proposed to pay 8 p.c. on old ord. shs. in respect of that year.

COMPANIES STRUCK OFF THE REGISTER.—The following were struck off the Register of Joint Stock Companies on September 7th: Hardware and Electrical Co., Lacland Electric Manufacturing Co., Residential Wireless, Shaw Electrical Transmission Co., Stafford Radio Co., Waterloo Electric Co., Westminster Radiophone Co., Wholesale Wireless Co., Wireless Accessories Stores, Wireless Club, and Wireless Supplies. The following will be struck off the Register unless cause to the contrary is shown before December 3rd: Keynsham Electric Light and Power Co., Wireless Appliances.

New Companies.

COLSTON ELECTRICAL CO., LTD.—Cap., £4 000. To acquire business of electrical contractor carried on by A. E. Finch at 9, Denmark Street, Bristol.

ERLCO (ELECTRICAL SERVICES), LTD.—Cap., £4 000. Electrical engineers, dealers in and repairers of electrical goods, wireless experts, etc. Reg. office: 106, Friar Street, Reading.

BRITISH BRUNSWICK, LTD.—Cap., £110 000. Manufacturers of and dealers in wireless apparatus and accessories, etc. Reg. office: 34, George Street, Hanover Square, London, W.1.

SYNCHROMATIC TIME RECORDING CO., LTD.—Cap., £1 000. Electrical contractors, electrical, mechanical, wireless and general engineers, etc. Reg. office: Coopers Buildings, 12, Church Street, Liverpool.

BRITISH DI-ELECTRIC CO., LTD.—Cap., £2 500. To acquire business of electrical engineers and factors of electrical goods now carried on at 116, Victoria Street, London, S.W.1, as the British Di-Electric Co.

ATKINSON AND PAYNES, LTD.—Cap., £2 000. To acquire the business carried on by H. C. Gaffney at 16, Birchfield Road, Handsworth, Birmingham, and to carry on the business of dealers in wireless apparatus, etc.

ERNEST JONES (BRADFORD), LTD.—Cap., £3 000. Electricians, mechanical and electrical engineers, workers and dealers in electricity, etc. A first director: A. E. Jones, electrical engineer, 37, Lydden Terrace, Leeds.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

CHESHAM, John Alfred (trading as ELECTRIC SERVICE CO.), 86, Trent Boulevard, West Bridgford, wireless and electrical engineer. £12 12s. 6d. August 10th.

ELECTRICAL DISPLAYS AND ACCESSORIES, LTD., 37, Piccadilly, W. £32 2s. 7d. July 27th.

LEE, H. A., 531, London Road, Westcliff-on-Sea, electrician. £26 15s. 5d. August 17th.

MARTIN, Mr. R., 128, Tewkesbury Street, Cardiff, electrical contractor. £13 15s. 8d. August 13th.

PORTER, Walter Horace, Park Vale, Bristol Road, Edgbaston, electrical engineer. £10 5s. 6d. August 10th.

WIRELESS SUPPLIES AND INSTALLATIONS, Town Hall Buildings, Banbury. £12 19s. 1d. August 17th.

Deed of Arrangement.

HARDING, Robert, 5, Railway Street, North Shields, electrical engineer. Filed September 22nd. Trustee, E. Macartney, 1, Eldon Square, Newcastle-on-Tyne, C.A. Secured creditors, £800: liabilities unsecured, £409; assets, less secured claims, £227.

Mortgage.

ALLIED ELECTRIC MANUFACTURERS, LTD., Sheffield.—Reg. September 15th, £1 000 1st debentures, to A. H. Spalton, 14, Dalewood Drive, Beauchief, incorporated sec.; general charge.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Bankruptcy Information.

HARTLEY, Francis Augustus, and HARTLEY, Ralph (trading as F. A. HARTLEY AND SON), 98, Katherine Street, Ashton-under-Lyne, electrical engineers. Receiving order, September 24th. Creditor's petition.

Companies Winding-up Voluntarily.

FALCONBRIDGE (C. E.), LTD. S. H. Hill, of 1, St. Peter's Church Walk. Nottingham, Chartered Accountant, appointed liquidator, September 21st.

WATES BROS., LTD. W. B. Anderson, chartered accountant, 40-43, Norfolk Street, Strand, appointed liquidator, September 24th.

Notices of Dividend.

COOKE, George Venables (trading as the WAKEFIELD WELDING CO. and the ALBION ACCUMULATOR SERVICE), 80, Ings Road, and previously in Albion Street, Wakefield, Yorks, oxy-acetylene welder and accumulator charger. First and final dividend, 5s. 11½d. per £, payable September 27th, Official Receiver's Office, 21, King Street, Wakefield.

JENSEN, James Leslie Roy, trading as JENSEN AND McNICOL, 149A, Seabank Road, Wallasey, wireless accessories factor. First and final dividend, 1s. 3¾d. per £, payable September 30th, offices of the Official Receiver, 11, Dale Street, Liverpool.

NORTH, Alfred, and NORTH, Fred, trading in co-partnership under the style or firm of A. and F. North, at 38, Bradford Road, and Market Place, Dewsbury, wireless and electrical engineers. First and final dividend of 1s. 0½d. per £, payable September 15th, at 16, Bond Street, Dewsbury.

Notices of Intended Dividend.

BARDSLEY, John Anderson Alfred, lately residing and carrying on business at 91, Old Hall Lane, Withington, Manchester, electrical contractor. Last day for receiving proofs, October 9th. Trustee, J. G. Gibson, Byrom Street, Manchester, Senior Official Receiver.

CARR, John Frederick, 89, Aston Avenue, Fallowfield, Manchester, electrical goods agent. Last day for receiving proofs, October 2nd. Trustee, J. G. Gibson, Byrom Street, Manchester, Senior Official Receiver.

Partnership Dissolved.

READ AND MORRIS (Frederic Orlando READ and Arthur Ernest MORRIS), wireless and electrical engineers, 31, East Castle Street, Oxford Street, London, W.1, by mutual consent as from July 31st, 1926. Debts received and paid by A. E. Morris, who continues the business.

Bankruptcy Proceedings.

HAMPSON, Richard, Yew Tree Bungalow, Hall i' th' Wood, Astley Bridge, lately 28, Victoria Square, Bolton, electrical engineer. The public examination of this debtor was held recently. The statement of affairs showed liabilities of £207, with a deficiency of £194. It appeared that in 1922 debtor commenced business in partnership at 28, Victoria Square, Bolton, as electrical engineers. His wife advanced him £20 capital. In January 1925 he withdrew from the partnership receiving no payment as his share in the business, but debtor had been sued by creditors of the partnership. The examination was closed.

KINZETT (F. E.) AND SON (other than Eric Francis Kinzett, a minor), 54, Fielding Road, Chiswick, Middlesex, wireless factors. The statement of affairs shows liabilities of £369, against assets of £152, or a deficiency of £217. Debtor Fanny Elizabeth Kinzett attributes the firm's position to bad debts, depression in trade and law costs. It appears that she and her son, who is a minor, entered into partnership and traded as F. E. Kinzett and Son without capital, at 54, Fielding Road, Chiswick, as wireless factors. She borrowed £40 from her daughter, which is still owing, and, as the business was unsuccessful, borrowed a further £70 from relations. In March 1926 goods were obtained to the value of £189 from the petitioning creditor, which were sold to a firm from whom they state they were unable to recover the amount, and the business was discontinued on April 12th, 1926. Debtor admits that she became aware of her position in March last.

Metal and Chemical Prices.

TUESDAY, September 28th

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£64 5 0	—	10s. 0d.
Electro Wirebars	,,	£66 7 6	—	12s. 6d.
H.C. Wire, basis	per lb.	9⅝d.	—	—
Sheet	,,	9⅞d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 1⅝d.	—	—
Brass 60/40—				
Rod, basis	per lb.	7½d.	—	—
Sheet, basis	,,	9⅞d.	—	—
Wire, basis	,,	10¼d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£5 0 0	4s. 0d.	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 0 0	10s. 0d.	—
Lead Pig—				
English	,,	£33 5 0	—	5s. 0d.
Foreign or Colonial	,,	£31 15 0	—	7s. 6d.
Tin—				
Ingot	,,	£311 10 0	—	£1 0 0
Wire, basis	per lb.	3s. 11d.	—	—
Aluminium Ingots	per ton	£112 0 0	—	—
Spelter	,,	£34 12 6	—	—
Mercury	per bottle	£15 17 6	—	2s. 6d.

Sulphur (Flowers)—Ton £11 10 0 ***Sodium Chlorate***—Per lb. 3d.
,, (Roll-Brimstone)—,, £10 5 0 ***Sulphuric Acid*** (Pyrites, 168°)
Copper Sulphate— ,, £25 to £25 10s. per ton, £6 15 0
Boric Acid (Crystals) ,, £37 ***Sodium Bichromate***—Per lb. 3½d.
Rubber—Para fine, 1s. 8½d.; plantation 1st latex, 1s. 9d.

The metal prices are supplied by British Insulated Cables, Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

The Lead Market.

Quiet Conditions Ruling with Lower Price Quotations.

QUIET conditions ruled in the lead market throughout the week, and with little support from dealers prices have sagged (James Forster and Co. state in their report dated September 24th).

The future is obscure. Continental demand shows no signs yet of waking up, and consumption in this country is being hindered by the difficulty of obtaining coal supplies. Arrivals, on the other hand, are not in excess of the present moderate requirements of the trade, so that it would appear that supply and demand at the moment are pretty evenly balanced.

Closing prices on September 24th were:—£31 15s. for September and £31 11s. 3d. for December, against £32 6s. 3d. and £31 18s. 9d. respectively at the end of the previous week.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

222 848 E. Habann. Method of transmitting speech by high-frequency waves. (22/10/23.
244 162 G. G. De Andia-Yrarrazaval. Sound reproducing and amplifying apparatus, such as phonographs and loud speaking apparatus for wireless telephony. (10/9/24.)
237 544 C. Lindstrom Akt.-Ges. Sound boxes for electrical transmission for loud speakers, telephones and the like. (26/7/24.)
225 516 A. Dauvillier. Process of and apparatus for the electric transmission of images. (29/11/23.)
230 779 Automatic Telephone Manufacturing Co., Ltd. Impulse transmitters for use in telephone or like systems. (15/3/24.)
231 419 Automatic Telephone Manufacturing Co., Ltd. Telephone systems. (28/3/24.)
244 166 E. Potter (Madsenell Corporation). Means and methods for electro-depositing nickel, cobalt or nickel alloys. (11/9/24.)
244 169 N. P. Hinton and Metropolitan-Vickers Electrical Co., Ltd. Receiving apparatus for high-frequency signalling systems. (11/9/24.)
244 170 W. S. Stephenson and G. W. Walton. Telephone instruments. (11/9/24.) (Cognate application 14 815/25.)
221 818 C. Lorenz Akt.-Ges. Multiple aerial for wireless signalling systems. (11/9/23.)
244 175 W. J. Palmer. Magnet structures for telephone receivers and the like. (12/9/24.)

EVERY letter sent out by every electrical firm should bear one of the coloured stamps reproduced here. They cost only 2s. 6d. per 1 000 and can be obtained from the E.D.A.

244 190 Standard Telephones and Cables, Ltd. (formerly Western Electric Co.). Space discharge tube systems for the manipulation of high-frequency currents. (17/9/24.)
244 193 Ferguson Pailin Ltd., S. Ferguson, and G. Pailin. Metal enclosed electrical switchgear. (20/9/24.)
244 195 G. F. Shotter. Electrical apparatus for the measurement of the level and flow of liquids and the height or movement of a body. (23/9/24.)
244 196 S. Nector. Thermionic valves. (23/9/24.)
244 200 W. Walker and Radio Communication Co., Ltd. Frame or casings or panel boards for supporting wireless or other apparatus. (27/9/24.)
244 201 F. J. Rundle. Crystal detectors for wireless apparatus. (29/9/24.)
244 202 Sterling Telephone and Electric Co., Ltd., R. H. Dougan and J. R. Penney. Automatic telephone instruments. (30/9/24.)
244 210 A. H. Watkins. Loud speakers. (8/10/24.)
244 214 British Thomson-Houston Co., Ltd., and J. Hutt. Crystal rectifiers for radio reception. (9/10/24.) (Cognate application 729/25.)
223 561 A. B. Muntyan. Electrolytic rectifiers. (19/10/23.)
244 227 J. W. Combe. Wireless receiving apparatus. (24/10/24.)

Applications for Patents.

September 6th.

21 900 W. H. Ashby. Electric lamp holder.
21 926 R. Basch and G. von Mery. Electrical incandescent lamp.
21 888 C. A. Cleghorn. Electrical circuits for wireless telegraphy, etc.
21 942 R. Fischer. Radio-active substances, etc. (7/9/25, Switzerland.)
21 956 Friho Manufacturing Co., Ltd. (Hofmann). Loud speakers, etc.
21 917 S. E. Grand. Supply of high tension current to wireless apparatus from electric mains.
21 937 F. Halstrup. Combined electric table lamp and alarm clock. (26/4/26, Germany.)
21 951 W. G. R. Jacob and W. S. Smith. Electric relays, etc.
21 912 R. A. Johnson. Electric connectors.
21 913 H. A. King. Electric connectors.
21 899 H. T. Laslett. Labels for electric accumulators.
21 876 F. R. F. Ramsay. Apparatus for supplying direct current for operating thermionic valves.
21 918 H. W. Sellers. High tension battery eliminator.

September 7th.

22 040 R. H. Bradley, A. H. Curtis, and Igranic Electric Co., Ltd. Appliance for construction of electrical circuit diagrams.
22 034 R. Gallois. Electrode for combined application of high-frequency currents and ultra-violet radiation. (3/10/25, France.)
22 041 Igranic Electric Co., Ltd., J. H. A. Spaink, and J. Russell-Taylor. Voltage regulating systems.
22 010 C. McAllister. Electric toasters.
22 056 N. A. V. Piercey. Voltmeters.
22 062 W. M. Rolph. Wireless receiving apparatus.
22 031 J. J. Rowe. Electric condensers.
22 053, 22 054. O. Stott. Wireless receiving apparatus.

September 8th.

21 934 British Thomson-Houston Co., Ltd. Electric arc welding. (5/9/25, U.S.)
22 142 C. S. Franklin. Aerials for wireless telegraphy.
22 130 A. S. W. Golding. Wireless signalling systems.
22 158 A. Joffe. Process for imposing polarisation phenomenon on dielectric substance.
22 159 A. Joffe. Insulating material.
22 185 V. Saushkin. Variable electrical condenser.

September 9th.

22 251 D. E. Barnett. Electrical connectors, etc.
22 281 R. E. H. Carpenter. Control of electrical circuits by electro-mechanical resonators.
22 210 W. D. Fletcher. Electric fittings.
22 204 H. V. Flinn and W. P. Kavanagh. Rheostats, etc.
22 203 P. S. Hedgeland. Combined wireless receiver and loud speaker.
22 271 C. Hollins. Variable electric condensers.
22 196 H. F. Joel. Electric accumulators.
22 279 G. A. Juhlin and Metropolitan-Vickers Electrical Co., Ltd. Rotary converters.
22 212 W. A. Macleay. Wireless receiving apparatus.
22 218 H. F. McLoughlin and Simplex Conduits, Ltd. Electric fuses. (2/9/26.)
22 266 Siemens-Schuckertwerke Ges. Means for preventing hunting in electric motors. (10/9/25, Germany.)
22 272 Soc. Anon. des Etablissements Tecalemit. Electric pumps. (17/9/25, France).

September 10th.

22 346 British Thomson-Houston Co., Ltd. Electric furnaces. (10/9/25, U.S.)
22 347 British Thomson-Houston Co., Ltd. Protective means for electric furnaces. (10/9/25, U.S.)
22 348 British Thomson-Houston Co., Ltd., and H. W. C. Liddiard. Electric control devices.
22 362 W. J. Brown and Metropolitan-Vickers Electrical Co., Ltd. Smoothing apparatus for direct current supply systems.
22 363 W. J. Brown and Metropolitan-Vickers Electrical Co., Ltd. Wireless, etc., amplifying instruments.
22 344 Dubilier Condenser Co. (1925), Ltd. (Dubilier). Apparatus for filtering electrical currents.
22 345 Dubilier Condenser Co. (1925), Ltd. Electrical condenser. (31/10/25, U.S.)
22 376 E. J. D. Dwyer and W. C. Dwyer. Electrical means for operating locking devices.
22 393 L. H. Paddle and W. J. Rickets. Electrical microphones for marine purposes.
22 378 H. W. Romanoff. Electrical machines.

September 11th.

22 426 A. Beer. Electrical oven. (12/9/25, Switzerland.)
22 432 S. Cox and A. W. Sharman. Electrical signalling.
22 455 Detex Distributors, Ltd., and R. Eisler. Connecting jacks, etc., for wireless, etc.
22 428 I. G. Dixon, I. R. Fleming, and R. W. M. Wright. Electrically driven pumps.
22 474 J. Geisslinger. Electric winding-up device for clockworks.
22 458, 22 459 W. H. Grinsted, T. Lyden, and Siemens Bros. and Co., Ltd. Automatic, etc., telephone systems.
22 466 Johnson and Phillips, Ltd., and P. M. Wood. Draw-out trucks for electric switchboards.
22 470 L. I. Leslie. Electric relays, etc.
22 460 V. G. B. Parton, and J. Stone and Co., Ltd. Electric lamp and shade holders.
22 400 O. G. Plumridge. Safety devices for electric circuits.
22 442 D. E. Rees. Terminal box for electric supply meters.
22 465 Vulcan Detinning Co. Electro-deposition of tin. (14/4/26, U.S.)

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Friday, October 1st.

Junior Institution of Engineers.—39, Victoria Street, Westminster. Inaugural meeting. Paper by Mr. L. Smith on "Notes on Transformer Testing and Test Plant Requirements." 7.30 p.m.

Saturday, October 2nd.

Electrical Association for Women.—Visit to all-electric farm of Mr. Borlase Matthews, East Grinstead.
Association of Mining Electrical Engineers.—South Wales Institute of Engineers, Park Place, Cardiff. Chairman's address by Mr. Dawson Thomas. 6 p.m

Sunday, October 3rd.

The Guildhouse, Eccleston Square, London.—Eighth course of addresses. Sir Richard Gregory, on "The Worth of Science." 3.30 p.m.

Monday, October 4th.

Electrical Contractors' Association (Derby Branch).—Ordinary meeting.
Society of Engineers.—Burlington House, London. Lecture by Capt. W. J. Liberty on "The History of Artificial Lighting." 5.30 p.m.

Tuesday, October 5th.

Institution of Heating and Ventilating Engineers.—Caxton Hall, Caxton Street, Broadway, Westminster. Paper by Mr. A. H. Barker on "Panel Heating." 7 p.m.
National Association of Supervising Electricians.—Junior Institution of Engineers, 39, Victoria Street, Westminster. Presidential address by Mr. A. M. Sillar. 7.15 p.m.
Electrical Society of Glasgow.—30, Gordon Street, Glasgow. Lecture by Mr. A. F. Stevenson on "Cable Ailments: Constitutional and Otherwise." 7.30 p.m.

Wednesday, October 6th.

Electrical Contractors' Association (Southern Section).—Ordinary meeting.
Electrical Contractors' Association (London Branch).—Ordinary meeting.
University of London.—University College, Gower Street, London. Public lecture by Mr. A. H. Barker on "The Engineering Plant at University College." 7 p.m.
Institute of Wireless Technology.—Engineers' Club, Coventry Street, London. Debate: "That it is impossible to obtain absolute purity of tone with a valve detector," opened by Mr. Y. W. P. Evans. 7 p.m.

Thursday, October 7th.

Electrical Contractors' Association (Newcastle Branch).—Ordinary meeting. 11 a.m.
Electrical Contractors' Association (Bristol Branch).—Ordinary meeting. 3.15 p.m.
Royal Institute of British Architects.—Conduit Street, London. Lecture by Mr. J. L. Baird on "Seeing by Wireless." 5 p.m. (In aid of King Edward's Hospital Fund for London.)

Friday, October 8th.

Junior Institution of Engineers.—39, Victoria Street, Westminster. Paper, "A Survey of Modern Airless Injection Oil Engines," by Mr. N. J. Griffin. 7.30 p.m

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THE ELECTRICIAN

ESTABLISHED 1861.

THE OLDEST WEEKLY ILLUSTRATED JOURNAL OF

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THERMAL *V.* WATER POWER.

A DISCUSSION on "The Economic Relationship between Electrical Energy produced Hydraulically and Thermally," took place at the Basle Sectional meeting of the World Power Conference. A report of the proceedings has already appeared in THE ELECTRICIAN. This subject seems at first sight to be of little more than academic interest to British electrical engineers. But though it is true that we shall always have to depend on thermal stations for the generation of the bulk of electricity we require, it will be sound policy in the future to neglect no source of power nor way of using it. The discussion was of interest and importance for another reason, in that it brought out that in many ways the thermal station is superior to the hydro-electric station. For instance, a short time ago there was considerable discussion about the feasibility of transmitting power generated at Niagara to New York. The electricity undertakings in that city were quite prepared to purchase it and to pay 50 per cent. more for it delivered at the switchboard than the working cost of their steam generated electricity. But nothing has yet been done. Even more significant is the position in the south of Sweden, where electricity for ordinary purposes can be generated more cheaply by British sea-borne coal than hydro-electric power can be transmitted from the distant mountain ranges.

A point of great importance to British engineers was made by Mr. JOHN W. LIEB in the course of the discussion. He laid great stress on the necessity of an absolutely uninterrupted supply in a great city like New York. A temporary failure would, he said, give rise to a wave of crime, which it would be almost impossible to quell. He was of opinion that an exclusively hydro-electric system could not be depended upon to meet this demand. The supporters of the hydro-electric idea naturally countered this by stating that failure is generally due to the breakdown of the overhead lines and that it can be overcome, and is being overcome, by providing these in duplicate or triplicate.

Considering the problem judicially, however, the position seems to be that there is room for both systems. This is confirmed by the fact that thermal stations with their ever-increasing efficiency are being used more and more in conjunction with hydro-electric stations for purposes other than dealing with the peak load and as a standby. Further, the increased development of water power will increase the periods of water shortage and so the thermal station will tend to play a larger and larger part even on those systems where at present water power deals with the greater proportion of the load. Studying this problem from the load diagram point of view, it is evident that the trend of modern practice is to keep hydro-electric stations with a steady flow of water in constant operation. The same applies to waste heat stations. They therefore will be used to supply the bottom of the load diagram. Water power plants with day to day storage will be employed for dealing with daily peaks on the load diagram, while those with long period storage facilities will be used during times of water shortage on other plants on the same systems and also for dealing with peak loads. The steam stations will be utilised to cover the remaining deficiencies in the load diagram, while Diesel engines can be reserved for the peak loads, for which purpose they are obviously specially adapted.

With a system such as this, containing such a variety of plant each section of which can do certain portions of the work more efficiently than the others, it is essential, as Mr. LIEB rightly insisted, that the distribution and control of the supply should be centralised in the hands of one man—the load dispatcher. In this country we have as yet had little experience in work of this kind, but as our stations and systems become more and more interconnected the part he can play in securing technical and economic efficiency will become more and more evident.

The discussion generally threw a number of sidelights on the problems of the hydro-electric engineer. It was specially emphasised that in Europe every water power was being gradually utilised to its maximum limit with no reserve. This was occasioning an alteration in the distribution of the load between the various stations concerned, with the result that heavier duties were falling on what had been regarded as standby plant.

If, then, as this discussion clearly shows, coal is in future, and not only in Great Britain, to be of paramount importance in the generation of electricity, it is necessary that a close investigation should be made of every method which seems to offer a prospect of its more economic utilisation. In this country a Joint Committee of the electrical and gas interests are already at work on the subject, and we await the results of their investigation with a good deal of interest. One aspect of the question was admirably stated by Col. MOORE-BRABAZON at the annual dinner of the Electrical

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Power Engineers' Association last week. Every ton of coal mined in this country, he said, could be made to yield 2 gall. of motor spirit over the aggregate, a quantity equal to one quarter of our petrol consumption, while the residual semi-coke could be efficiently burnt under the boilers of our power stations. The problem was recently dealt with in an informative manner by HERR SIGMUND KONIGSHEIM in a lecture which he delivered before the annual meeting of the German Association of Electricity Works. Some extracts from this lecture are given in the September issue of the "A.E.G. Mitteilungen." He argued that economy in generation can best be achieved by reducing the fuel costs and suggests that this is best achieved by carbonisation. He deals particularly with lignite, but his remarks can also be applied to hard coal. The process he described consists in removing the dust from the lignite, drying it, carbonising it to obtain semi-coke, distillation tar and distillation gas, and pulverising the former for use under the boilers. It is mentioned that the gas can also be employed for the same purpose as well as the lignite dust that had been previously extracted. Semi-coke is stated to be an ideal fuel for pulverised firing and the remaining by-products have a considerable market value.

To support these arguments Herr KONIGSHEIM works out a balance sheet for a 45 000 kW power station with an output of 180 000 000 kWh employed in connection with a carbonising plant of the type that has just been described. He describes the successive stages of refinement and shows that when coal with a tar content of 10 per cent. is first reduced to semi-coke and then the tar and other by-products extracted a reduction of no less than 94 per cent. in the cost of the current generated can be obtained, compared with the figures when the coal is burnt directly under the boilers. Though it will doubtless be contended that these figures are exaggerated, and that, even if they are not, certain factors connected with plant complications and market would render the practical results less roseate than those given, Herr KONIGSHEIM at least shows that there is matter for investigation and a good chance of improving present conditions.

Current Topics.

The Compensation Problem.

IN his speech at the dinner of the Southern Division of the Electrical Power Engineers' Association on Saturday, Mr. A. J. OSTLER did well to refer to the question of compensation, for we believe it is uncertainty on this point that has caused much conscious and unconscious opposition to the provisions of the 1926 Electricity Bill. We have no doubt, as Mr. OSTLER remarked, that the Association desires to pull its weight in any reorganisation schemes which will result from the passing of this measure, especially as it realises that any hardships that may occur will only be of a temporary nature. We do not see, however, that there need be any hardship. The number of men who will actually have to lose their present positions is small, and the industry can well afford to compensate them. There may have to be a certain amount of reshuffling, and with it a change of occupation, but this need cause no financial loss to the individual concerned, while the notion that to change from engineering to commerce means a loss of prestige should now be abandoned. In carrying through this re-organisation with the minimum of friction, the National Joint Board, to whose work Mr. OSTLER paid a glowing tribute, can play a great part, and we have no doubt that it will do so successfully. Whatever has been its failure elsewhere, the Whitley Council idea has in the electricity supply industry been crowned with success, and to settle the question of compensation will add another laurel to that crown. For the rest, the E.P.E.A. has a just claim to recognition, not the less because its claims are altruistic, and for the good of the industry generally.

The German Industry.

ON another page of this issue we review the very interesting report which has been prepared by Messrs. J. W. F. THELWALL and C. J. KAVANAGH, British Commercial Secretaries in Berlin on the "Economic and Financial Conditions" in Germany. Their principal point is that Germany has recovered from an acute financial crisis, and in so doing has given convincing proof of her remarkable powers of recuperation. For the whole of the period under review the country suffered from acute financial stringency, with the result that bankruptcies and unemployment rose to very high figures. A thoroughgoing reorganisation has, however, taken place, vertical trusts have given way to horizontal combines, uneconomical works and plant have been scrapped, with the result that exports are now catching up imports. Though no specific reference is made to the electrical manufacturing industry, there are some interesting paragraphs on the position of electricity supply. The States are entering more and more into this field. Prussia especially has brought in a Bill providing for the setting aside of £2 690 000 for the acquisition of undertakings not with the idea of creating a State monopoly, but to prevent private monopoly and secure a supply of electricity on favourable terms for the whole country. In the meantime a considerable amalgamation of private interests had taken place, with the result that the whole question of Prussian plans is to be generally discussed. Saxony, Baden and Bavaria are also participating as States in the work of electrical development. It is interesting to learn that the price of electricity to large consumers is about 0·3 pf. per kWh, rising to 24 pf. for small consumers. Lighting costs between 40 and 54 pf. per kWh. The two-rate tariff is being increasingly used, the fixed charge varying between 2 m. and 30 m. per month, and the running charge between 9 and 19 pf. per kWh.

A Railway Man and Electric Traction.

IT is as interesting, as it is unusual, to find a railway man singing the praises of electric traction. But Mr. R. H. SELBIE, general manager of the Metropolitan Railway, did this in his presidential address to the Institute of Transport on Monday evening. He began by deploring the lack of foresight displayed by the railway companies in dealing with the suburban traffic and, though it may be said on their behalf that they are now forced to look for new ways of saving rather than for new ways of spending money, it would show a broader outlook on their part did they undertake a conversion, which before long would amply pay for itself. The suburban traffic from London and many other towns is growing every year, and, unless electric traction is adopted, the railways, as at present constituted, will not be able to carry those who have to travel. This will be, as Mr. SELBIE pointed out, playing into the hands of road competition. As far as handling the increasing traffic is concerned electrification would bring with it undoubted advantages, a point which Mr. SELBIE emphasised by stating that an electric train could attain a speed of 30 miles per hour from rest in 25 sec., as compared with the 60 sec. taken by the steam train. The electric train can also be more easily adapted to the needs of the traffic. Mr. SELBIE also effectually laid the bogey of cost. To electrify the outer suburban lines would not cost more than £25 000 per mile of double track and the advantages obtainable by the adoption of such a policy would be real and commercial. Everything, it is true, points to electric traction as the motive power of the future, but we should like to see signs of something like an immediate movement in that direction.

An Electric Satellite Town.

THE question of adequate railway facilities round London and other large towns and the bearing of electrification on their provision may be emphasised by reference to an interesting ceremony which took place on Tuesday. The

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Minister of Health (the Rt. Hon. NEVILLE CHAMBERLAIN, M.P.) visited the satellite town of Welwyn Garden City in Hertfordshire and opened a new main line station, which not only gives better accommodation for those who have to travel to London every day, but improved access to towns in the north, east and west. Though Welwyn is 20 miles from London the journey takes less time than from many places that are nearer, and to those who believe in comfort in the home it offers through the cheap electricity that is available an excellent chance of combining the amenities of both urban and rural existence. As we have already pointed out every house in Welwyn Garden City is wired for electricity and there are a number of dwellings of the "all electric" type. Electricity is already largely used for industrial purposes within its boundaries, the applications including the manufacture of shredded wheat, light castings and baking. Welwyn is up-to-date enough to possess an outdoor sub-station, which will form an important link in the network with which the North Metropolitan Electric Power Co. is covering this part of Hertfordshire. It should therefore prove attractive not only to dormitory residents, but to factory owners who require more space. It may indeed well prove to be the vanguard of that movement from the town to the country, which will, we believe, be one of the results of the greater availability of electricity. For, as Mr. CHAMBERLAIN said, it provides new factories in proximity to new houses, and thereby solves a problem which has long been considered almost too difficult to tackle. By constructing a new station at this centre, where cheap electricity and convenient transport is available, the railway company have shown their faith in the garden city idea. Manufacturers might well follow their example.

Electrical Benevolence.

IN 1914 Sir HUGO HIRST was Festival President of the Electrical Trades Benevolent Institution and, without invidiousness, we may add that that was one of the most successful years this deserving body has ever had. We are therefore glad to learn that Sir HUGO has agreed to preside at this year's Festival Dinner, which will take place at the Trocadero Restaurant, London, on November 10th, at 7.30 p.m. He has issued an appeal asking for support and we have no doubt that this will be responded to at least as generously as in former years, especially as he will have behind him the loyal support and effort of his numerous staff. This being so we suggest that Sir HUGO might find it possible to do a little more for the industry for which he has already done so much, by establishing this association on a sounder footing. As he himself says, the funds available for pensions and relief to the deserving are comparatively meagre. We feel that that is at least in part due to the fact that the appeal to increase them is made only once a year. It should surely be possible to form permanent collecting agencies in all the large electrical concerns so that not only would there be a constant flow of income into the coffers of the Association but that those who are most likely to require assistance from the fund would be encouraged to contribute to its support, both for their own benefit and for that of others. Perhaps Sir HUGO will also be willing to consider suggestions for stimulating contributions at the dinner itself. One way would be to impose a fine of £1 per minute on every speaker who takes longer than five minutes to say what he has to say.

Long and Short Waves.

AT the last meeting of the Radio Society of Great Britain, Dr. W. H. ECCLES, the new president of the Institution of Electrical Engineers, opened a discussion on "The Relative Value of Long and Short Waves." Very long waves, over 5 000 m., travelled equally well by night and by day, and the distance at which good signals could be received depended on the transmitting power. Waves of the order of 1 000 m. travelled much better by night than by day, while in both cases the strength of the signals received fell off as the distance increased. Waves 100 m. long could be picked up as far as 200 miles away in the day time, while waves 30 m. long could be picked up at distances up to 50 miles, were inaudible at distances between 50 and 500 miles, and were again audible at distances between 500 and 1 500 miles. This silent band was called the skip, and the shorter the wave the longer the skip. At night the distances were increased, and a 20 m. wave had been heard at distances exceeding 7 000 miles, but not at shorter distances. As a broad rule, after the skip the signals became stronger the longer the distance, though there were times generally in the middle of the night when the signals could not get through. Summing up the whole position as disclosed in the literature available, Dr. ECCLES said that short waves were certainly more useful than long waves for distances up to 1 000 miles at night. Beyond this distance the relative utility of long and short waves depended on the kind of work, and the time at which it was to be done. It would be cheaper to use short waves than long waves for international communication between countries that only required to be in touch for a few hours daily. On the other hand, a commercial firm competing with cables would find long waves generally more trustworthy.

Maintenance of Electric Rolling Stock.

THE "Railway Gazette" calls attention to some useful information which was recently given on the subject of the maintenance of electric rolling stock. From this point of view electric locomotives differ from those operated by steam, in that, if well designed and properly inspected and repaired at regular intervals, they may be expected to run without attention during the intervening intervals, except so far as it is necessary to ascertain whether they are in good working order or not. The intervals at which the inspection and repair periods must be set can only be determined by operating experience and careful study of the individual car and locomotive designs, having in mind that a thorough inspection with minor adjustments frequently prevents the necessity for extensive work. It was therefore recommended by speakers in the discussion that facilities for testing and inspecting locomotives and rolling stock at definite intervals should be developed to a high degree in order to obtain perfection in operation, and so to reduce detention and intermediate inspection to a minimum. It is obvious that complete utilisation of stock cannot be obtained unless there is full co-operation between the mechanical and traffic departments, and to ensure that co-operation it is essential that all concerned should be aware of the peculiarities of electric traction. This can be done by the adoption of educational measures, which should be applied from the highest to the lowest. Courses of this kind should be instituted well in advance of any change over, so that those having direct charge of electrical equipment may be fully acquainted with it and thus able to handle it in the best possible manner.

The New Chiswick Station.

A HEATED discussion is going on at Chiswick regarding the proposed erection by the London and Home Counties Joint Electricity Authority of a generating station on Duke's Meadows. The protests mainly centre round the disturbance to the amenities of the neighbourhood which this will cause, and do not display any overwhelming amount of knowledge regarding the appearance of a modern generating station or its contribution to the smoke nuisance. A further interesting point is the exact position of Chiswick House in the scheme. As we reported a week or two ago the Joint Authority were to cede this historic building to the local authority in return for the Duke's Meadows site. We wondered at the time how they had become possessed of it, and some further information we have acquired on the subject makes us wonder still more.

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NOTES ON WIRELESS MATTERS.

The Rectifier in Telephone Receivers—Reputation of the Grid Rectifier—A Dog with a Bad Name.

By L. B. TURNER, M.A., M.I.E.E.

FOR the reasons referred to in my last article,* no doubt the grid rectifier is, as already stated, the most popular type. But in the more aristocratic wireless circles a view is widely and strongly held to the effect that the grid rectifier cannot be expected to produce signals of high acoustic quality, for which the anode, or even pre-eminently the crystal, rectifier must be used.† This opinion is probably based partly on

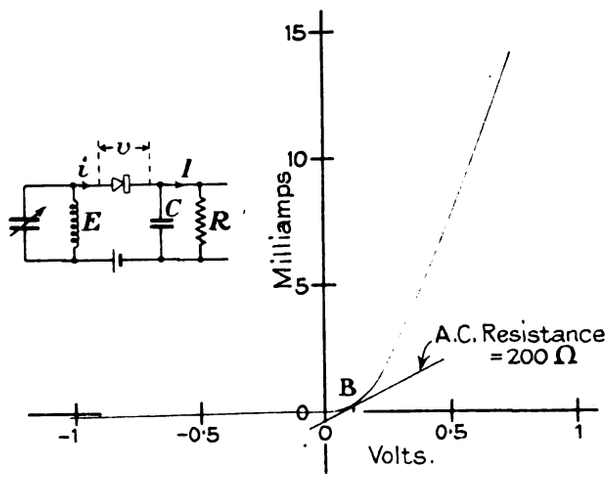

Fig. 1.

practical experience of the over-all performance of different receivers—experience which, so far, the writer does not share, for he has found as good acoustic quality from some receivers fitted with grid rectifier as from any he has heard. But a dog with a bad name may be hung, though deserving it no more than other dogs; and the cumulative grid detector has a bad name. One of its bad names is the word cumulative. The preceding résumé of the theory of the three types of rectifier was cast in a form intended to show that all three types are really tarred with the same brush; and we shall see shortly that the tar is not really very black.

In Figs. 1 and 2 (crystal and anode rectification), if R is negligibly small, it is true that the rectified current instantly assumes the value appropriate to the then high frequency amplitude. In Fig. 3 (grid rectification), it does not (whether R is large or small). But, as already explained, it is only in specialised laboratory applications that R is small. In a wireless receiving set R is large, and the P.D. across it—the output of the rectifier—only reaches its sensibly final value when C has acquired its sensibly final charge. The resistance for small changes of the rectifier shunted by the large resistance R (or r) is approximately w, the a.c. resistance of the rectifier; so that this time constant is approximately Cw in Figs. 1 and 2 and cw in Fig. 3. Now in each case C (or c, as the case may be) is present as a high frequency shunt in order to avoid the high frequency back P.D. which would occur if all the current through the rectifier were obliged to traverse R (or r, as the case may be). For good efficiency R (or r) should be large compared with the rectifier's A.C. resistance; and to avoid much loss from the high frequency back P.D., the reactance of C (or c) should be small compared with that resistance—say, one-tenth, or less. For the same radio-frequency, the time constant Cw (or cw) is the same in each case.

The condenser thus introduces a lag or sluggishness. If the transmitter's amplitude suddenly rises, the proper corresponding amplitude in the receiver is not sensibly reached until after a lapse of time t making $(1-\varepsilon^{-Cwt})$ sensibly unity; and if the transmitter amplitude suddenly falls again, there is a like delay in the reproduction. All three types of rectifier are subject to the creep of the state-point and exhibit the sluggishness of response to the beginning and end of a sudden signal, and a corresponding reduction of sensitivity to a tone as its frequency rises.

That is the common tar brush. How black is the tar? This depends on the ratio between the radio-frequency N and the acoustic frequency n; and one advantage of short waves is that this ratio is large. For the high frequency reactance of C to be $\frac{1}{10}$th of w

$$1/2\,\pi NC = w/10$$
$$\text{i.e.,} \quad Cw = 5\,\pi N$$

Now in order to keep the sluggishness imperceptibly small, it is only necessary that the time constant Cw should be sufficiently small in comparison with the acoustic period. Suppose we demand that

$$3.Cw \geqslant 1/4\,n$$

($1/4\,n$ is the time taken for the acoustic current to fall from maximum to zero when the tone is steadily maintained; and ε^{-3} is only 5 per cent.) Then

$$15\,\pi N \geqslant 1/4\,n$$
$$\text{i.e.,} \quad N/n \leqslant 60\,\pi \leqslant 19.$$

If the wavelength is 1 500 m, $N = 200$ kc/s, so that even for an extreme acoustic frequency of 10 kc/s the ratio $N/n = 20$, and no perceptible effect from sluggishness is to be expected.

At a wavelength of 1 500 m, with the crystal characteristic of Fig. 1, R might well be 2 000 Ω (with slight positive bias), and C 0·04 μF; with the anode characteristic of Fig. 3, R might be 300 kilohms (with anode supply 150 V), and C 100 μμF; and with the grid characteristic of Fig. 3, r might be 2 megohms (with a bias of about +2 V), and c 32 μμF. In each rectifier the same sluggishness would be present; and in each it would be imperceptible.

Before finally dimissing the delay action of the condenser as equal in all the rectifiers, we should recollect that the current passing between the rectifier terminals is not only the current passing *through* the rectifier, to which latter the characteristic curve refers. The rectifier is to some extent, however small, shunted by stray capacities neglected in the foregoing treatment. The larger the a.c. resistance of the rectifier, the more perceptible is the effect of stray capacities; and since the grid rectifier has

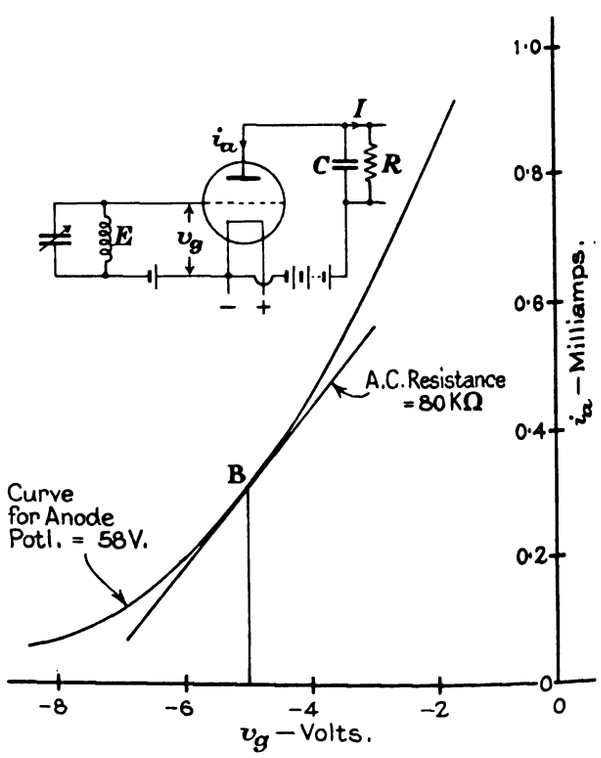

Fig. 2.

(*Concluded on page 420.*)

* THE ELECTRICIAN, September 10th, 1926, p. 288.

† "I do not wish it to be thought that the grid leak method need be so absolutely condemned, but I think, after comparing it judicially with the bottom bend method, the latter scores considerably, as it is, as I have said before, in fact a crystal rectifier."—P. P. Eckersley, *loc. cit.*

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GLASGOW'S ELECTRICAL EXTENSIONS.

Two More 15 000 kW Turbo-Alternators for Dalmarnock—Further Steam Raising Equipment.

VISITORS to the Glasgow Convention of the Incorporated Municipal Electrical Association last June who also inspected the Corporation's famous station at Dalmarnock

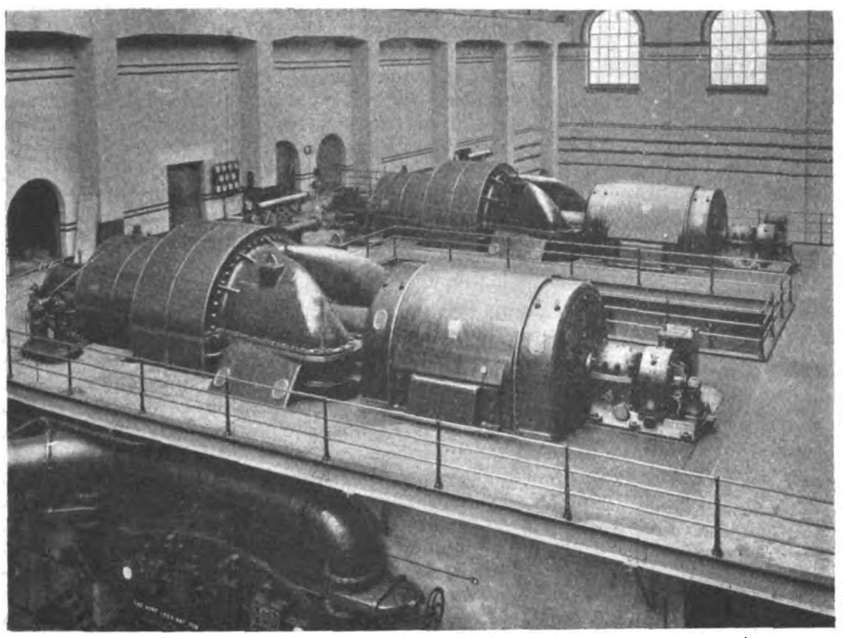

Fig. 1.—Interior of the turbine room at Dalmarnock showing the two new Parsons sets.

saw certain extensions in progress, which centred round two new 15 000 kW sets (*Fig.* 1). These extensions have now been completed and were formally opened by the Lord Provost on Wednesday last.

The order for the turbo-alternators was placed with C. A. Parsons and Co. in 1923. They were to be capable of giving a continuous maximum rating of 18 750 kW at a speed of 1 500 revs. per min. The sets are of the standard Parsons type, the station steam conditions being 270 lb. gauge pressure at the stop valve, 700 deg. F. total temperature, and an exhaust vacuum at full load of 29·1 in. (barometer 30·00 in.). Arrangements are made to extract from the turbines steam at a pressure of 5 lb. absolute to heat the feed water to a temperature of 150 deg. F. before it enters the boilers.

The turbine is of the single cylinder pure reaction type. The first blade height is $2\frac{3}{8}$ in. on a rotor diameter of 31 in., and the final blade height is $21\frac{1}{2}$ in. on a rotor diameter of 70 in. Mild steel is used throughout the blading, and for the first twelve expansions an axial clearance of "end tightened" blading is adopted. Owing to the large diameter of the turbine rotors at the last expansions, and the consequent difficulty of forging in one piece, discs are used. These are butted together so that vibration is impossible. An axial hole is also trepanned through the centre of all shafts to enable the centre to be examined for soundness.

The alternators are of the totally enclosed "turbo" type and are designed for 18 750 kW 6 600 V 2 050 A 0·8 P.F. and 25 periods at a speed of 1 500 revs. per min. Owing to the large output at 25 periods, precautions had to be taken to keep the alternator stators within railway gauge dimensions; even so they had to be transported when the railway was free of all traffic in the opposite direction.

The alternators are of the revolving field and stationary armature type. The excitation for the alternator rotor is provided by direct coupled exciters. The voltage regulation of the alternators is carried out entirely in the exciter shunt field circuit.

The stator casings are cast in one piece, with separate feet which can be removed for transport purposes. The laminated cores, which were assembled under heavy pressure, are held in position by massive cast iron end plates. The core conductors are of "Parsons" patented helically stranded coreless cable manufactured in the required "D" shape without crushing and without damage to the strand insulation.

The slot insulation is mainly of mica moulded around the conductor. The end windings are well spaced, permitting good ventilation and are securely braced and clamped. The rotors are of the barrel type, the excitation winding being placed in radial slots milled out of solid steel forgings. Trepanned axial holes through the centre of the shafts enabled the forgings to be examined for soundness before completing the manufacture. The windings are of high conductivity copper strip and the insulation is mica. The rotor end windings are efficiently packed with moulded heat resisting packings and are held securely in position by massive high tensile weldless nickel chrome steel end caps, which in turn are supported by the rotor body and strong steel end rings. Fig. 2 is an illustration of the completely bladed turbine rotor.

For the ventilation of the alternator, "Parsons" closed circuit system using surface air coolers is employed. In the stators a patented system of ventilation is applied in which the cooling air enters the stator along its whole length and circumference, giving highly efficient and uniform cooling.

The alternators are directly connected to three single-phase transformers of Metropolitan-Vickers Electrical Co.'s construction. These transformers have a capacity of 7 800 kVA and step the pressure up from 6 500 to 20 000 V.

The new boiler room used in connection with these sets is equipped with eight Babcock and Wilcox marine type boilers,

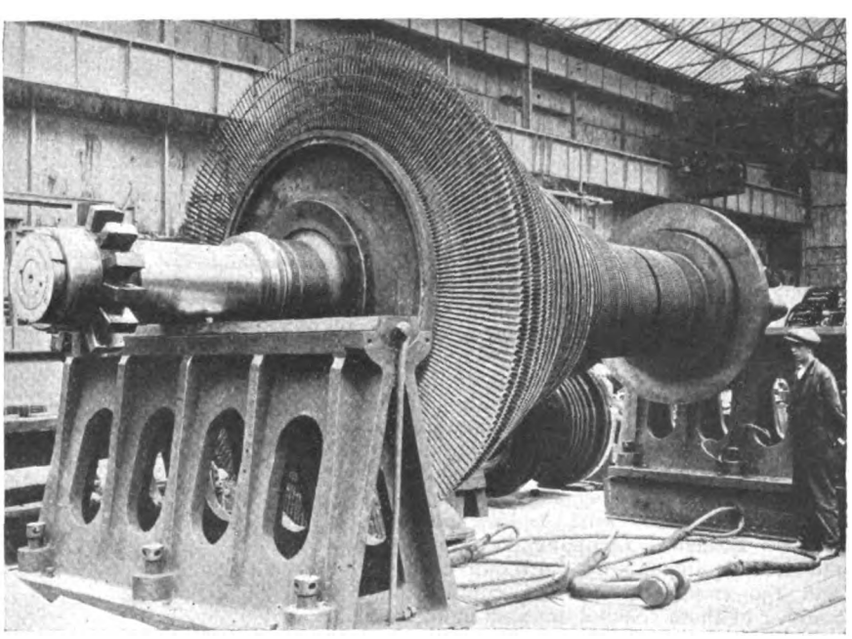

Fig. 2.—View of completely bladed turbine rotor.

the normal full load output of each unit being 50 000 lb. of steam per hr. There are two stokers per boiler. Four

(*Concluded on page* 420.)

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RAILWAY SUBURBAN ELECTRIFICATION.

Progress in Sydney—Further Large Metropolitan-Vickers Contract—Use of New Ventilating Construction on Motor Generators.

THE electrification of the Sydney City and Suburban Railways is one of the most important projects of its kind yet undertaken. Its inception dates from 1915, when the problem of providing improved transport facilities for a rapidly increasing population was thoroughly investigated by the New South Wales Railway Commissioners. A full report on the "Proposed Electric Railways for the City of Sydney" was prepared by Mr. J. J. C. Bradfield, Chief Engineer of Sydney Metropolitan Railway Construction, after a personal study of the electric railways operating in Europe and America, and on the basis of this report a very comprehensive scheme was adopted.

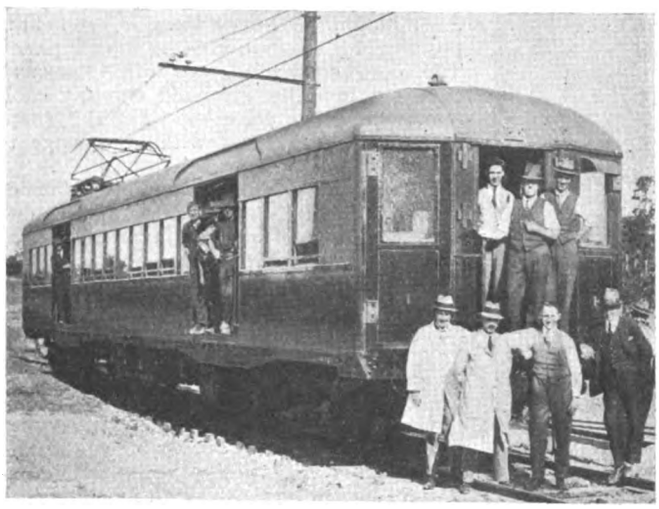

Fig. 1.—Motor coach on trial run on the Illawarra line, near Sydney.

This scheme, which is illustrated in the map shown in Fig. 2, provided for the construction of an underground loop railway for two-way service in the city of Sydney itself, for the construction of a number of new lines into the outlying districts, and for the gradual electrification of practically all the railways within an area of about twenty miles radius, the total amount of electrification being about 400 track miles. The work is bound up with the new bridge now being erected across Sydney Harbour, for one of the most important railway extensions is a new section of line which will pass over this bridge and form a direct route from Sydney city to the north.

The commencement of work was delayed owing to the war, and it was not until the year 1923 that the specifications were issued covering the rolling stock and equipment for the first section to be electrified—the Illawarra line between Sydney Central Station and Sutherland. The main features of the original plan were adhered to, including the decision to adopt multiple unit trains as being the most economical means of obtaining fast and frequent service on suburban lines, and also the decision to adopt overhead trolley line. In 1925 a contract was placed with the Metropolitan-Vickers Electrical Company for complete electrical equipments for 150 motor coaches and 150 trailer coaches. A considerable number of these coaches are now in service on the Illawarra line, on which a service as far as Mortdale was inaugurated in February last. An additional contract for similar equipments for 101 motor coaches and 101 trailer coaches has now been placed with the same company.

Fig. 1 shows one of the motor coaches out on trial on the Illawarra line. One motor coach and one trailer coach constitute a train unit, and trains of 1, 2, 3 or 4 two-coach units are made up as required. The coaches are 61 ft. 6 in. in length and have seating capacity for 79 passengers in the case of motor coaches and 83 passengers in the case of trailer coaches.

The equipment of the motor coaches includes two motors, each of 360 H.P., for each coach. These are probably the most powerful individual motors ever installed on multiple unit trains. They are of the box frame type, mounted on the axles of the rear bogie of the coach. They are wound for the line pressure of 1 500 V, each pair of motors being controlled by series-parallel connection. A special feature of the motor design, patented by the Metropolitan-Vickers Co., is that in order to obtain the large outputs required in the limited space available within the trucks, the armature slots are tapered and armature coils wound of special strip are used. By this method a considerable increase in output for a given size of armature is obtained. The armature coils are insulated with mica and asbestos, and the Metropolitan-Vickers Co.'s new process of bakelising the coils at various stages of their manufacture is used. The motors have commutating poles and are self-ventilated with a fan mounted on the motor shaft.

Multiple unit control of the electro-pneumatic type is provided, the control gear being energised from a 36 V circuit which is served by a motor generator set and standby battery. The master controller in the driver's cab controls, through small electro magnets, air valves connected with the compressed air supply which works on the pistons closing the main contactors. The contactors with their operating pneumatic

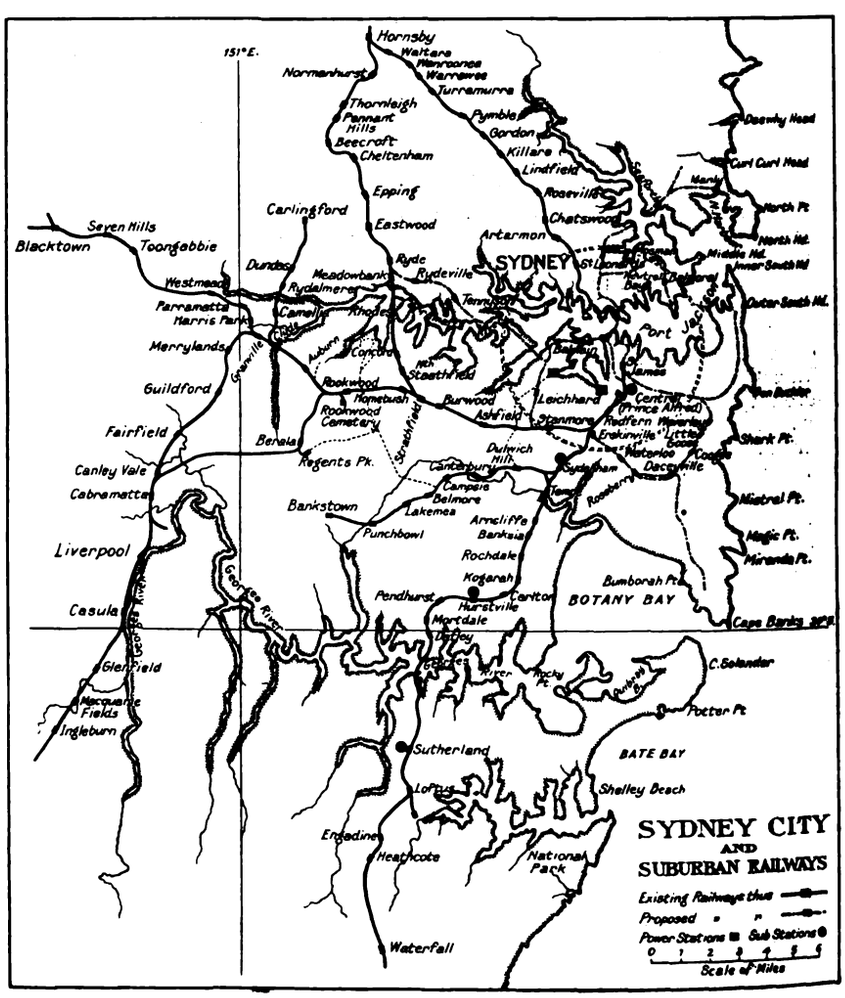

Fig. 2.
Map showing Sydney city and suburban railways.

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cylinders and magnetically operated valves are assembled in switch groups, which are mounted under the cars in order to leave the body space of the coach as free as possible. The motor generator set referred to above is also mounted under the car. It takes current at the line pressure of 1 500 V and gives a low voltage supply for lighting and for the operation of the control gear. The set is provided with special ventilating ducts in the iron parts of the stator and rotor through which air is drawn by a fan on the rotor. The cooling air does not come into contact with the windings and the set thus has the output of a ventilated machine with all the advantages of a totally enclosed machine. This arrangement is patented by the Metropolitan-Vickers Co., as is also a special design of automatic voltage regulator which is used in connection with the motor generator set. In addition to the motor coach control gear a number of the trailer coaches will also be provided with driving cabs.

It is interesting to note that in actual operation the trains already in service obtain an acceleration of 1·37 miles per hr. per sec., which is about four times the acceleration of steam trains. In maintaining a rapid service with frequent stops this is an advantage of very great importance.

Power for operating the Illawarra line is taken from the Ultimo power station, near Sydney Central Station, and the White Bay power station, about three miles to the east. The Ultimo power station supplies the Prince Alfred substation with power at 6 600 V 25 periods, while the White Bay power station is connected by six 11 000 V 50 period underground lines to the Meeks Road sub-station at Sydenham, whence duplicate 33 000 V and 11 000 V overhead lines connect to the sub-station at Hurstville.

Rotary converter sets of exceptionally large size, equipped for semi-automatic control, have been supplied by the Metropolitan-Vickers Electrical Co. for sub-stations on this line. Two 4 500 kW 1 500 V machines are installed at the Prince Alfred sub-station. These machines have sixteen poles and run at 187½ revs. per min. They are capable of carrying an overload of 25 per cent. for two hours, and a momentary overload of 10 000 kW each. Special fireproof insulating barriers are fitted in front of the commutator risers and between adjacent pairs of brushes to cool and deflect any arcs which may be produced by short circuits, and thus render the machines immune from damage under severe traction conditions. At the Hurstville sub-station there are two 1 500 kW 750 V Metrovick rotary converters of similar construction connected in series to form a 3 000 kW 1 500 V set. These machines have twelve poles and operate at 500 revs. per min. The automatic contactor gear which controls the rotary converters in each sub-station is installed alongside the machines in ascreened enclosure. The sub-station operator works outside this protected area and starts up the sets by a push-button which causes the main oil circuit-breaker to close. The steps of starting up the rotary converters, synchronising, and correcting polarity then follow automatically, and the attendant has only to operate another pushbutton to close the d.c. circuit-breaker. The control panel for the 3 000 kW set at Hurstville sub-station is shown in Figs. 3 and 4.

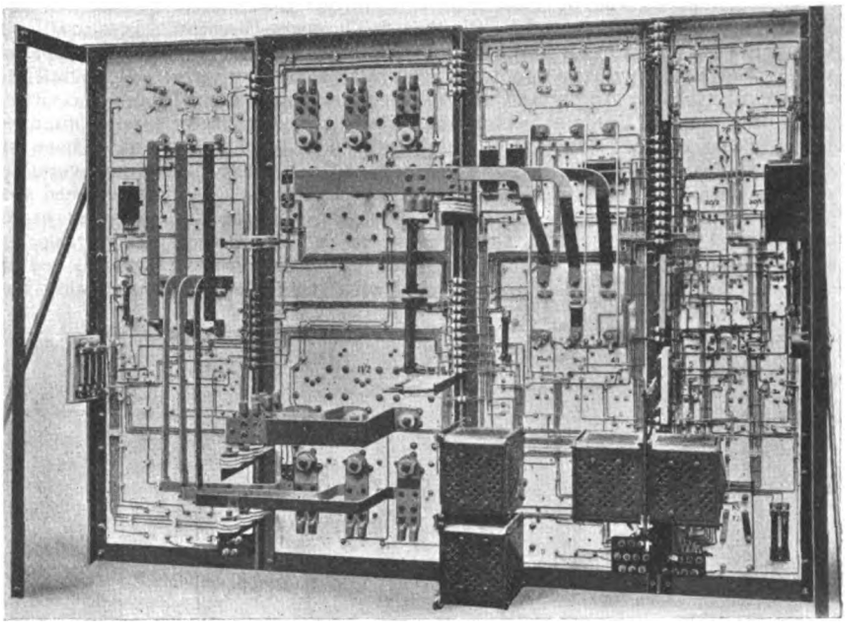

Fig. 4.—Contact panel, back view.

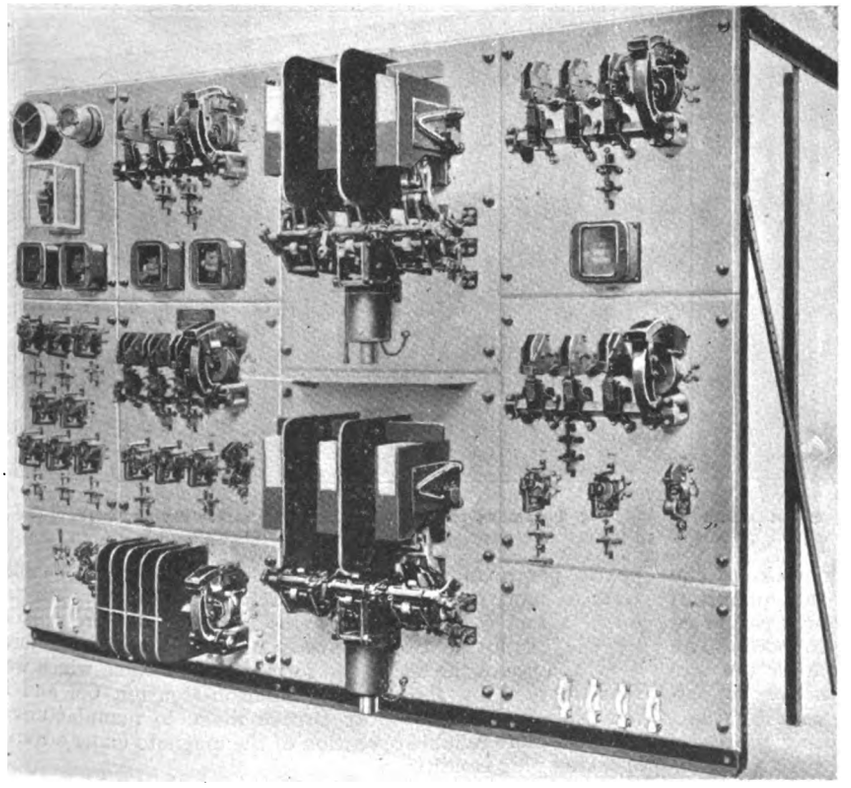

Fig. 3.—Contactor panel for control of 3 000 kW rotary converter in Hurstville sub-station.

The high tension switchgear for the three sub-stations which are in commission on the Illawarra line has also been supplied by the Metropolitan-Vickers Electrical Co. The 33 000 V switchgear includes electrically operated oil circuit-breakers of the outdoor type, each unit having a breaking capacity of 160 000 kVA. The 11 000 V and 6 600 V circuit breakers are mainly of the semi-metal-clad type, in which the circuit-breaker itself is built on metal-clad lines while the remainder of the apparatus is contained in a masonry cubicle. Provision is made in the switchgear layout of Hurstville sub-station for extension of the h.t. line to Sutherland sub-station which will serve the next section of the line.

Electrification of other lines is expected to follow in the order of Bankstown section, Sydney to Parramatta, Sydney to Hornsby via Strathfield and Sydney to Hornsby via the Sydney Harbour Bridge.

The Lancashire Dynamo and Motor Co., Ltd., Trafford Park, Manchester, has issued a new catalogue (list No. 1 800) dealing with Lancashire planer equipments. It contains fully illustrated descriptive matter concerning the installation of the Lancashire drive to either new planers or the conversion of old drives. It is claimed that a saving of upwards of 70 per cent. in time alone is effected by such conversions.

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BRITISH MAGNETO MANUFACTURE.

Some Steps in its Development—Post-War Enterprise—Continuous Flow Production—Some Vital Points in Design.

IN last week's issue of THE ELECTRICIAN we made brief reference to the part played by the British Thomson-Houston Co. in the manufacture of home grown magnetos. Before the war, as is well known, the magnetos used in this country were mainly of German origin and the enforced manufacture of this equipment in England was in the initial stages naturally beset with technical difficulties, which have now been overcome by close research and careful attention to the material and the details of the various production processes.

Towards the end of 1914 the British Thomson-Houston Co. was commissioned by H.M. Government to manufacture a special type of four spark magneto of six and eight cylinder aircraft engines. To deal effectively with this demand production was concentrated at the Coventry works of the company and, to give some indication of the quantities involved it may be mentioned that during the war period no less than 40 000 magnetos for aircraft were produced. The demand for this product naturally languished after the war and attention was subsequently concentrated mainly on the production of magnetos for motor cars and motor cycles. The position at that time and the manufacturing processes adopted were described in THE ELECTRICIAN of April 30, 1920, Vol. 84.

This alteration in the class of demand naturally made it necessary to evolve new designs, and after a good deal of careful work not only was a satisfactory equipment produced, but it was manufactured by methods thought out in an up-to-date and efficient planning department, with the result that an intensive manufacturing programme on highly efficient mass production lines was possible.

The three principal magnetos made are Type G, which is suitable for 3, 4 and 6 cylinder engines, and Types K and M, which are suitable for single and twin engines. These all conform to the standards fixed by the British Engineering Standards Association. During the past six years many thousands of these rotating armature magnetos have been supplied. In design they embody all the latest improvements. Thus, the laminated magnet poles used give low speed sparking characteristics ; a single unit body casting ensures increased strength and more accurate alignment of bearings ; and the use of a special non-riveted condenser greatly reduces the liability to breakdown. Greater accuracy of timing between the two sparks, on magnetos giving two sparks per revolution, is obtained by the use of an annular form of cam ring, and the operation of the safety spark gap on 3, 4 and 6 cylinder magnetos is rendered more reliable by the employment of a rotary safety spark gap. Moreover, the use of the spark gap form of distribution, which was first adopted by the British Thomson-Houston Co. and is now standardised by most British magneto manufacturers, achieves more reliable operation of the magneto under adverse sparking plug conditions.

These improvements, coupled with highly efficient manufacturing methods and a rigid system of inspection and testing, have resulted in a small, compact and very efficient magneto, which it is claimed is capable of rendering excellent service under the diverse conditions met with in practice.

The trend of modern engine design, however, is constantly in the direction of higher speeds and a higher compression ratio, with the result that the service required of the magnet

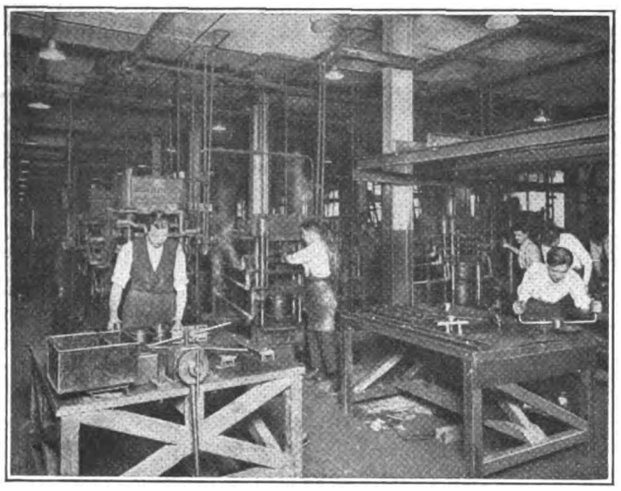

Fig. 1.—View in the moulded insulation department at the Coventry works of the British Thomson-Houston Co.

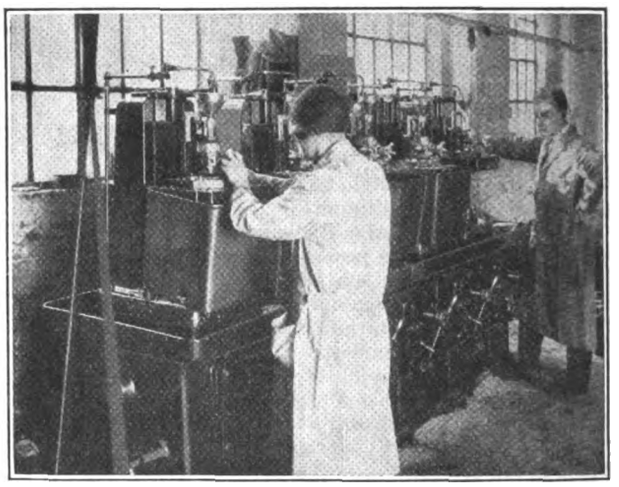

Fig. 2.—Special boring machine for magneto housing.

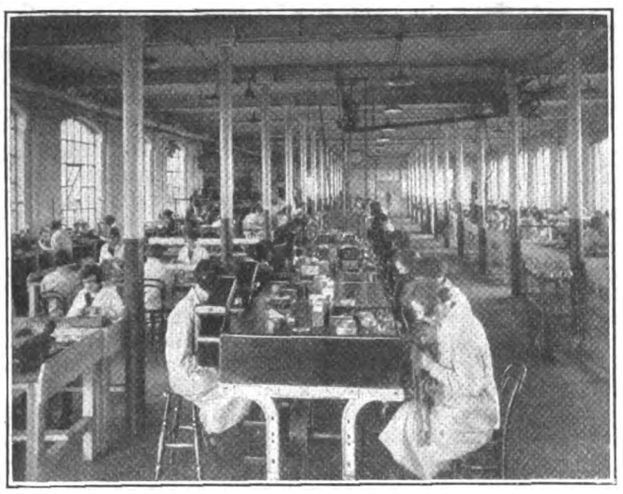

Fig. 3.—Winding department in the Coventry works of the British Thomson-Houston Co.

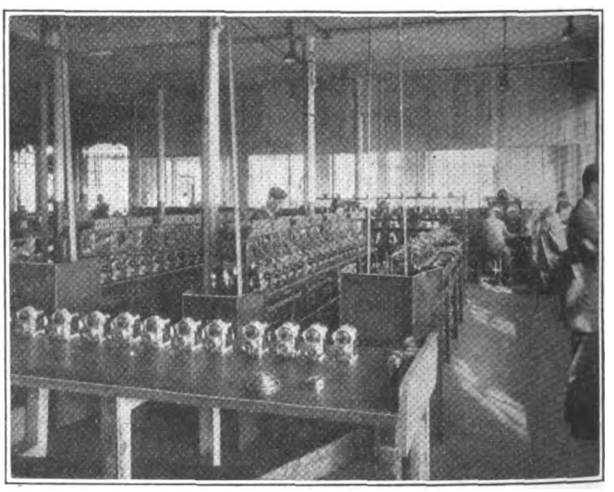

Fig. 4.—Testing car and cycle magnetos at the Coventry works of the British Thomson-Houston Co.

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becomes even more exacting. The British Thomson-Houston Co. has therefore designed a polar inductor magneto for this class of work which is essentially a four spark machine and can, therefore, be run at ¾ times instead of 1½ times the engine speed on a six cylinder engine, thus giving a considerable increase in the life. Owing to the armature being stationary, moreover, the windings are subjected to lower mechanical stresses, high tension slip rings are eliminated and the contact breaker does not rotate, thus permitting the contact rocker arm bearing to be eliminated. These magnetos, like those with a rotary armature, are fitted with a spark gap distributor and rotary safety spark gap. A further important feature is the automatic ignition timing device, which ensures that under all ordinary conditions the engine is operating at its maximum efficiency.

In addition to magnetos the British Thomson-Houston Co. is manufacturing lighting sets for motor cycles and lighting and starting sets for cars, the latter being of entirely new design in which the charging current curve rises rapidly at low speeds

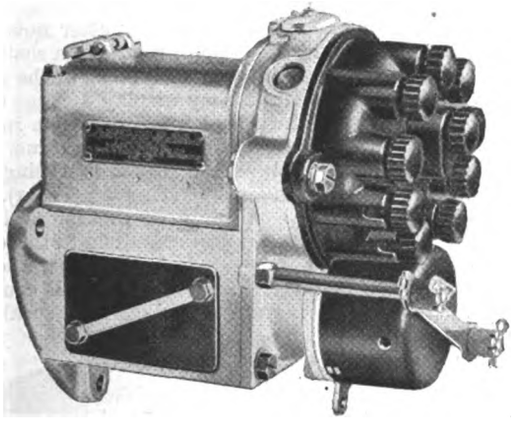


Fig. 5.—B.T.H. type s.c. spigot mounted magneto for nine-cylinder aircraft engines.

and falls away beyond about 30 miles per hour. In the case of the starting motor a very large starting torque is obtained so as to give rapid acceleration without draining the battery.

Turning to the manufacturing details of these important machines it may first be mentioned that their efficiency and reliability in service is largely due to the care that has been expended in the selection of the raw materials used. All these materials, including the magneto, silk, moulded insulation, mica and enamelled wire, are now manufactured in this country, and as a result of extensive research it has been possible to replace the expensive platinum-iridium points on the contact breakers by tungsten.

The manufacture of all the B.T.-H. magnetos is carried out at the Coventry works of the company, which comprise two large factories—the Lower Ford Street and Alma Street factories. These are both well equipped with the most modern machinery and laid out to deal with an intense magneto manufacturing programme on the "continuous flow" production basis.

Apart from the usual economical lay-out of machine tools, and minimum machining costs, the manufacturing organisation employed takes into consideration other important factors, such as :—(*a*) synchronising the factory output with the future requirements of the sales department, and arranging for rapidly increasing or decreasing production as occasion requires, and (*b*) ensuring that the time for conversion of the raw material into the finished product is as short as possible, so that the ratio of tied-up capital to turnover is as small as possible. To do this the output required of the factory for definite periods is estimated and the working programme drawn up so that the raw materials flow into the factory in the requisite quantities at stated intervals. After a rigid inspection and, where necessary, tests, the raw material passes through a main control station which informs each departmental head of the amount and rate of work required of him for a specified period.

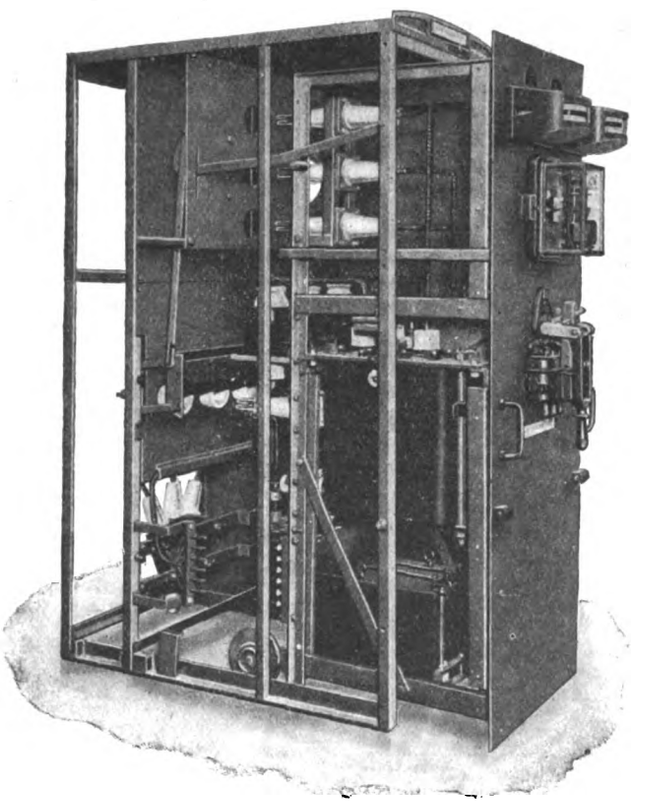
By means of this system, the orthodox methods of storing raw materials and partly finished components in the process of manufacture have been abandoned, with the result that the capital investment is considerably reduced. Further, the system responds rapidly to any fluctuations in the demands of the sales department, and has a further important advantage that changes in design can operate very quickly at specified periods with an almost perfect balancing of parts involved.

The satisfactory operation of a magneto in service is largely dependent on a rigid inspection and the efficient testing of the complete magneto and its component parts. All component parts of B.T.-H. magnetos are therefore carefully inspected to ensure that they conform strictly to the specified dimensions. On many dimensions the tolerances are so fine that a systematic daily check on the gauges is necessary. Such components as armatures, condensers and moulded insulations are subjected to strenuous tests during the various stages of manufacture, and the complete magnetos are finally run for long periods at high speed, after which they are inspected and tested for low speed sparking performance.

In conclusion it may be mentioned that in order to maintain and improve the product a careful analysis is made of all the troubles experienced. In addition magnetos of each type are constantly being run to destruction under conditions which are very much more severe than those obtaining in practice so that steps can be taken to remedy weak points in design, workmanship and quality.

B.T.-H. Control Equipment.

WE have received from the British Thomson-Houston Co., Rugby, four lists dealing with the control equipment that they manufacture. The first two of these relate to truck type ironclad switchgear which has been designed so that it can be handled with safety by unskilled attendants. The standard current ratings in the case of the Type T, Form C2 equipment range from 50 to 600 A at 6 600 V, and from 50 to 300 A at 11 000 V, and from 20 to 600 A at 6 600 V, and from 20 to 300 A at 11 000 V in the case of the Type T Form B4 equipment. In both cases the equipment is arranged as self-contained unit sheet and angle steel with welded joints. Each unit comprises a fixed cubicle and movable truck, the former being divided into three compartments to provide separate accommodation from the busbars,



Typical 6 600 V three-phase equipment truck partially withdrawn, with safety shutters half open—one side cover and lower intermediate screen removed.

line cable box and truck respectively. The necessary control apparatus and instruments are mounted on the movable truck, and when the latter is withdrawn, its equipment is disconnected from the busbars and the line by the separation of isolating contacts.

The two other lists deal with d.c. motor control pillars, which are fitted with drum starters and free plate starting switches respectively. Both have a duty of four starts per hour against full load torque. For successive starts 14 times the starting period must be allowed between starts for cooling.

A fifth list deals with fractional horse-power motors for a.c. and d.c. circuits. These machines were recently dealt with fully in THE ELECTRICIAN.

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THE GERMAN WIRELESS EXHIBITION.

The Market for English Goods—Quaint Loud Speaker Designs—Systems of Picture Transmission—Large Attendances the Rule.

By A CORRESPONDENT.

THE third German Wireless Exhibition was held from September 3rd to 12th, both Sundays inclusive, in the well-known Radio Hall in the Witzleben quarter of Berlin. This building offers some 80 000 sq. ft. of floor area for wireless exhibits.

Even the most optimistic exporter would hardly regard Germany as presenting a promising market for English

Fig. 1.—A loud speaker attachment for telephones.

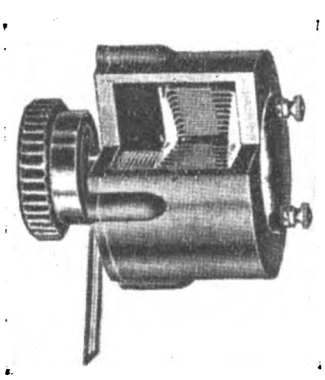

Fig. 2.—A new form of variable.

wireless goods, but among the loud speakers both the Amplion and the Brown are well known, and English crystals make a good showing in the publicity pages of most of the German wireless papers. But although it is possible to find a market for many English productions in Germany, in the wirelesss trade that country is, of course, to be regarded more as a supplier than a buyer, and such competition is especially strong in many of the European markets. In this connection it is rather an ironical commentary upon past events that now the stabilisation of the German currency is an accomplished fact, the writer found many complaints made by German makers upon the subject of French "exchange dumping," especially in Spain, which market is, in consequence of the depreciation of the franc, being supplied with many classes of wireless goods at prices which German makers cannot touch.

The Berlin Exhibition this year is the largest which has yet been held, with about 250 exhibitors. But the financial

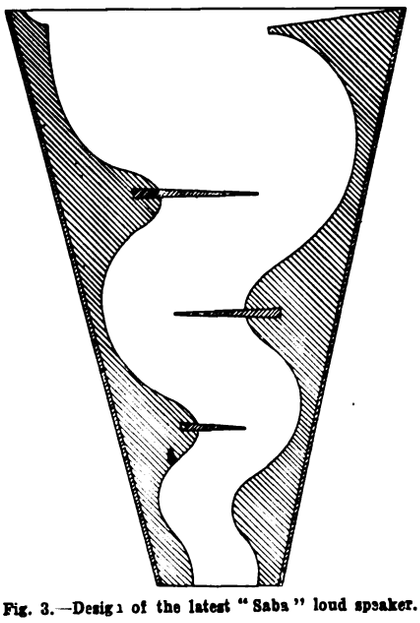

Fig. 3.—Design of the latest "Saba" loud speaker.

recovery of the country is hitting productive industry very hard, as is shown by a figure of some 1¾ million unemployed at the middle of the present year, and this state of things is not without its effect upon the wireless industry. It is largely due to the crisis that the advance in wireless prices which was anticipated at this time last year has not materialised, in fact there have been reductions in many cases, and the market is frequently upset by offers of stock at uneconomic prices.

It need scarcely be said that an exhibition of the size of that held in the Haus der Funkindustrie furnishes ample material for prolonged study. On the whole, the components are by far the most interesting part of the exhibition by reason of the mechanical ingenuity which is apparent in the construction of many of them. Some of the new designs, it is true, might be termed examples of misapplied ingenuity, but there are many of extreme interest. In our report of last year's exhibition, we mentioned, as an example of the way in which many makers were striving after novelty, the case of the loud speaker in the form of a large sea shell. This year there is one firm apparently so convinced of the acoustic properties of the sea shell that they display a range of forty photographs of different shells which are available ready for attachment of the loud speaker unit. In the same branch, another large maker has been prominently advertising for the past year a "telephone-speaker" attachment (Fig. 1). This, of course, is not new, as something of the same kind was shown at the very first wireless exhibition held in this country in the Horticultural Hall in 1922, but though the idea did not succeed in attracting the public fancy in this country, it evidently fills a need in Germany. Other loud speakers are also available in such unconventional shapes as wooden flower vases, such as those shown by August Schwer Söhne, of Villingen, the makers of the "Saba" instruments. Fig. 3 shows a section through one of these. In fact, the attention which is being devoted to loud speakers on all hands was one of the features of the show, and it is evident that makers intend to make up for lost time in this line.

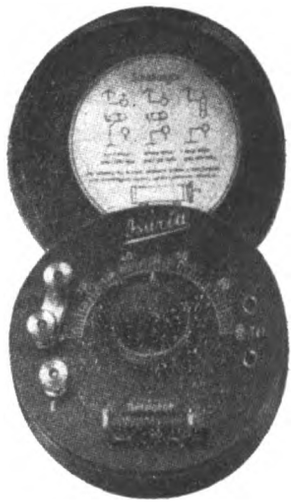

Fig. 4.—Pocket crystal instrument.

The position in regard to wireless telephones seems to be stationary, there being no particular change either in designs or prices to be recorded since last year.

Among the condensers, a number were noticed with the banks of plates die-cast, while in others the side members are now pressed to receive the vanes, thus ensuring greater accuracy of spacing than was possible with the old system of spacing washers. A novel construction of variable condenser (Fig. 2) was seen on stand No. 222, made by Oscar Schlieper, of Kaiserin-Augusta-Allee 39, Charlottenburg, in the shape of an instrument with circular moving vanes and circular fixed vanes enmeshing longitudinally, the whole encased in a bakelite box, priced at 16s. 6d. retail for the 0·0005 capacity. This was only one instance of a large number of variations from standard practice available in this line.

In the way of dials and instrument tuning generally, German practice seems tending to the employment of dials which will permit of direct tuning on to the desired station. which is either engraved or written on the dial. Fig. 5 shows some of the designs which are available in this line. Various slow-motion dials and vernier arrangements were also available in large numbers.

There are now a large number of German terminals on the market of a type strongly resembling the well-known Clix design, but with these, as well as in the case of many switch bases, handles, coil wrappings, etc., the appearance was totally spoiled by the gaudy colouring employed for the insulating material.

For enthusiasts who consider it necessary to be always provided with a pocket set for use at a moment's notice, the

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firm Isaria Zälerwerke A.-G., of Munich, provide a crystal set in a metal case about the size of the ordinary tin of boot polish, as shown by Fig. 4. In regard to instruments generally, however, taking the exhibits of some of the largest makers as a guide, the writer noticed no particular change in design. Indeed, in the way of cheaper sets, there are still large numbers exhibited which seem to be of precisely the same design as those current just over a year ago before the removal of the official restrictions on the employment of reaction or wave-lengths over 700 m. In fact German manufacturers seem to share the view enunciated by one of our own leading makers a few weeks ago that future advances in wireless are to be looked for more in refinement of detail than in spectacular new circuits, and their efforts are accordingly largely directed to improvements and experiments with components.

Many more makers are turning their attention to the production of low-loss and similar coils, and there are some fine exhibits to be seen in this line. In the way of coil-winding machines, K. H. Krückeberg and Co., of Neue Königstr. 31–32, Berlin, exhibit a number of both of the hand-operated and power-driven types at prices from £12 upwards. The same

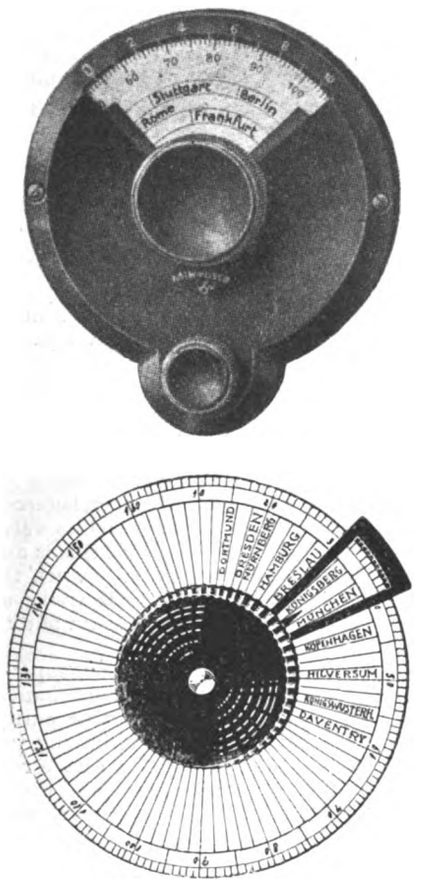

Fig. 5.—Some German dials.

firm have also brought out a stitching machine for coils, which is claimed to save considerably upon the old method of sewing by hand, which often took the disproportionate time of 4½ min. against a winding time of ½ min. It is claimed that this new machine will divide the time required for sewing by four.

The Karolus system of picture transmission was exhibited on the stand of the Telefunken Co., with a number of specimens of pictures transmitted by this method in approximately 20 sec. against the 30 min. formerly required.

Like several English cabinet makers, many German firms have now realised the importance of the market which is provided for box and cabinet work by wireless home construction, and there are a number exhibiting; some of them, such as August Geiger, of Württemburg, making a speciality of cabinets for export. Home construction in Germany has to all intents and purposes only been permitted under the regulations for a little over twelve months, and one of the results of the changed conditions is to be seen in the much greater quantity of technical literature which has made its appearance since last autumn. Numerous publishers were represented at this year's gathering, and the new publications available furnish a striking proof of the increased interest which is now taken in wireless construction. The German postal authorities have, in fact, passed from their first attitude of mistrust and opposition to one of positive encouragement, and on one of the Reichpost stands were to be seen numbers of home-constructed instruments with prizes awarded officially for the best work.

The total attendance at the Berlin exhibitions strikes the visitor as being considerably greater than what is usual at any of the London gatherings, but much of this is doubtless to be attributed to the outside attractions offered by the exhibition, and not altogether to the wireless interest of the Berlin public, although this is considerable, as the city contains close upon half of the broadcast listeners of the country. On the commercial side, however, there is no doubt that German wireless makers mean business, and regular yearly visits to this exhibition show how greatly they are making up for lost time in the one or two sections where formerly the state of the industry compared rather unfavourably with English or American practice.

AIR HEATING AND MECHANICAL STOKERS.

An Interesting American Report.

IN the newly issued National Electric Light Association Report on "Furnaces and Stokers," an account is given of the progress of mechanical stoking in the United States during twelve months 1925–1926. Much space is devoted to air heating, and the experience in this connection of a number of prominent American stations are of interest.

The Commonwealth Edison Co. of Chicago describe the results with two different types of air heaters—the "Babcock and Wilcox" tubular heater and the "Usco" multiple plate heater. The latter heater was put into operation in Chicago in October, 1923, and the report states that up to the present no repairs of any kind have been required, and that judging from regular inspection the plates are as good as when installed. The only difficulty has been a minor one due to a small deposit of soot having to be scraped off by hand about every three months, although this is being remedied, and it is stated that the plates are in general very easily cleaned and that no great amount of soot and dirt collects. It is also interesting to note that the Commonwealth Edison Co., in common with other American stations, have adopted the principle of washing the plates with water about every 14 days.

The results obtained in the way of fuel economy are quite satisfactory, and the same applies to another set of "Usco" air heaters in operation at the North-East power station of the Kansas City Power and Light Co. at Kansas City, which were started up in July 1923. In this case an interesting series of curves is given in the report showing the increase in efficiency and capacity of the boilers due to the installation of the heater, a considerable number of tests having been carried out with greatly varying coals, including, for example, low grade Missouri bituminous coal of only 8 700 B.Th.U. per lb. and Arkansas anthracite of 11 500 B.Th.U. per lb. The net result is that on a station already run on the most scientific lines the efficiency of the boiler plant has been put up from 1·5 to 5·5 per cent. by air heating, and further it has been found that the evaporation of the boiler plant can be increased without giving any additional losses due to unburnt fuel in the ash.

This installation would seem to prove the general experience in American stations that corrosion troubles with air heaters installed on scientific lines are not a serious matter, although undoubtedly many badly designed equipments have suffered in this way. Thus, at the North-East power station, Kansas City, the sulphur content of much of the coal is particularly bad, being as high as 4 to 5 per cent., and so far there is no sign of any corrosion, although the plates of the heater have been specially drilled for chemical analysis and investigation.

Obviously, on scientific grounds, the correct method of running a steam boiler plant, or in fact any furnace, is to equalise the temperature as much as possible at every stage—that is to say, to heat up both the air for combustion and the water going into the boilers so as to minimise expansion and contraction troubles, and it is curious that air heating has only just recently been employed on an extensive scale for steam boilers, although invented over 100 years ago and a very old practice in the carbonisation industries.

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Notes on Wireless Matters.

(*Continued from page* 412).

the highest resistance, it is the most susceptible to this effect. Some 5 or 10 μμF between grid and filament should be allowed for, and if c were only 32 μμF, 10 μμF of shunting capacity would produce an appreciable, though small, drop in the high frequency P.D. reaching the rectifier. One would tend, therefore, to make c (say) 64 μμF instead of 32 μμF, thereby augmenting the sluggishness; alternatively one must tolerate a

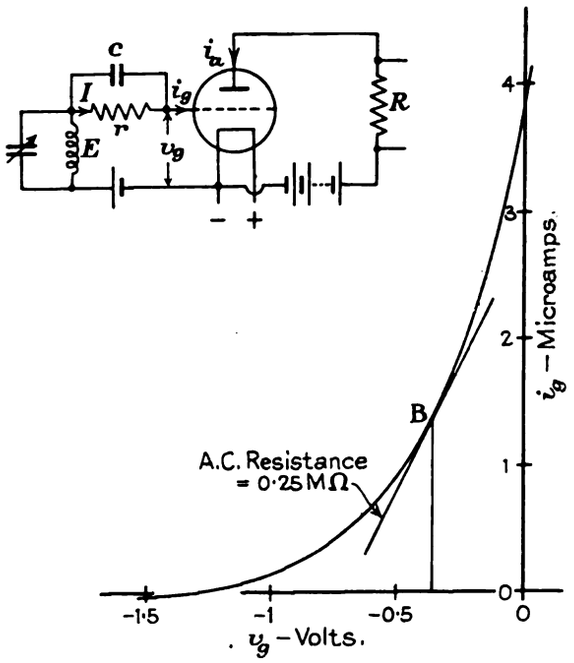

Fig. 4.

slight drop in the efficiency of the rectifier. At long wavelengths these considerations would have weight; but in the neighbourhood of 1 500 m. they are trivial.

With the condenser C or c exonerated from blame for whatever acoustic distortion may be caused by the rectifier, there remain two other effects which might be responsible.

If the rectifier takes current asymmetrically from the high frequency circuit, harmonics of the radio-frequency must be set up in the coil and condenser. The significance of this fact —which had hitherto escaped the present writer—was exposed by Mr. H. L. Kirke in the discussion of the paper by Mr. P. P. Eckersley already cited. Mr. Kirke said: "I think the distortion from grid current is due to the fact that it produces harmonics in the carrier wave and the side band, and the harmonics in the carrier wave and the side band heterodyne, showing themselves as harmonics in the rectified low frequency current."† He added, however: "If you have a fairly low damped oscillatory circuit which can by-pass all the harmonics produced by the distorting grid current, you will not get distortion." The effect, so far as it is perceptible at all, is certainly present in the grid rectifier; but it is also present in the crystal rectifier.

Glasgow's Electrical Extensions.

(*Concluded from page* 413.)

boilers are equipped with Babcock and Wilcox union compartment type stokers, while the remaining boilers have Underfeed stokers. Cast iron economisers have been used, but in the present section the capacity of the Green economisers is greatly increased.

The new boiler feed pumps are of G. and J. Weir's standard turbine driven type. The principal motors for the boiler room auxiliaries are by the British Thomson-Houston Co.

The extensions to the coal handling plant have been carried out by Strachan and Henshaw. The additional auxiliary power required is provided by a 1 500 kVA 20 000/440 V transformer supplied by Ferranti.

We have to thank Mr. R. B. Mitchell, the city electrical engineer, and C. A. Parsons and Co. for supplying us with the illustrations and information on which this article is based.

† *Loc. cit.*, p. 504.

CORRESPONDENCE.

WIRELESS WITHOUT BATTERIES.

[To the Editor.]

Sir,—We notice in your issue, dated October 1st, a letter from Mr. N. W. Prangnell, of Acton, referring to apparatus exhibited at the recent Radio Exhibition for the purpose of operating wireless apparatus from the house mains. Mr. Prangnell states that most of the apparatus of this type exhibited would, to his mind, be unsafe.

Mr. Prangnell, however, states that there was one type at the Exhibition which did not merit this condemnation.

We have no knowledge as to the particular make to which Mr. Prangnell is referring, but we should like to call attention to the fact that in the three types of apparatus which we exhibited for this purpose, viz., one for replacing h.t. batteries and running the set direct from the mains, one for charging h.t. batteries, and one for charging l.t. batteries, proper provision was made in every case by using enclosed terminals or enclosed connections for flexible leads to ensure complete safety in use, as far as concerns any possibility of shock from the mains, and that precautions were also taken to make it impossible to earth the mains.—We are, etc.,

Burndept Wireless Limited.
P. K. Turner,
Research Department.

Blackheath, London.
October 4th.

BROADCAST RECEIVING APPARATUS.

[To the Editor.]

Sir,—With reference to the article entitled "Broadcast Receiving Apparatus," appearing on p. 348 of your September 24th issue, we were particularly interested in your correspondent's remarks regarding the use of a separate oscillator valve in super-heterodyne receivers.

As you are no doubt aware, receivers built from our six-valve super-heterodyne receiver outfit employ a combined oscillator and first detector, and when designing the original circuit particular care was taken to avoid the disadvantages which so often exist when a combined oscillator and detector valve is used. With a well-designed super-heterodyne circuit the use of the combined oscillator and detector valve naturally results in the economy of one valve, and this is an important consideration with many users, especially when they can feel assured that the volume, stability, selectivity and ease of adjustment are practically as great as if an additional valve were used.

The special design of receivers built for our super-heterodyne outfit gives perfect stability under all conditions, with selectivity of a remarkably high order, extreme purity of reproduction, whilst there is no question of having to make any special selection of valves. Although we have recommended particular makes of valves, others have been used with equal success and without any necessity whatever for individual selection.

So far as the selectivity of such receivers is concerned, a very interesting test was carried out with one in a building directly opposite Selfridge's, and the London transmission was entirely eliminated in favour of other stations.

Since the date when the Igranic outfit was originally designed there has been considerable development in the design of valves, and it is now possible to obtain valves having the remarkably high amplification factor of 40. Such a valve functions with very great efficiency as a detector or intermediate frequency amplifier, and, as a result, a stage of intermediate frequency amplification may be saved and a separate oscillator employed without any loss of efficiency, considered on a valve basis. A circuit on these lines is employed in our new portable receiver the neutro-sonic seven.

We cannot, however, consider that the use of a combined oscillator and detector is out of date, and there has been no falling off in the large sales which we have enjoyed of our standard super-heterodyne outfit. We attribute these large sales to the ease with which the outfit can be assembled, the saving of one valve and the extreme purity, selectivity, stability and ease of control enjoyed by users of the completed receivers.—We are, etc.,

Igranic Electric Co., Ltd.,
A. H. Curtis.

Bedford,
October 5th.

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GERMAN INDUSTRIAL RECOVERY.

Department of Overseas Trade Report—Nationalising Electricity Supply—Moderate Prices for Current—The Tariff Problem.

THE "Report on the Economic and Financial Conditions in Germany, 1925-26," which has been compiled by Messrs. J. W. F. Thelwall and C. J. Kavanagh and is published by H.M. Stationery Office at a price of 4s. 6d., summarises the general position of the industry in that country and shows the remarkable powers of recuperation that are at work. In a general review Mr. Thelwall describes the sixteen months preceding June, 1926, as the severest stage of Germany's post-inflation recovery. The dominating factor was the insufficiency of working capital and credit which became so acute that for a time ready-money payments nearly ceased. There is, he adds, hardly another country of similar industrial importance which could have overcome with such comparative ease and with so little material disturbance the complete destruction of its currency or passed with equal rapidity through the subsequent period of necessary reorganisation. Anything that Germany may experience in future can be regarded as insignificant with what she has recently been through. An upward movement is evidently to be looked for as Germany gradually forms new capital to replace that destroyed by inflation. In furthering this aim the policy will be to minimise imports and force the export trade.

Bankruptcy and the Crisis.

The severity of the recent crisis is closely examined by reference to bankruptcy and unemployment statistics which caused a period of acute commercial misery. Among other things, it showed up the weakness of the vertical trust, which has now given way to the horizontal combine. One of the great aims of German industrial policy is to bring about a European iron, steel and coal combine in respect of sales and production, not for altruistic reasons, but because it is believed that with capacity so far in advance of demand unrestricted competition is likely to deal all producing countries a severe blow. The extent to which this capacity exists is shown by the statement that although it was a year of acute crisis more steel was produced during the first six months of the period under review steel in excess of pre-war figures was produced and the output maintained at that high level for the remainder of the period. More pig iron was produced with 80 furnaces in operation than in Great Britain with double that number at work. Everywhere in the metallurgical and engineering trades serious attention is being devoted to the efficiency of production, while transport arrangements are being overhauled and brought into line with mass production programmes.

The electrical manufacturing industry is not specifically mentioned, though the general statements apply equally to it as to the others; but an interesting survey of the movement towards the concentration of German electricity supply industry is given, attention being mainly directed to the part played by the State in the development of large power schemes. There is much difference of opinion on this point, but the present position is outlined as follows:—

Government's Share Dealings.

After having bought a block of £600 000 shares in the Rheinisch-Westfaelisches Elektrizitätswerk A.G., which came on the market as the result of the liquidation of the Stinnes concern, the Prussian State, towards the end of 1925, acquired the majority of the Siemens Elektrische Betriebe A.G., Hamburg. This concern supplies the north of Germany from the Dutch frontier to Mecklenburg, with the exception of Hamburg and Schleswig-Holstein, and it is intended to link up its system with the works of the Grosskraftwerk Hannover A.G., which already belongs to the Prussian State. The title of the Siemens Elektrische Betriebe A.G. was altered into Nordwest-deutsche Kraftwerke A.G., and the capital raised from £200 000 to £500 000.

At the beginning of 1926 the Prussian State bought the majority of the Braunkohlenindustrie A.G. Zukunft in Weisweiler in the district of Aix-la-Chapelle; this company controls several power stations on the left bank of the Rhine.

When the Prussian Government in February, 1926, brought in a bill dealing with the participation of the State in direct electric undertakings, it became evident that all these acquisitions were part of a large programme. The bill provided that a sum of £2 690 000 was to be set aside for the purpose of such participation. The amount of £1 022 000, which had been spent on the investments detailed above, was included in the bill in addition. At the same time, the Government declared that, while it was not their intention to create a State monopoly, they desired to prevent the formation of a private monopoly and wished to secure the supply of electric power on favourable terms for the whole country.

Meanwhile the Rheinisch-Westfaelisches Elektrizitätswerk A.G. and the Elektrowerke A.G. Berlin (owned by the Reich) together had acquired a majority of about 75 per cent. of the Braunschweigische Kohlenwerke A.G. As this company controls lignite mines and power stations in central Germany, which were favourably situated for linking up with the electric system of the Prussian State in northern and western Germany, the latter entered into negotiations with the new proprietors with a view to entering into partnership. Up to the end of June, 1926, however, no result had been arrived at, and in the meantime it was decided that the whole question of Prussia's plans with regard to electricity supply required thorough discussion between the Reich and the Federal States.

The electricity works of the Prussian State have, even after the most recent purchases (June, 1926), an output equal to only about 10 per cent. of that of the Elektrowerke and the Rheinisch-Westfaelisches Elektrizitätswerk. These two large concerns have also been expanding during the year; the Elektrowerke bought participations in Upper and Lower Silesia in addition to the works which they already owned there, and the Rheinisch-Westfaelisches Elektrizitätswerk took over a number of works in the southern Rhineland.

Water Power Progress.

The A.G. Saechsische Werke extended their field of activity in the States of Saxony and Thuringia during 1925. Further, in June, 1926, the company proposed to increase their capital from £2 000 000 to £5 000 000 and to conclude a second foreign loan in order to provide funds for additional expansion. The new shares are to be taken over by the State of Saxony, which at the same time is expected to provide a guarantee for the foreign loan.

The State of Baden has acquired a participation to the amount of Frs. 7 500 000 in a Swiss company which will erect a power station of 110 000 H.P. at Rheinfelden, in Switzerland. A contract for the reciprocal supply of electrical current has also been concluded between Switzerland and Baden.

The various companies engaged upon water-power work, such as the Rhein-Main-Donau A.G. and the Neckar A.G., are carrying out their programmes with the assistance of the Reich and the States concerned. The Inn works, as well as the first portion of the Walchensee plant and the Mittlere Isar station, have been completed and are supplying electric power on a large scale.

With a view to decreasing the severe unemployment, the Bavarian Government has commenced to construct the second stage of the Mittlere Isar system.

The prices of electric current in Germany are moderate on account of the enormous increase in output, of which, unfortunately, no recent statistics are available. As to power for large consumers, prices in most cases are below the pre-war level, amounting to between 3 and 4 pfennigs per kWh. For small consumers they are higher than before the war, and with few exceptions lie between 20 and 34 pfennigs per kWh. those between 20 and 24 pfennigs prevailing. Prices for electric light are between 40 and 54 pfennigs per kWh.

The foregoing quotations are taken from tariffs which provide for a fixed price per kWh. It is, however, becoming more and more usual to charge a definite sum per month, representing a kind of rent for the installation; this varies between Mks. 2 and Mks. 9 per month, but may go as high as Mks. 30; on the other hand, the price per kWh is then lower, usually between 9 and 19 pfennigs. Some works offer specially favourable terms for current used during slack periods, with a view to arriving at an even distribution.

We regret an error which occurs in the advertisement of S. Smith and Sons, Ltd., appearing on page xxvii of our issue of October 1st. The word "headlamps" in the text under the illustration should read "handlamps."

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NEWS IN BRIEF.

"Electric Hen's" Big Output—Telephone and Telegraph Receipts Up—Blackpool Rumour Denied—Laying the Fused Electric Wire Bogey.

A MAMMOTH electric incubator in California hatches three million eggs a year.

Chesterfield's new automatic telephone exchange was formally opened last week.

It is reported that Moscow will shortly be in telephonic connection with Warsaw.

An electrical engineer is required at the Brighton County Borough Mental Hospital.

The Commissioners of His Majesty's Works, etc., have invited offers for the erection of the "Oval" (London) telephone exchange.

The Great Northern Telegraph Co. announce that telegraphic communication with Hankow has been restored, but traffic is liable to delay.

Several additional first grade instructors are required in the Engineering Department of the Cape Technical College, Cape Town, South Africa.

At a Cardiff building trades exhibition there were good shows of electrical fittings by Cross Bros., Ltd., and wireless apparatus by the Western Radio Co.

The Institution of Electrical Engineers requires the services of an editor for "Science Abstracts." A knowledge of physics, electrical engineering and foreign languages is essential.

The revenue from the British Government telegraph service from April 1st to September 30th was £2 980 000, an increase of £380 000, and from the telephone service £8 550 000, increase £800 000.

The Slough Rheostatic Co.'s football club has sustained a great loss in the death of one of its regular players, Mr. G. Webb. As a mark of sympathy the club's match with St. Helen's Cables was cancelled.

Attention has been called to the fact that Blackpool was the first seaside resort to adopt arc electric lighting on the promenade and the first town to use municipal electricity for street lighting and for electric trams.

Thornton U.D.C. held an electrical exhibition during last week. It was opened by Coun. J. Marshall, chairman of the Electricity Committee, and was under the superintendence of Mr. A. G. Cooper, electrical engineer.

A piece of land adjoining Blackburn Tramway Depot at Intack has been converted into a bowling green for use of tramway employees. On September 30th Alderman Higham, chairman of the Tramways Committee, was defeated in a match on the new green with Coun. Jenkins.

Mr. W. Simpson, J.P., electrical engineer, of Hapton, recently met Mr. Thomas A. Edison in America, and received from him an autographed photograph. It was on the strength of having visited Mr. Edison 45 years ago that Mr. Simpson was granted an interview. He found the inventor still hard at work.

Mr. C. Furness, borough electrical engineer, of Blackpool denies the truth of the statement that the Corporation proposes to turn over to oil consumption and resume the illuminations. He says "to carry out such a conversion would entail enormous expenditure and the provision of costly storage tanks."

In co-operation with local electrical contractors and some of the leading electrical manufacturers, Tunbridge Wells Electricity Department opened on Wednesday an electrical exhibition at which special demonstrations are given of electric cooking and bread baking. The exhibition closes to-morrow (Saturday) evening.

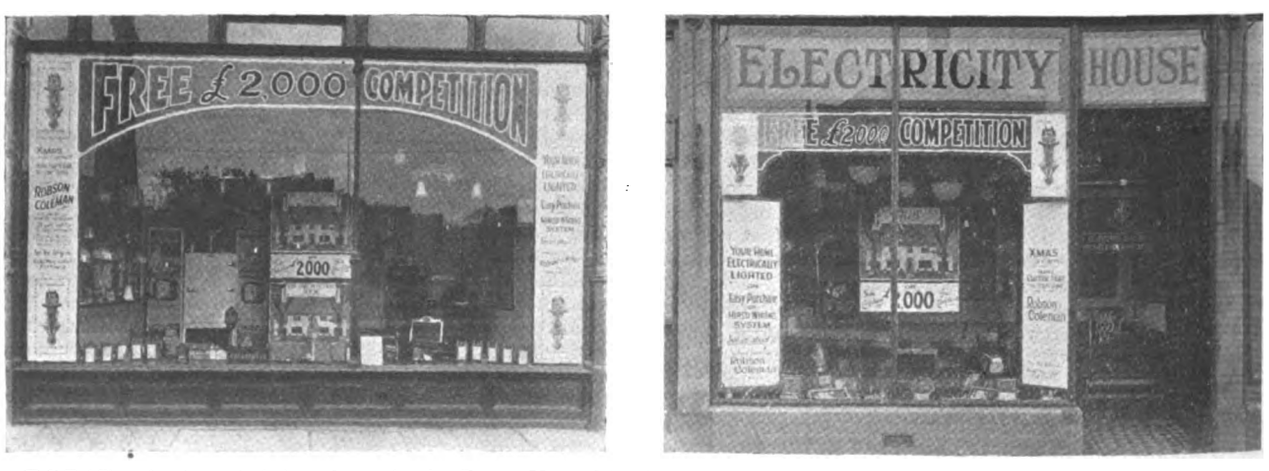
The new Edinburgh automatic telephone exchange was put into operation last Sunday, and the Central and Museum exchanges were closed. The apparatus in the new exchange was supplied by Siemens Bros. and Co., Ltd. There are 13 740 lines connected, and provision has been made for ultimate extension to 23 560 lines.

The annual review of income and expenditure in connection with Robert Gordon's College (Aberdeen) states that £8 932 has been spent during the financial year on the equipment of the new engineering laboratories. A good deal of the equipment of the new electrical engineering laboratory, for which £2 000 has been set aside, is now in order.

Mr. L. J. Kettle will preside at the eighteenth annual dinner of the Faraday House Old Students' Association, to be held at the Hotel Cecil (London) on October 29th. Members may introduce guests, who need not necessarily be Faradians, and tickets (10s. 6d. each) can be had from Mr. H. W. Fairman, at Faraday House, Southampton Row, W.C.1.

Following a report in a Liverpool newspaper that a recent church fire was caused by the fusing of an electric wire, John Hunter and Co. informed the paper concerned that "As we were responsible for the . . . installation . . . which was installed some six years ago, we immediately, for the sake of our own reputation, made a very minute investigation, and the result of this is that we can say conclusively that the fire was not caused by the wiring in the church . . ." A paragraph containing this explanation was published.

A statement issued by the Post Office shows that in May last, the month of the general strike, the number of inland trunk traffic calls was 8 641 893, an increase of 1 438 181, over the number in the corresponding month last year. The total number of telephones on the system at the end of July was 1 426 042, of which 500 893 were in the London area, and the remaining 925 149 in other parts of Great Britain, including Northern Ireland. During the quarter ended June 30th, 55 621 new telephone stations were added, and after deducting 26 594 cessations the net addition was 29 027.



GREAT enthusiasm is being shown in the Better Home Lighting Campaign in the Newcastle area. Here are two contractors' windows "tying up" with the national effort. The picture on the left shows one of the Newcastle windows of Robson and Coleman. The other illustration shows the same firm's display at its Whitley Bay branch. The Competition posters are framed, and the windows of the house are cut out and illuminated by a lamp placed behind the poster.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

THE late Mr. John Kilpatrick, chairman of James Kilpatrick and Sons, Ltd., electrical engineers, left (personal estate) £7 120.

Mr. William Macintosh, of William Douglas, Ltd., of Edinburgh, is the new president of the E.C.A. of Scotland.

Mr. H. H. Wiggans, of the Newcastle Electric Supply Co., has been appointed consumers' engineer in the Worthing Electricity Department.

Coun. J. Walsh, electrical contractor, Blackburn, is to be nominated for re-election as Conservative member for St. Mark's Ward at the November municipal elections.

Sunderland Corporation Tramways Committee have appointed Mr. H. W. Snowball as rolling-stock superintendent in succession to Mr. George Haswell, who has retired.

Sir Hugo Hirst, together with Lord Reading, Sir Alfred Mond and Mr. James de Rothschild, have agreed to join the board of the Palestine Electric Corporation, Ltd.

Mr. Walter McBretney, B.Sc., A.M.I.E.E., head master of Wallsend Secondary School and Technical Institute, has been appointed principal of the Dartford (Kent) Technical Institute.

Mr. G. Hewson, having obtained an appointment as chemist with the London Electric Supply Corporation, Ltd., has resigned the position of superintendent of the Juvenile Training Centre, Jarrow.

Mr. A. M. Eagleston, electrical engineer, as President of the Oxford Rotary Club, received an American flag from the President of the New York Rotary Club on the occasion of his visit to Oxford.

The late Dr. James Thomson Bottomley, chairman of Kelvin, Bottomley and Baird, electrical and navigation instrument makers, and a nephew of the late Lord Kelvin, left personal estate in Great Britain, £63 764.

Mr. H. W. Swift, formerly chief lecturer in mechanical engineering at Leeds University, has been appointed head of the engineering department at the Bradford Technical College, in succession to Prof. G. F. Charnock (retired).

Mr. P. L. Riviere, chief electrical engineer in the London County Council Tramways Department, has been appointed chief engineer to the Westminster Electric Supply Corporation, Ltd., and will take up his duties in that position on November 1st.

Mr. Frank B. Holt, A.M.I.E.E., of Ashton-under-Lyne, was married recently at Hallford Congregational Church, Whitworth, near Rochdale, to Miss Marjorie R. Kershaw, daughter of Coun. Grindrod Kershaw, of Broadley, near Rochdale.

The marriage took place at All Saints' Church, Maidstone, on September 29th, of Mr. Alan Wilson, electrical manager to Drake and Fletcher, Maidstone, and Miss Gertrude Fredericka Sheldrake, daughter of the late Capt. F. E. Sheldrake, of Liverpool.

Exeter City Council has adopted the recommendation of the Tramways Committee to increase the salary of the tramway engineer and manager, Mr. W. Y. Smith-Savile, from £450 to £500 as from August last, to £525 in April next, and by annual increments of £25 to £600.

The late Sir Herbert Samuel Leon, late chairman of the Yorkshire (West Riding) Electric Tramways, Ltd., Smithfield Markets Electric Supply Co., Ltd., and Anglo-American Telegraph Co., Ltd., left unsettled property valued at £726 816; net personalty £660 620.

Prof. V. H. Blackman, F.R.S., Prof. F. G. Donnan, F.R.S., and Prof. F. A. Lindemann, F.R.S., have been appointed members of the Advisory Council to the Committee of the Privy Council for Scientific and Industrial Research, in succession to members who have retired.

Mr. A. V. Swallow, chief chemist at the St. Helen's Cable Works, Slough, who has been with the firm for over a dozen years, was, on the occasion of his marriage to Miss Irene Parker, of Slough, presented by the company and members of the staff with a canteen of cutlery, suitably inscribed in silver.

Gainsborough Electricity Committee, having been authorised by the U.D.C. to appoint an electrical engineer and manager of the electricity undertaking, has interviewed six applicants, and appointed Mr. H. Haigh (deputy electrical engineer, Morecambe) to the position. The other applicants who were selected for the final interviews were Mr. Gleaves, Stockport; Mr. W. B. Redfern, Gainsborough; Mr. Ross, Ayrshire Electrical Board; Mr. Thain, deputy electrical engineer, Doncaster; and Mr. E. C. Linay, deputy engineer, Worksop.

Developments in the activities of the Electrical Wholesalers' Federation have rendered necessary the appointment of a full-time secretary, and from a large number of applicants Mr. James W. McKay, whose portrait is here reproduced, was chosen. Well-known as an organiser, and possessing valuable experience of Parliamentary work, Mr. McKay has had a long acquaintance with the electrical industry, and was associated with the introduction of the flame arc lamp and with early colliery electrification enterprises. At one time he represented the Brush Electrical Engineering Co. and the British Electric Traction Co. in South Wales and the West of England. His services, particularly as a public speaker, were greatly valued by Government Departments during the war, and his war-time work included several important posts calling for great organising and administrative ability. Mr. McKay has also acted as general secretary of the United Kingdom Business Men's Federation, and as British Trade Adviser at the German Embassy in London.

Mr. J. W. McKay, the new E.W.F. Secretary.

As announced in previous issues of THE ELECTRICIAN, Dr. J. A. Fleming, F.R.S., retired from the University Chair of Electrical Engineering at University College, London, at the end of June last, and Mr. W. C. Clinton was appointed as his successor. It was decided to create an Electro-Communications Section of the Faculty of Engineering, and Dr. Fleming consented to take up, for a period of twelve months, the position of special lecturer in that subject. Mr. R. R. Poole has now been appointed assistant in the electro-communications section.

The Council of the University of Leeds has appointed Mr. E. L. E. Wheatcroft to the newly created chair of Electrical Engineering. Mr. Wheatcroft's academic career at Cambridge was one of unusual distinction, and his war service was with the R.G.A. Portsmouth Command and afterwards in the 35th Siege Battery, which he left with the rank of acting captain. His practical training was gained in the works of the British Thomson-Houston Co., and later with the General Electric Co. in America. He has had an extensive experience in certain phases of heavy electrical engineering (particularly in regard to problems relating to the generation and transmission of power) and has carried out a considerable amount of research work. In making this appointment the University has in mind the desirability of developing the Department of Electrical Engineering.

Obituary.

The following deaths are reported :—

Mr. Richard Boxer Amos, electrical engineer, 20, Monson Road, Redhill, on September 27th, in his 71st year. Mr. Amos had been in business at Redhill for a long period.

Mr. Zac Ellis Knapp, on October 1st, aged 59. Mr. Knapp was, at the time of his death, director of construction of the Metropolitan District, London Electric, City and South London and Central London Railway Companies. Born on September 12th, 1867, he came to England from America in 1901 to take up an appointment with the Underground Railways. In 1910 he was appointed general manager of the London United Tramways, and in 1913 returned to the Underground Railways as chief engineer. In 1915 he was appointed manager for maintenance and construction. From March 1917 to November 1918 he acted as general manager of the Associated Equipment Co., and at the end of 1918 he returned to the Underground Railways to take up again his post as manager for maintenance and construction, also acting at this time for a short period as commercial manager. In 1921 he was appointed director of construction, being responsible for the extension of the London Electric Railway from Golder's Green to Edgware, the reconstruction of the City and South London Railway by the enlargement of its tunnels, the extension of the City and South London Railway to Morden, and the extension of the Hampstead Section of the London Electric Railway from Charing Cross to Kennington.

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"WIRING THE HOMES OF BRITAIN."

Electrical Campaign Opens with Enthusiastic Support—Suggestions for Contractors—Reports on Progress in the District Areas.

OVER half a million competition booklets have already been sold, and orders for a large proportion of a further half million, now being printed, have been received from electrical people co-operating in the E.D.A.–E.L.M.A. Better Home Lighting Campaign. These figures prove conclusively that the great electrical drive is already receiving vigorous support. Of the incidental campaign helps similarly large quantities have been sent out. Over 1 500 000 poster stamps for affixing to letters have been sold, besides about 800 posters and over 100 advertising electros. The great need of the moment in connection with the campaign is for more and still more Electrical Circles in every district throughout the kingdom. These Circles, it may be repeated, are quite informal bodies, and anyone who is prepared enthusiastically to make the campaign a success in his own area, should lose no time in arranging to form a Circle.

The first Campaign demonstration house to be opened to the public.

The need for more Electrical Circles in the London and Home Counties area was emphasised by Mr. J. W. Beauchamp at a meeting in London last Friday, which was attended by representatives of manufacturers, electrical contractors, and electricity supply undertakings. Mr. Beauchamp attached great importance to the desirability of having as many demonstration electric houses as possible. He would prefer to see hundreds of small house demonstrations than twenty or thirty big provincial electrical exhibitions. For the first time in its existence, the whole electrical industry was organised throughout the country for one common end. The prolongation of the coal stoppage was unfortunate, but it could certainly be turned to electrical advantage.

Mr. Buckle suggested that to key up their shops with the campaign, contractors should devote part of the interior display space to the presentation of lighting fittings similar to those reproduced in the competition booklets. It would give the public a better idea of the actual appearance of the fittings and would also give the contractor a splendid chance to say to people demanding the book: "Perhaps it will help you in filling up your ballot form to see the actual fittings illustrated in the book." As many of the competitors coming into electric shops would be primarily interested in the competition and not in electricity, this opportunity to interest them in the electrical side was a valuable one.

FREE this fine Electric HOUSE
You can win this CONTEST
£2,000
1st PRIZE in this Easy Competition
Robson & Coleman
POST CARD
ROBSON & COLEMAN,
Electrical Engineers,
Electricity House,
Haymarket,
NEWCASTLE-ON-TYNE
If you live in the country you need ELECTRIC LIGHT!
The SIGN of good SERVICE
INSTALLATIONS fully guaranteed.
Robson & Coleman,
Dear Sirs,
Please send me, free of charge, one copy of EDA COMPETITION BOOKLET, "Electric Lighting in the HOME."
Yours faithfully,

Both sides of a card used by a Newcastle firm of contractors to stimulate country customers' interest in the Campaign.

While some contractors were not able to put in the standard window displays specially devised for use in conjunction with the Campaign, all should make the competition poster the centre of their display.

In his experience, demonstration electric houses were the best means for advertising the benefits of electricity to the greatest number of people. He had found that such houses were easily arranged, and although there might be some difficulty with builders, furnishers, etc., in getting the first house started, there was always an abundance of houses and furniture offered for subsequent displays. The reason was that speculative builders soon found that there was no better way of disposing of their houses quickly than when they were nicely furnished and electrically equipped to give the maximum of comfort, and invitations to view were regarded by the public as a privilege. After an initial effort in Newcastle, a number of builders begged to be allowed to provide houses for demonstration purposes, and house furnishers were similarly pressing with their offers of assistance when they learnt that the furnishings of the first house had been sold three times over in a fortnight.

Before the close of the meeting, a number of promises to form Electrical Circles were forthcoming, but to ensure smooth working, still further Circles are needed, particularly in Greater London.

Several of the large electrical manufacturing firms are taking special steps to interest their staffs in the Campaign. W. T. Henley's Telegraph Works Co., Ltd., for instance, have bought large quantities of competition booklets, and have distributed them to all sections of their workers, with the request that each shall endeavour in some way to help the scheme forward.

Another example showing what can be done inside one organisation is furnished by the Hackney Electricity Department, which has formed an Electrical Circle comprising the whole staff, including the jointers and jointers' mates. A series of model rooms similar to those shown in the competition booklet has been fitted up in the Hackney Electricity Demonstration Hall, and a specially trained lady assistant is in constant attendance with the sole object of interesting callers in the electrical side of the Competition.

West Hartlepool's Distinction.

As forecast in THE ELECTRICIAN last week, West Hartlepool achieved the distinction of being the only place to have its demonstration electric house (illustrated on this page) opened on the first day of the Campaign. The opening ceremony was performed on Monday by the chairman of the Electricity Committee, and the borough electrical engineer, Mr. J. H. Parker, informs us that the advance publicity obtained for this function brought so large a gathering, that it filled the house, the garden, and was formed up in a long queue down the road. The house will be open for a fortnight, and early in the new year a similar exhibition will be held in a bungalow type of house. In conjunction with the electric house, demonstrations of electric cooking are being given daily in new electricity showrooms which have been arranged on the ground floor of the Tramway Buildings, whither Mr. Parker's offices were transferred on his appointment as tramways manager last month. Mr. Parker explained at the opening of the house that there would be no sales from the showroom, as there were plenty of electrical contractors in the town ready to perform that service.

Live electrical contractors throughout the country look upon the Campaign as a very great help, and reports indicate that local branches of the Electrical Contractors' Association are playing a prominent part in the promotion of local interest in the Campaign. The E.C.A. Bournemouth branch has arranged to open a model "electric home" or lease a central hall and instal a series of model rooms, and the Potteries branch has taken space under the E.D.A.-E.L.M.A. national advertisements and is publishing the names and addresses of seventeen local E.C.A. firms from whom the Competition book may be obtained. Similar action is being taken by the Newcastle branch and the example is being followed in other areas. Barnett and Soans, of Burton-on-Trent, have overprinted the back of the Competition book with a big display giving the addresses of their several branches, and Robson

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and Coleman, of Newcastle, are sending out a large mailing card to country customers inviting postal application for the Competition book. This card, which has a postcard attached, is reproduced on the opposite page, both sides being shown. The idea is worthy of emulation where possible customers are living in adjacent rural or semi-rural areas, but, where possible, the public should be encouraged to call personally at the shop for the booklet. This does not mean, however, that the negative policy of waiting for people to come in should be adopted. If a contractor thinks the calls made do not represent a fair proportion of the residents in his district, he should adopt means to increase the number of callers. He can, either by himself or in collaboration with other electrical contractors, issue advertisements in the local newspapers, using stereos similar to the one reproduced on the opposite page, or he can send out circular letters.

A suitable letter for this purpose (E.D.A. Sales Letter No. 2) is included in the big handbook of the Campaign (E.D.A. 1 000), and this letter, or a modification of it, should materially increase the number of inquiries for booklets.

Mr. Henry J. Miles, of Page and Miles, Ltd., Brighton, and president of the E.C.A., is one of the keenest supporters of the campaign. He told a correspondent of THE ELECTRICIAN that he was taking every opportunity, when visiting E.C.A. branches, of exhorting the members he addresses to support the Competition in ever way possible. "As for my own firm," he continued, "we have already ordered a considerable supply of the Competition books and other literature and posters, and we intend having suitable display windows during the period. In fact, we shall leave no stone unturned to make the whole scheme an unqualified success, as it deserves to be. It was said in a speech the other day that this is a Competition in which all were winners and there were no losers, and I think this expression covers the subject in one comprehensive phrase. The supply authority will most certainly benefit by the increased use of electricity, the manufacturers by the increased sale of apparatus, the contractor by increased installation work, and last, but by no means least, the general public will be educated in the proper and most efficient way in which electricity can be of service to them in their homes, giving them comfort, cheerfulness and cleanliness, in a safe, reliable and economical way.

"Canny" Scots Enthusiastic.

Last week THE ELECTRICIAN published exclusive reports from a number of its provincial correspondents on local Campaign activities. These are supplemented this week with further reports obtained at first hand. In view of the reputation for "canniness" which attaches to the Scot, and particularly the Aberdonian, writes a Scottish representative of THE ELECTRICIAN, it may be confidently affirmed that if the Campaign catches on in Aberdeen, its success in other parts of the kingdom is assured, and adds that the movement is being taken up with enthusiasm and thoroughness by the most enterprising firms in the city. The Electricity Department officials are co-operating actively in the scheme, and so, too, are the local representatives of the leading electrical manufacturers. The Corporation has taken 2 000 copies of the Competition booklet, and it is anticipated that some 3 000 or 4 000 more, at least, will be circulated by local electrical contractors. The General Electric Co., Ltd., are distributing the literature through the contractors in the North-Eastern area, and by active co-operation with the retailers are stimulating this great educational movement. Mr. Wink, the local manager, has been energetically pushing on the publicity work and giving expert advice and practical assistance in connection with the scheme. Mr. Andrew M'Robb, electrical contractor, with premises in Market Street, Union Street, and Blaikie's Quay, is also taking a prominent part locally in the scheme.

The Manchester correspondent of THE ELECTRICIAN states that the full effects of the National Campaign have not begun to be felt there yet, partly on account of the fact that everybody is fully occupied with Civic Week celebrations. Trade interest is, however, gradually being aroused, and Mr. R. C. Hawkins says that matters are progressing favourably. A local trader in a big way said on Monday that he had not had any inquiries for booklets yet; but, as the Electricity Department states, it is too early yet to expect any great influx of inquiries.

"Providing good light is not a matter of luck, it is a matter of installing good lamps." That is a slogan which Nottingham is taking to itself—a laudable copy of a well-known advertisement now appearing in the local newspapers—in this autumn Better Home Lighting Campaign, writes the Nottingham correspondent of THE ELECTRICIAN. The conversion of home lighting from gas to electricity, already proceeding at a fair rate in both the city and the close suburb of West Bridgford, is expected to receive great impetus from the Campaign. Another good sign, from the Nottingham trade point of view, is the steady and daily increasing return of miners to work in this area.

So far as South-West Lancashire is concerned, writes the Liverpool correspondent of THE ELECTRICIAN, the Campaign could not have been introduced at a more opportune time, for this month the two Lancashire cities—Manchester and Liverpool—are holding civic or "at home" weeks, during which every inducement is offered to people in the surrounding districts to visit the respective cities to view the shops and interest themselves in the objects of civic pride. The local branch of the Electrical Contractors' Association, of which Mr.

FREE
THIS FINE
ELECTRIC
HOUSE
This splendidly designed Electric House (or a cheque for £2,000) may be yours in return for a few minutes of your time. Fill in your name and address on the coupon, or a slip of paper, and take it to any Electric Shop or Electricity Supply Showroom, and you will receive the interesting booklet giving full details of the competition.
The competition is open to everybody above the age of sixteen, and there is no charge of any kind. There are many other valuable prizes.
Issued by
The British Electrical Development Association, Inc., 15, Savoy Street, Strand, W.C.2.
CUT ACROSS HERE
Please supply free copy of Competition Booklet "Electric Lighting in the Home."
Name
Address

A reproduction of a small-size advertisement which has been prepared by the E.D.A. for use by supply undertakings and contractors for local advertising purposes.

H. C. Hazel, of Lindsay and Co., is the chairman, has the situation well in hand, and local contractors are working in close co-operation. Liverpool Corporation Electricity Showrooms have a good supply of Competition books, and before October 16th an additional 100 electric light fittings will be installed in the demonstration room, which adjoins the showroom, devoted exclusively to lighting accessories.

But that is not all. In down-town Liverpool—to be precise, on the St. George's Hall Plateau—there will be erected a Corporation subsidy house. It will be a composite exhibit in the arrangement of which the Housing and the Electricity Committees, and local house furnishers will lend a hand.

Surrounded by collieries and dependent on them and the steelworks, which are closed owing to lack of coal, Rotherham is feeling severely the effects of the coal dispute, and three-quarters of its working population is unemployed. Nevertheless (states a local representative of THE ELECTRICIAN) electrical traders in the town are fighting against this handicap, and are enthusiastically supporting the campaign, and some inviting window displays have been arranged. Lilleker Bros., of Doncaster Gate, have just opened an up-to-date showroom, and a good range of lighting accessories is exhibited there. Mr. J. Lilleker told our representative that customers were already impressed by the campaign, and the booklets were disapppearing quickly.

Other electrical traders, too, expressed their sympathy with, and support of, the scheme. Attractive displays of fittings have been arranged by Woodhead Bros., in Church Street, who have placarded their windows with bills proclaiming "The Better Way—The Electric Way"; Smith Bros., High Street; and Ibbotson Bros., Effingham Square. The demand for Competition booklets is good at every one of these shops.

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IN LIGHTER VEIN.

Random Comments and Reflections on Electrical Topics.

THE advantages of the "all-in" tariff had been discussed with the householder. who had agreed to change over. The man arrived to change the meter, and in response to a request from the lady of the house, explained that she would now get current for ¾d. per kWh, plus a small standing charge, to which she replied "But we must have the best quality, and I like the 5½d. kind!"

* * *

This calls to mind an incident in a discussion which actually took place in the House of Commons some time ago. The member who was "fathering" an Electricity Bill, in response to a question from the opposition on the quality (*sic*) of the electricity supplied by the particular company, said: "Not being an expert I am unable to give an exact comparison, but I understand that a very high quality is maintained, equal at least to that supplied by the —— company!"

* * *

Mr. Volt and Miss Amp, who have appeared before in these columns, have swelled visibly since the announcement of the E.D.A.-E.L.M.A. Campaign and are pleased with the interest that is being taken in them. They are following the Campaign with interest and expect a heavy season. They have just returned from a stay in the country and have taken up their headquarters in town with Miss Edie Hay and Elmer L. Bu Rowe.

Unfortunately, Miss Amp caught a chill while travelling on the overhead, as the conductor failed to provide her with a wrap and she is at present confined to conduit. It is hoped that she will be fit again shortly and able to accompany Mr. Volt on his tour of the circuit on his extension of boundary and new housing campaign.

* * *

One of the "Facts" given in the E.D.A. booklet on home lighting:—

(2) That a bedroom can be lighted for an hour for less than the cost of two hairpins.

This will no doubt prompt the younger generation to ask: "What is a hairpin?"; and no doubt the ladies will have forgotten how much a hairpin does cost. Let us be up-to-date whatever happens. The following is suggested as an alternative treatment:—

(2) That a bedroom can be lighted for an hour every day for 12 months for less than it costs to have the hair waved, and an electric fire used for an hour per day for a month for less than the cost of a shampoo.

That an electric fire costs less than a permanent wave, lasts longer and costs less to maintain.

* * *

The illustration in the E.D.A. Leaflet (No. 1011) showing a row of candles and a penny, together with a remark on "light equivalent to 160 watts" prompts the query "What watt?" A little light on the subject seems indicated.

* * *

An engagement is announced between Miss Edie Hay, the only daughter of Mr. and Mrs. P. S. Hay, of the Savoy, Stranded, D.C.2, and Mr. Elmer L. Bu Rowe of the 1st Van Guards.

Mr. Bu Rowe is one of the Service Bu Rowe's and is a well-known man-about-town, having served in many campaigns.

The announcement does not come as a surprise, as their names have been associated for some time. It is rumoured that their honeymoon will be spent in exploring New Avenues, where Mr. Bu Rowe will find plenty of scope for his favourite pastime of pulling up trees.

* * *

We are informed on good authority that the title of the latest B.C.G.A. publication is "Shop Lighting by Gas," and *not* "Stop Lighting by Gas."

* * *

It can justly be said that in its short existence the B.B.C. has built up a vast business on sound lines.

* * *

Many an electrical engineer has shone as a dictator until he married his typist.

* * *

Mrs. Newly-wed (over the telephone to hubby): Oh, Jack, please come home at once; I've got the wires mixed in some way. The wireless set is smothered with icicles and the electric refrigerator is playing "Valencia."

TRADE PUBLICATIONS.

Details of Catalogues and Dealer-Helps Issued by Manufacturers.

A NEAT folder giving prices and other details of "Elasta" lamps for Brighter Homes is being sent out by Pope's Electric Lamp Co., Ltd., Elasta House, 5, Arthur Street, New Oxford Street, London, W.C.2.

Elliott Bros. (London), Ltd., Century Works, Lewisham, London, S.E.13, have recently issued pages 81-86 of Section A of their general catalogue, giving particulars of their new miniature series of moving coil type ammeters and volt-meters.

The Automatic Coil Winder and Electrical Equipment Co., Ltd., Wellington House, Buckingham Gate, London, S.W.1, will send on application copies of their latest booklet on the Macadie automatic coil winder, the Avometer, and the Slektun inductance coils.

The St. Helens Cable and Rubber Co., Ltd., Slough, has issued "C.T.S., mostly in Difficult Positions," containing a list of actual installations and explaining their difficulties, and "Wiring," giving further details and illustrations of C.T.S. installations.

Phillips and Turner, Cambridge Street, Birmingham, supply to factors their new "Business Getter" hanging card, which gives prices and other particulars of a wide range of electrical accessories and parts required by electric wiring contractors. Sheets, on which is printed the same list of items but without prices, are also supplied. It is suggested that the factor should fill in his own prices on these.

The Igranic Electric Co., Ltd., 149, Queen Victoria Street, London, E.C., is issuing to dealers a useful series of small cut-out standing show cards illustrating a shortwave coil, a triple honeycomb coil, Pacent jacks and plugs, filament rheostats, the superaudioformer, and a Pacent variable condenser; a folder containing descriptions and prices of various patterns of Igranic inductance coils (publication 6 231), a leaflet (No. 6 230) on the Igranic six-valve supersonic heterodyne receiver outfit; and a leaflet (No. 6 188) on the Igranic low loss dual variable condenser.

Lewcos multiway battery leads, connecting wire, frame aerial wire, Lewcords for headphones, loud speaker connections, etc., enamelled wire aerials, silk cotton and enamel insulated wire, multistrand h.f. Litz wire and Lewcoflex coloured rubber flexible are amongst the radio specialities mentioned on small leaflets which the London Electric Wire Co. and Smiths, Ltd., Playhouse Yard, Golden Lane, London, E.C.1, is distributing to dealers. Lewcos battery leads are about 5 ft. in length and consist of two large section v.i.r. conductors to be used for l.t. connections, together with a number of small v.i.r. flexible wires for connection to h.t. terminals and grid bias.

Wagner Electric Supplies, Ltd. (incorporating L. J. Wolf), 66, Victoria Street, Westminster, S.W.1, offers to send to those interested copies of their manual of Electrical Testing (Bulletin 138), which gives instructions for measuring the resistance of electric circuits for motor testing, obtaining excitation or magnetisation curves of a.c. generators, for synchronous impedance, load and temperature tests, d.c. motor or generator magnetisation tests, load, speed and temperature tests. Methods for ascertaining d.c. generator external characteristics are also explained, and directions are given for transformer, insulation, core loss, copper loss, polarity, winding, and ratio and temperature rise tests.

Points of View.

Interesting Pronouncements on a Variety of Topical Electrical Subjects.

AT present in Britain over 90 per cent. of the population live within the service area of some [broadcasting] station.—*Capt. P. Eckersley.*

* * *

In view of the Government's Electricity Bill this important question of high pressure transmission [of gas] must receive more attention in future.—*Mr. H. D. Madden.*

* * *

Electricity, at 20 000 V, now tests the timing of eight cams on the Model T Ford camshaft, not only more precisely than was possible by the former method, but seven times faster.—*Mr. Henry Ford.*

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THE E.P.E.A. DINNER.

"The Most Aristocratic of Trades Unions"—Conservation of Coal Resources—The Compensation Question—Service to the Community.

THE annual dinner of the Southern Division of the Electrical Power Engineers' Association to the members of the National Executive Council, was held last Saturday at the Hotel Cecil, London. The attendance was even larger than usual, and the company spent a most enjoyable evening.

The Government was represented by Lieut.-Col. J. T. C. Moore-Brabazon, M.P., Parliamentary Secretary to the Ministry of Transport, and the Electricity Commissioners by Mr. S. L. Pearce, while a number of chief engineers of electricity supply undertakings were also present.

In proposing the toast of "The Association," Col. Moore-Brabazon said that a few months ago he would have had grave doubts about proposing the toast of a trade union, but the E.P.E.A. was doubtless the most aristocratic of those bodies, and what it lacked in numbers it made up in quality. Everyone in the country owed a great debt of gratitude to the members of the Association for the way they had carried on during the general strike. In his position as Parliamentary Secretary to the Ministry of Transport he had during the past three months got to know a good deal, not only about the legislative side, but also about the technical side of the electrical industry. He realised that everyone was proud of his own generating station, but that attitude tended to a parochial outlook. For if the country was regarded as a whole, it was found to be highly industrialised, and should therefore be considered as one unit. That was what the Bill proposed to do, and the results must be advantageous.

When the new scheme was working, electrical development would be accelerated, and no one would benefit more than the members of the Association. The proposed grid would enable over 250 000 H.P. of water power which was now going to waste, to be harnessed, and the tides of the Severn which amounted to 300 000 H.P., might also be brought under contribution, while the harnessing of the wind was not outside the bounds of possibility. It was evident also that we were rapidly drawing to the end of the time when coal in the raw state, amounting to 8 000 000 tons per year, would be consumed in generating stations. As much as 15 gall. of oil could be extracted from a ton of coal, and at the present time all but 2 per cent. of the oil consumption of this country came from abroad. If 2 gall. of the motor spirit required could be extracted from each ton of coal raised, nearly one-quarter of the petrol consumption of this country could be met in that way.

Co-operating for Development.

In reply, Mr. A. J. Ostler, the president of the Association, said that Col. Moore-Brabazon's presence was a reminder to members that hearty co-operation between all parties in the supply industry was necessary to ensure the best results from any schemes for greater development which might be put forward. He did not know whether the anæsthetic of the financial provisions, the appeal machinery, or the compensation arrangements in the Bill were going to keep the patient sufficiently docile to ensure the success of its operation, but as president of an association whose members were in the position of the under-dog, he hoped that the treatment would be expeditious so that the period of convalescence might quickly be reached. He believed that the Association could assist very materially in securing beneficial results from the scheme, and that though some of its members might suffer temporarily, the industry was so progressive that there would be room for all. He hoped, therefore, that the Government would see that the minimum amount of inconvenience would be felt by the individual.

It had always passed his comprehension why so excellent a system as the Whitley scheme had not been more widely adopted. He asked for recognition for the E.P.E.A. because it was the voice of the technical staffs in the country who were mainly responsible for the efficient operation of the electricity supply industry. It was therefore capable of being of much greater use than it had been.

During the general strike the Association gained a great reputation for right thinking and correct action, simply because they, as a constitutional, non-political trade union engaged in a key industry had done their duty to their country. But any credit due to them was that which accrued to any body of men who tried to think and act straightly in times of crisis. The Association was a trade union where craftsmanship was paramount, and in the electrical age we were now entering, would be found supplying a body of men with right ideas of service to the community. Service was the very basis of the Association, and the spirit of brotherhood was developing between the technical staffs up and down the country, producing that community of interests which found expression in the more efficient working of the various undertakings, and keener interest in all supply problems.

Replying to the toast of "Our Guests," proposed by the chairman, Mr. A. H. Bennett, Dr. W. H. Eccles said that organisation had undoubtedly improved the status of the station engineer, and though future development might temporarily injure some of the members, he hoped that the demand for power would grow so rapidly that more members of the E.P.E.A. would be required.

During the course of the evening a presentation was made to Mr. R. R. Telfourd, immediate Past-President of the Association, and to Mrs. Telfourd.

Manchester Notes.

Electrical Industry's Part in Civic Week Celebrations

[FROM OUR OWN CORRESPONDENT.]

IN the Civic Week Celebrations great interest has been taken by all sections of the community, but so far as illuminations are concerned the trade is quite agreed that very little enterprise has been shown, and that in view of the offer of free current made by the Corporation more might have been done. From a very careful survey made I am bound to come to the same conclusion, but the unsettled industrial position and extreme depression in the cotton trade are undoubtedly responsible.

The flood-lighting of the Town Hall is very effective and has evoked favourable comment on all hands, and amongst the few shops which have done anything, Henry's, in Market Street, is looked upon as an excellent example of outline lighting. The illuminated tram car has caused much interest in its nightly tours of the city.

Power Station Visits.

On communicating with the Electricity Department I was informed that in two days no fewer than 450 permits to visit the Barton power station have been asked for by the general public and the interest shown may provide a guide to other towns which contemplate allowing their consumers to "see the works." No limit has yet been put on the number of visitors, but this may have to be done before the end of the week.

The Transport Parade took place last Saturday and included a tramway section comprising an old horse tram and a three-horse 'bus, the first electric tram and one of the very latest models, together with a skeleton car stripped in order that all working parts might be seen. On Wednesday and on Saturday of this week the Pageant of Industries will take place. The entry list has been closed for some time, and many leading electrical firms are taking part.

The system of automatic telephone working is being demonstrated in the York Street premises for the benefit of the citizens and visitors to Manchester. Permits may be obtained from the District Manager, P.O. Telephones, Peru Street, Salford.

In addition to the power stations at Barton and at Stuart Street and the various distributing stations, the tramcar sheds and repair works at Hyde Road are open to visitors.

Amongst other industrial processes the public will have an opportunity of seeing the automatic weighing and packeting of tea by electricity at Brook, Bond and Co.'s establishment; and at Rd. Johnson, Clapham and Morris's works in Trafford Park all the most modern electrical appliances for the economical and expeditious handling and stocking of all kinds of sheet metals and hardware will be freely open to public inspection.

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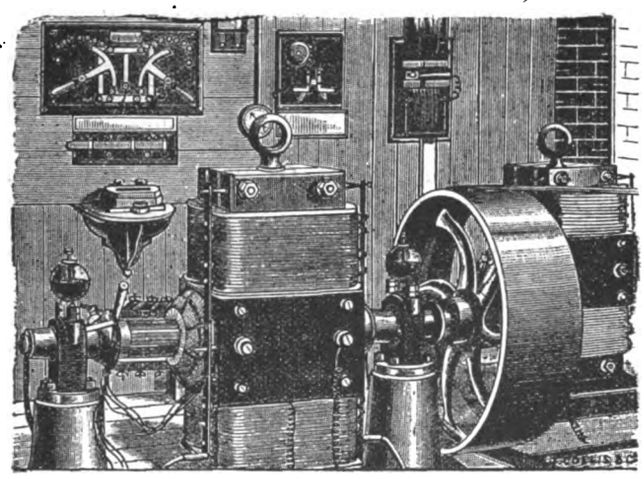
FORTY YEARS AGO.

Details of an Early Country House Wiring Installation.

CONSIDERABLE space was devoted in THE ELECTRICIAN on October 8th, 1886—exactly forty years ago—to a description of probably the first large country house lighting installation to be completed in this country—Wentworth Castle, near Barnsley. The installation for 500 lights was



Reproduction of a woodcut in "The Electrician" of October 8th, 1886, showing the dynamo room of an early country house lighting installation.

carried out by Mr. Wilson Hartnell, of Leeds. The reproduction of the dynamo room here reproduced from the original woodcut seems really antique, and the statement in the description of the lighting fittings at the Castle that "the glow lamp . . looks well when simply pendant from its own conducting wires" illustrates the enormous advance made in fittings design in forty years.

* * *

From the same issue of THE ELECTRICIAN we learn that:—A Walsall church was one of the first to have electric lighting, energy being supplied from the Cannock Chase Colliery.

* * *

Concealed ceiling lighting was adopted in the new premises of the Constitutional Club, London. The contractors were B. Verity and Sons, of Covent Garden.

* * *

The City and Guilds Old Students' Association held its first annual dinner, when the guests included Professors S. P. Thompson, J. Perry, Meldola and W. E. Ayrton.

SHOWROOM LIGHTING.

An Interesting Electrical Installation in the New Devonshire House.

IN the lighting of the new Citroën motor showrooms in Devonshire House, Piccadilly, London, which were opened to the public last Friday, great care has been taken to provide even, diffused and shadowless illumination, with fittings harmonising with the fine decoration of the interior.

The lighting fittings, some of which are illustrated below, were designed and supplied by Bagues, Ltd., and the installation was put in by Grierson, Ltd. The fittings which supply the general illumination have pure white alabaster bowls, and shadows from the numerous columns, which are a noticeable feature of the showrooms, are eliminated by wall fittings (seen in the pictures below) with light sources about 9 ft. above the floor level. Additional lighting below the balcony is provided by cleverly concealed cornice units with lamps in double holders spaced about 9 in. apart.

In the artificial lighting of the windows at the back of the showroom an imitation of natural sunlight is obtained by throwing the light away from the windows and having it reflected from a well, the walls of which are coloured so as to give the exact shade of lighting required.

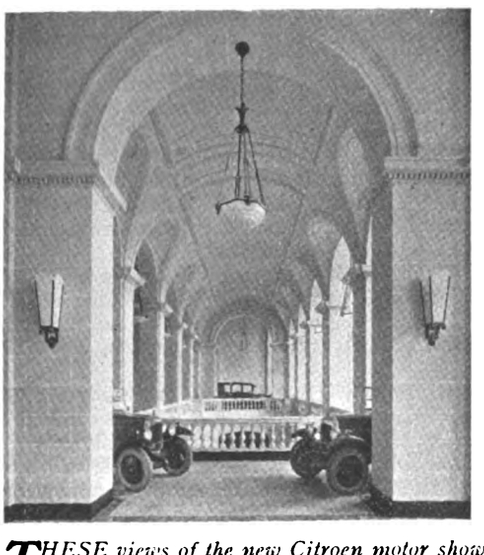
Along the exterior frontage there are four luminous signs by Voltalux, of Paris, which are the first of their kind to be installed in this country. Giving no evidence by day of their luminosity, the signs consist of box-shaped letters, each with a slot in the centre, the concealed tubular lamps being placed along each side of the slot. When they are lighted at night none of the framework is visible, and all that is seen is the reflected illumination.

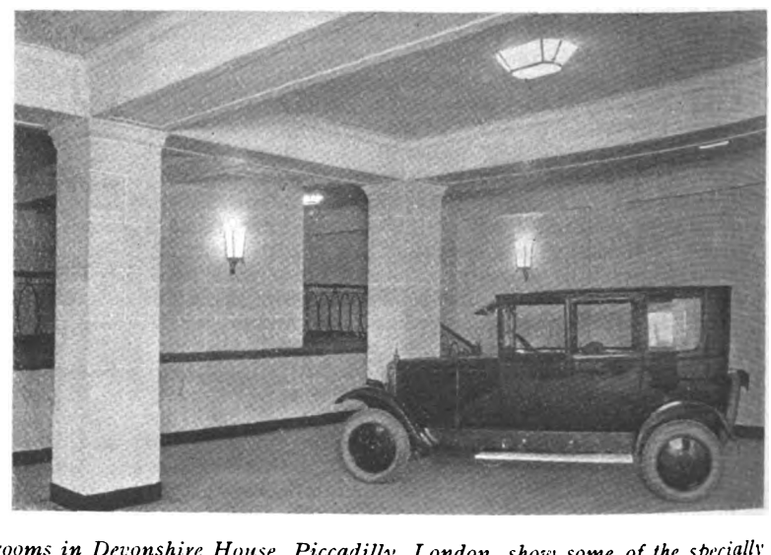
To clean the inside of the letters or to replace any of the tubular lamps, it is only necessary to take off the top of each letter, which comes away like an ordinary box, so that all lamps are immediately accessible.

Lighting Restrictions.

Further Criticism of Vague Operation of and Slight Saving under Regulations.

FURTHER criticism of the present lighting restrictions was offered by Mr. J. W. Beauchamp in an address to the Drapers' Chamber of Trade. At the present moment, so far as he could ascertain, the way in which the restrictions were being operated was extremely vague. He did not want to belittle the national emergency, but these regulations were very obnoxious, because in reducing electric light very little coal was saved. He thought the Drapers' Chamber of Trade might consider taking some concerted action.





THESE views of the new Citroen motor showrooms in Devonshire House, Piccadilly, London, show some of the specially designed lighting fittings, brief details of which are given above. The sales value of suitable lighting is frequently overlooked by motor car manufacturers, but in this case every advantage has been taken of the best modern lighting practice.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given.

MANCHESTER CORPORATION, October 8th.—Two 25 000 kVA three-phase transformers and one 1 250 kVA three-phase transformer (specification B.49); and one 100-ton electrically operated crane (specification B.50) for Barton power station. Specifications (deposit £2 2s. for each) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester.

WINGATE PARISH COUNCIL, October 9th.—Supply and erection of 14 30 ft. poles, with eight electric bracket lamps, at Trimdon. Specifications can be seen on application to Mr. W. Stoker, clerk, 7, Granville Terrace, Wheatley Hill, Trimdon, Durham.

LONDON COUNTY COUNCIL, October 11th.—Electrical installation at County Secondary School, Sutherland Grove, Southfields, Wandsworth. Specification from the Chief Engineer, Old County Hall, Spring Gardens, S.W.1; deposit £1.

MANCHESTER GUARDIANS, October 11th.—Twelve months' supply of electric lamps. Forms of tender from the Clerk, Union Offices, All Saints, Manchester.

THAME GUARDIANS, October 11th.—Electric lighting installation at the Institution. Specification and form of tender from the Master of the Institution.

BARNES URBAN DISTRICT COUNCIL, October 12th.—Supply and erection of one 40 000 lb. water-tube boiler, coal and ash handling plant, chimney, bunkers, etc. Specification, etc., from C. S. Davidson, Electricity Works, High Street, Mortlake, London, S.W.14; deposit £1 1s.

BIGGLESWADE URBAN DISTRICT COUNCIL, October 12th.—Electric light wiring of 90 houses in course of erection, and 52 existing houses at Townfield, Biggleswade. Specifications rom Mr. T. R. Howitt, surveyor, Biggleswade; deposit £1 1s.

MANCHESTER CORPORATION, October 12th.—Supply of tramway permanent way special track work. Specifications, etc., from Mr. Hy. Mattinson, general manager and chief engineer, 55, Piccadilly, Manchester; deposit £1 1s.

SHEFFIELD CORPORATION, October 14th.—Supply of one 10 000/12 500 kW turbo-alternator, to be erected at Neepsend generating station. Specifications and forms of tender from Mr. S. E. Fedden, general manager and engineer, Electric Supply Department, Commercial Street, Sheffield; deposit £2 2s.

DURHAM COUNTY COUNCIL, October 16th.—Electrical works in connection with the conversion of Earl's House School and other buildings into a tuberculosis hospital. Plans and specifications can be seen at the offices of M. and T. R. Milburn, 19, Fawcett Street, Sunderland; deposit £2 2s.

CARLISLE CORPORATION, October 18th.—Lagging steam piping at new electricity station. Specifications from Mr. C. W. Salt, city electrical engineer; deposit 10s. 6d.

DUBLIN COMMISSIONERS, October 18th.—Magazine flame arc lamps. Specification from the City Electrical Engineer, Fleet Street, Dublin.

DUBLIN BOROUGH COMMISSIONERS, October 18th.—Supply and erection of four water-tube boilers, with stokers, economisers, feed pumps and accessories, for the Electric Supply Department. Specification from the City Electrical Engineer, Fleet Street, Dublin; deposit £5 5s.

DUBLIN BOROUGH COMMISSIONERS, October 18th.—Supply and installation of a complete 5 000 kW generating set (including steam turbo-alternator and exciter, condensing plant, etc.), at the Pigeon House generating station. Specification, etc., from the City Electrical Engineer, Fleet Street, Dublin; deposit £3 3s.

EDINBURGH CORPORATION, October 18th.—Two motor-driven circulating water pumps, drainage pump valves and pipework for Portobello generating station. Specification from Mr. E. Seddon, Electricity Department, Dewar Place, Edinburgh; deposit £1 1s.

GLASGOW PARISH COUNCIL, October 19th.—Six months' supply of electric fittings. Form of tender (No. 62) from M. A. Reynard, inspector and clerk, 266, George Street, Glasgow, C.1.

WEST RIDING EDUCATION COMMITTEE, October 19th.—Electric light installation at Shellow New School, Owston. Specification from the Education Department, County Hall, Wakefield.

INDIA STORE DEPARTMENT, October 20th.—Supply of sub-station plant for Ridge Institute, Jubbulpore, including transformers, condensers, cables and ironclad draw-out truck type h.t. switchgear. Specification (5s.) from the Director-General, Belvedere Road, Lambeth, London, S.E.1.

ROCHDALE CORPORATION, October 20th.—Electric light and power installations to 128 houses on Albert Royds Street housing estate. Particulars from the Borough Surveyor, Town Hall, Rochdale.

ROCHDALE GUARDIANS, October 20th.—New electrical machinery and apparatus at the Poor Law Institution and Infirmary, Birch Hall, Dearnley, Littleborough. Specifications from Mr. I. Clegg, Union Offices, Townhead, Rochdale; deposit £2 2s.

IRISH FREE STATE COMMISSIONERS OF PUBLIC WORKS, October 22nd.—Extension of electric lighting installation at Ordnance Survey Office, Phœnix Park, Dublin. Specification from Mr. J. J. Healy, Secretary, Office of Public Works, Dublin; deposit £1.

STAFFORDSHIRE COUNTY EDUCATION COMMITTEE, October 23rd.—Electric wiring of Wolstanton Boys' New Secondary School. Specifications from Cramp and Frith, 33, Brazennose Street, Manchester; deposit £5 5s.

BARRY URBAN DISTRICT COUNCIL, October 25th.—Underground mains, sub-station, transformers and meters. Specification, etc., from Mr. T. Franklin, Gas and Water Offices, Barry, Glam., or from A. H. Seabrook and Partners, 146, Bishopsgate, London, E.C.2; deposit £3 3s.

BLACKROCK AND KINGSTOWN DRAINAGE BOARD, October 26th.—Supply and fixing of electrically driven pumping plant at the Eden Road pumping station, Dun Laoghaire. Specifications from Kaye Parry, Ross and Hendy, 48, Kildare Street, Dublin.

ILFORD URBAN DISTRICT COUNCIL, October 26th.—Supply and erection of one transformer kiosk, including transformer and switchgear, etc.; one switch kiosk, including switchgear, and l.t. (660 V) paper insulated cables. Specifications, etc., after October 8th, from Mr. Arthur H. Shaw, Electricity Works, Ilford.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

ANATOLIAN RAILWAY ADMINISTRATION, HAIDAR PACHA, October 9th.—Sand-blowing plant mounted on motor-driven truck on which is also to be mounted electric arc welding apparatus. October 11th.—Four wagon jacks and six jacks, electrically or hand operated.

AUCKLAND (N.Z.) ELECTRIC POWER BOARD, October 11th.—Ironclad switchgear and single phase transformers. (Reference B.X. 2 793.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, October 11th.—One d.c. generator and one internal combustion engine, for Helwan-les-Bains electric power station. (Reference B.X. 2 883.)

AUSTRALIAN POSTMASTER-GENERAL'S DEPARTMENT, October 12th.—Automatic telephone exchange equipment.

INDIAN STORES DEPARTMENT (ENGINEERING BRANCH), SIMLA, October 16th.—Supply of four electrically-driven horizontal centrifugal or turbine pumping sets, with transformers. (Order No. N/4 870.) (Reference A.X. 3 590.)

NEW PLYMOUTH (N.Z.) HARBOUR BOARD, October 16th.—Supply, delivery and erection of 30 cwt. portal electric horizontal luffing jib crane, fittings and accessories. (Reference A.X. 3 458.)

SYDNEY COUNCIL, October 18th.—Two 100 ton electrically-operated overhead travelling cranes. (Contract 1 033.) (Reference A.X. 3 467.)

CHRISTCHURCH (N.Z.) DRAINAGE BOARD, October 19th.—Supply and erection of three sets of electrical centrifugal pumping plants. (Contract 26 329.) (Reference A.X. 3 215.*)

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CAPE TOWN MUNICIPALITY, October 20th.—Motors and starting switchgear, for Brackenfel Quarry. (Reference B.X. 2 902.)

VICTORIAN RAILWAY COMMISSIONERS, October 20th.—Supply and delivery of rail motor equipment. (Contract No. 39 614.) (Reference A.X. 3 449.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Telephone plugs and sleeves. (Schedule C.120.) (Reference B.X. 2 799.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Lamps, lamp caps, and lamp sockets. (Schedule C.124.) (Reference B.X. 2 800.)

SYDNEY ELECTRICITY DEPARTMENT, November 1st.—Supply, delivery, erection, setting to work, testing and maintenance at Bunnerong power station of boiler feed pumps. (Reference A.X. 3 470.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Supply of 110 000 V transformers for Waikaremoana power scheme (section 17). (Reference B.X. 2 744.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Indoor control gear and switchgear for Waikaremoana electric power development (section 14). (Reference B.X. 2 675).

CAPE TOWN MUNICIPALITY, November 3rd.—Two automatically-controlled, electrically-driven sewage pumps, etc. (Reference A.X. 3 617.)

VICTORIAN RAILWAY COMMISSIONERS, November 3rd.—Supply of 77 miles of seven-strand h.d. copper cable.

VICTORIA RAILWAY COMMISSIONERS, November 3rd.—Pole changing transformer (contract 39 822). (Reference B.X. 2 915.) Pole transformers (contract 39 823). (Reference B.X. 2 914.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE.—November 4th.—Supply of primary battery material. Reference B.X. 2,900.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 4th.—Supply of one electrically-operated 40-ton goliath crane. (Reference A X 3 657 *)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, November 8th —Diaphragms, cords, etc. (Reference B.X, 2 860)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th —Telephone transformers. (Reference B.X. 2 797.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone protective apparatus. (Reference B.X. 840.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, November 10th.—Supply and erection of steam turbine-driven centrifugal boiler-feed pump. (Contract No. 770.) (Reference A.X. 3 534.) Supply and erection of motor-driven centrifugal boiler-feed pump. (Contract No. 771.) (Reference A.X. 3 536.)

SYDNEY CITY COUNCIL, November 15th.—Supply of 33 000 V cable and pilot cable. Specification (No. 1 047) from the Constructional Engineer, Electricity Department, Town Hall, Sydney.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 16th.—Supply of timing clocks for indicating the duration of telephone trunk line calls. (Reference B.X. 2 827.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 23rd.—Lightning arresters and transformers. (Reference B.X. 2 792.)

PORT ELIZABETH MUNICIPALITY, November 25th.—Supply and erection of duplicate electrically-driven automatic float controlled centrifugal sewage pumps, etc. (contract 24, Mill Park). (Reference A.X. 3 680*.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 26th.—Primary battery material.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 30th.—Supply of 110 kW transformers. (Reference B.X. 2 874.)

SOUTHLAND ELECTRIC POWER BOARD, INVERCARGILL, N.Z., December 1st.—Supply of a 3 000 H.P. horizontal Francis turbine and 2 350 kW generator. (Reference B.X. 2 822.)

VICTORIAN RAILWAY COMMISSIONERS, December 1st.—Rotary converter or rectifier set, with switching equipment for its automatic operation.

STATE ELECTRICITY WORKS, MONTEVIDEO, December 6th.—Diesel-electric generating sets.

NEW ZEALAND GOVERNMENT RAILWAYS, DECEMBER 10th.—Electric motors. (Reference B.X. 2 861.)

VICTORIAN ELECTRICITY COMMISSION, December 15th.—Water tube boiler, with superheater, economiser, etc., for Yallourn power scheme. Specification (No. 28/82), from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.2; deposit £3 3s.

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 1st.—Supply and erection, at site of Seru pumping and power station, of four Diesel engine alternator groups, three pumps and accessories. Specification (10s. 6d.) from Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 4th.—Supply of switchgear and transformers for Waikaremoana electric power scheme. (Reference B.X. 2 872.)

Tenders Accepted.

BRIGHTON GUARDIANS.—H. J. Galliers, electrical fittings, £382 10s. 7d.

KILMALLIE PARISH COUNCIL.—D. Bryce, electric lighting work in new hostel at Fort William.

H.M. DOCKYARD, PORTSMOUTH.—Electric Furnace Co., Ltd., 3-ton Héroult electric furnace.

ABERDEEN EDUCATION AUTHORITY.—A. McRobb, electrical work in Intermediate School at Torry, £601.

HAWKHURST PARISH COUNCIL.—Weald Electricity Supply Co., public electric lighting for seven years.

CHIPPING NORTON CORPORATION.—Chipping Norton Electric Supply Co., public lighting, £297 3s. per annum.

INDIAN STORES DEPARTMENT.—General Electric Co. (India), Ltd., ceiling fans, R. 5 434, and generator, £1 216.

STAINES GUARDIANS.—J. Cooksey, electric light installation in part of the Infirmary, London Road, Ashford, £42 10s.

GLASGOW CORPORATION.—J. Laird and Co., Electric lighting work of pavilions at Bellefield Sanatorium, £692 14s. 8½d.

WINGHAM PARISH CHURCH.—H. M. Bigglestone and Sons, electric light installation, including engine, dynamo, etc.

RUGBY GUARDIANS.—Rugby Electrical Engineering Co., installation of 12 electric irons in the institution laundry, £59 15s.

GUILDFORD CORPORATION.—C. A. Parsons and Co., Ltd., the provision and equipment of a new generating station, £130 874.

FAILSWORTH URBAN DISTRICT COUNCIL.—Moston Brick and Building Co., Ltd., electric light installation at 40 houses in Lord Lane.

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY.—Fuller's United Electric Works, Ltd., 17 400 plates for train lighting accumulators.

LANARKSHIRE COUNTY COUNCIL.—Johnston Park and Co., electric light installation at Roadmeetings Hospital, Carluke, £1 381 10s. 6d.

SALFORD CORPORATION.—Tudor Accumulator Co., Ltd., cleaning No. 3 battery at Frederick Road power station, £204 net (estimated).

MAIDSTONE CORPORATION.—Brush Electrical Engineering Co., Ltd., 5 600 kW Ljungstrom turbine, with accessories, £23 046 (recommended).

NORTHFLEET URBAN DISTRICT COUNCIL.—British Electrical Installations Co., wiring 88 houses for electric light, £32 9s. per block of four houses.

STIRLING CORPORATION.—Lockhead and Macnab, electrical work in 11 houses and four shops on the St. Mary's Wynd housing site, £109 13s. 1d.

GRIMSBY CORPORATION.—Sir Wm. Arrol and Sons, erection of electrically operated gates and barriers at the new bridge in Corporation Road, £1 359 15s.

NEW SOUTH WALES DEPARTMENT OF WORKS.—Metropolitan-Vickers Electrical Co., Ltd., (Sydney) 19-panel main switchboard for General Post Office, £1 456 15s.

THURSTONLAND AND TYAS URBAN DISTRICT COUNCIL.—Smith and Hargreaves, electrical installation work in 16 dwelling houses in Stocksmoor Lane, Thurstonland.

SALFORD CORPORATION.—Metropolitan-Vickers Electrical Co., Ltd., supply and erection of equipment for new 6 600 V feeder from Agecroft power station to Prestwich, £565 (recommended).

GLASGOW CORPORATION.—J. Brash and Co., main supply cables at Mearnskirk Sanatorium, £2 439 6s. 6d.; Kennedy, Stark and Co., electric lighting, bells and fire alarms, £1 880 3s. 8d.

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GLASGOW CORPORATION.—Standard Telephones and Cables, Ltd., lead-covered cable, Richard Johnson and Nephew, Ltd. and Siemens Bros. and Co., Ltd., double concentric wire; Birkbys, Ltd., and British Insulated Cables, Ltd., insulated bolts.

NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMWAYS.—Electrical Plant Manufacturers, Ltd., two 250 kVA single phase transformers, £429 18s.; Metropolitan-Vickers Electrical Co., Ltd., electric equipments for 101 motor and 101 trailer railway cars, £313 555.

STOKE-ON-TRENT CORPORATION. — Metropolitan-Vickers Electrical Co., Ltd., 10 000 kW turbo-alternator, condensing plant and auxiliaries, £41 904 15s.; Davenport Engineering Co., Ltd., cooling tower, £6 596 15s.; A. Reyrolle and Co., Ltd., switchgear, £2 570 15s. (all recommended).

MARYLEBONE (LONDON) BOROUGH COUNCIL.—Ridout and Ratcliff, Ltd., electric wiring of tenements in Ashland House, and H. J. Cash and Co., Ltd., electric wiring of tenements in Berkeley Buildings (both recommended). The Electric Supply Committee recommends that the Council's resolution of June 17th to accept the tender of London and South Wales Electric Engineers, Ltd., for these works be not proceeded with.

NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMWAYS.—Electric Plant Manufacturers, Ltd., two transformers and spares, £1 091; Australian General Electric Co., Ltd., eight 1 500 kW rotary converters, switchgear, transformers, etc., for sub-stations, £44 063 15s.; A. Snashall, two jet condensing plants for Lithgow power station, £3 374 5s.; G. Battle and Co., Ltd., 10-ton electric overhead travelling crane, £1 774 8s.

COVENTRY CORPORATION.—British Thomson-Houston Co., Ltd., initial installation for new electricity power station, including two 2-cylinder turbines, running at 3 000 revs. per min., designed for 325 lb. gauge pressure and 700 deg. F. temperature, coupled to alternators each having a rating of 23 400 kVA, 6 600 V, three-phase. The station is ultimately to contain five or six 18 750 kW continuous-maximum rated turbo-alternator sets, with step-up transformers, switchgear, boiler house equipment, coal and ash-handling plant. etc. The amount of the initial contract is £510 848.

CROYDON CORPORATION.—S. Butler and Co., electrically-driven coal-handling crane, £1 243 15s.; also tendered: Taylor and Hubbard, Ltd., £1 286; Bedford Engineering Co., £1 475; T. Smith and Son, Ltd., £1 565; T. Broadbent and Sons, Ltd., £1 625; Babcock and Wilcox, Ltd., £1 855; Stothert and Pitt, Ltd., £1 862; J. M. Henderson and Co., £1 875; Sir W. Arrol and Co., Ltd., £1 890; Butters Bros. and Co., £1 985; J. Carrick and Sons, Ltd., £2 070; R. H. Neal and Co., Ltd., (Austin Construction Co.), electric crane track, £349 15s.; also tendered: J. Booth and Bros., Ltd., £475; Bedford Engineering Co., £480; R. W. Blackwell and Co., £619 12s.

BARKING TOWN URBAN DISTRICT COUNCIL.—Power and Lighting Cables, Ltd. (Deutsche Kabelwerke A.-G.), supply of 2 680 yds. of l.t. cable, £1 481 15s. (recommended). Also tendered: Hogan and Wardrop, £1 496 6s. 8d.; Magna Wire and Cable Co., Ltd., £1,539; Hackbridge Cable Co., Ltd., £2 010; Ateliers de Constructions Electriques de Charleroi, £2 023 8s.; Enfield Cable Works, Ltd., £2 060; Callender's Cable and Construction Co., Ltd., £2 060 15s.; Siemens Bros. and Co., Ltd., £2 061; W. T. Henley's Telegraph Works Co., Ltd., £2 063 12s.; Standard Telephones and Cables, Ltd., £2 063 12s.; British Insulated Cables, Ltd., £2 065; Union Cable Co., Ltd., £2 070; Johnson and Phillips, Ltd., £2 073; Pirelli-General Cable Works, Ltd., £2 090 8s.

Work in Prospect.

Trade Possibilities for Electrical Installation Contractors.

BLACK NOTLEY.—King Edward VII Memorial Hall Sanatorium. Particulars, the county architect, Mr. J. Stuart, Springfield Old Court, Chelmsford.

BRENT KNOLL (SOMERSET).—Parish hall. Particulars, the Rev. A. C. Schofield.

BURSTOW (SURREY).—Village hall, Copthorne Bank. Particulars, the Secretary, Copthorne Village Club and Institute.

BUSHEY.—Houses (20), Clapgate estate. Particulars, the contractors, Lockwood and Thornton.

CANNOCK.—Housing scheme (39), St. John's Road. Particulars, the Surveyor.

CHAILEY (SUSSEX).—Additional housing schemes (115). Particulars, the Surveyor.

CUMNOCK (AYRSHIRE). — Housing scheme (52). Particulars, the Burgh Surveyor.

EAST HAM, E.—Roman Catholic presbytery and parish hall, Green Street (about £4 000). Particulars, the Priest-in-charge.

EATON BRAY (BEDS.).—Houses. Particulars, the contractor, Mr. A. H. Gates, Linslade.

FECKENHAM.—Housing scheme (26). Particulars, the architect, Mr. Earp.

KETTERING.—Church school (£8 000), Oakley Street, for Fuller Baptist Church. Particulars, Rev. C. B. Ellis.

MACCLESFIELD.—Extensions to Guardians' institution. Particulars, the contractors, Cooper Bros., Catherine Street.

MARGATE.—Schools (300 places), Garlinge. Particulars from the clerk to the Education Committee. Houses (22), Invicta Road, for Wood and Co. (Margate), Ltd.

MARGATE.—Additional 78 houses, Dane Valley Estate. Particulars, the Borough Surveyor.

MARKET DRAYTON.—Picture-house, for Mr. Markham, proprietor of Ye Olde Wyche Theatre.

MOLD.—Houses (58), Maesy Avenue. Particulars, the contractors, H. G. Jones, Ltd., Bromborough.

NORTHAMPTON.—Police office, tramway shelter, and public lavatories. Particulars, the borough engineer, Mr. Alfred Fidler.

POOLE.—Additional 40 houses, Granville Road. Particulars the Borough Surveyor.—Housing scheme. Particulars, the contractors, Dacombe and Rabbetts.

PURLEY (SURREY).—Extensions to War Memorial Hospital (over £18 000). Particulars, the Secretary.

REIGATE.—Almshouses, Deerings Road. Particulars, the architect, Mr. C. E. Salmon.

REIGATE.—Houses, Kingswood. Particulars, the contractor, Mr. P. S. Frampton.

RICKMANSWORTH.—Cinema theatre. Particulars, the architect, Mr. Howard Greeborn, of Messrs. Morlands.

ROCHESTER.—Business premises, High Street and Star Hill, for Mr. E. Basset Willis. Church hall, Frindsbury Road, Strood, for Roman Catholic church.

UPMINSTER.—Schools, for Essex Education Committee. Particulars, the Director of Education, Chelmsford.

WESTHAMPNETT (SUSSEX).—Houses. Particulars, the contractors, Sadler and Co. (16, West West Wittering) and Alec Hooker and Son (6, West Stoke).

Rumours Confirmed.

Appointment of Successor to Mr. S. L. Pearce on Electricity Commission.

AS exclusively foreshadowed in THE ELECTRICIAN last week important changes have been made in the Electricity Commission, and are now officially announced by the Minister of Transport.

This announcement states that Mr. S. L. Pearce, having been offered the position of engineer-in-chief to the London Power Co. consequent upon the retirement of Sir Alexander Kennedy, F.R.S., has decided to accept that position. He has therefore tendered his resignation as a member of the Electricity Commission.

The Minister of Transport has invited Mr. T. P. Wilmshurst, at present electrical and tramways engineer to the County Borough of Derby, and chairman of the Engineering Consultative Committee of the East Midlands Advisory Board, to become an Electricity Commissioner, and Mr. Wilmshurst has accepted the appointment.

It has been arranged for the changes to take place on November 1st.

Mr. Pearce, while still consulting and chief engineer and general manager of the Manchester Corporation Electricity Department, was appointed as a member of the Advisory Expert Committee set up at the request of Lord Weir to review the technical scheme prepared by Sir John Snell for the Weir Committee. Subsequently, on the retirement of Mr. Page, he was appointed to be one of the Electricity Commissioners, and in both capacities he has rendered valuable service in connection with the preparation, Committee and Report Stages of the Electricity Bill now before Parliament.

Details of the career of Mr. T. P. Wilmshurst, the new Commissioner were given in THE ELECTRICIAN last week, together with a recent snapshot of Mr. Wilmshurst.

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ELECTRICITY SUPPLY.

Many Increases in Charges Owing to Coal Stoppage—Barnsley's Hired Wiring System—Plymouth Plant Loan Sanctioned.

WINCHESTER Corporation has increased the charges for electricity by 7½ per cent.

Hoylake and West Kirby U.D.C. is advancing the charges for current from 6½d. to 7d. per kWh.

High Wycombe Electric Light and Power Co., Ltd., has increased its charges by ½d. per kWh.

The profit on the Burnley Electricity Department during the year ended March last was £42 143.

Bath Corporation is adding 10 per cent. to the present charge for electricity for power purposes.

Colwyn Bay U.D.C. has decided to reduce the charge for electricity for lighting from 6d. to 5d. per kWh.

Cheadle and Gatley U.D.C. is increasing the charge for electricity for domestic lighting from 6d. to 8d. per kWh.

At Eastbourne 66 electric cookers (428 kW) were connected to the Corporation mains during the year ended March last.

The Reading Electric Supply Co., Ltd., has increased its prices by 10 per cent. in consequence of the increased cost of coal.

Northampton Electric Light and Power Co. has made a temporary surcharge of 10 per cent. on the charges for electricity.

Order Applications Withdrawn.

The Gwynedd Trust has withdrawn its applications for Special Orders for the supply of electricity in Portmadoc and Criccieth.

Blackburn Electricity Committee has decided temporarily to increase the price of electricity for lighting and heating by 10 per cent.

Callender's Cable and Construction Co., Ltd., has increased the price of electricity in Surbiton for power and heating by ½d. per kWh.

The ratepayers of Stalmire, near Blackpool, last week vetoed a proposal for the preparation of an electricity scheme for the district.

Thornton Electricity Council intends to seek further borrowing powers to permit of the extension of the present electricity undertaking.

Newhaven U.D.C. has decided to offer no objection to the erection of a generating station at the junction of Grove Road and New Road, by Crompton and Co., Ltd.

Thatcham (Berks) P.C. has decided to change from gas to electricity for street lighting, and the Thatcham Electric Light Co. is to provide 24 lamps at a cost of £42.

Bury T.C. has temporarily increased the charges for electricity for lighting by 10 per cent. and for power by 15 per cent., and the question is to be reconsidered in December.

Barnsley T.C. has adopted a hired wiring system for cottage property, and has applied to the Electricity Commissioners for a loan of £5 000 to cover the cost of wiring the first houses under the scheme.

Thornton-le-Fylde U.D.C. has applied for loans of £10 000 for mains and services, £2 000 for meters, £600 for overhead cables for the Little Thornton area, and also a sum for the purchase of land and erection of kiosks.

Preston Electricity Committee recommends that the domestic tariff be revised so as to provide for the payment of 20 per cent. on the rateable value in cases of houses rated up to £40 per annum, with an additional 5 per cent. over £40.

Morecambe's Electricity Scheme.

Morecambe T.C. has been informed that the Unemployment Grants Council are unable to make a contribution towards the cost of the electricity scheme. The Electricity Commissioners have sanctioned the borrowing of £10 000 for mains and plant.

York Corporation has received from the Electricity Commissioners sanction to a loan of £3 777 for mains and services, in respect of expenditure previous to March 31st last, and to a further sum of £16 000 for mains and services for a future period.

At Sheffield the price for electricity hitherto charged at 2d. per kWh or under (including traction) has just been increased from 10 to 30 per cent. on the basic rate, and the charges over 2d. are increased from 5 to 15 per cent. on the basic rate.

Mr. J. A. Bell, City Electrical Engineer, has submitted to Aberdeen P.C. a report on the wiring of Oldmill Hospital. Hitherto the hospital has generated its own electricity, but the scheme submitted now recommends that the supply be taken from the Corporation.

Preston Electricity Department has reported that it is still buying English coal at 30s. a ton, as it is not necessary, with the Corporation's modern electrical plant, to buy the best quality. Consequently, charges for electricity have not yet had to be increased.

The Electricity Commissioners have informed Wellingborough R.D.C. that the Ministry of Transport has consented to the use of overhead lines at Earl's Barton, for the supply of electricity by the Northampton Electric Light and Power Co. The Council had opposed the use of overhead mains.

The County of London Electric Supply Co. announces that the reduction of 10 per cent. in the percentage increases of charges for electricity which came into operation at the end of March is withdrawn, and the rates will be those in force up to last March. It is hoped that this will be only a temporary measure.

Fylde Guardians are again considering the question of installing electricity in Kirkham Institution. Six years ago tenders were received for the work, and the firms are being asked to quote again, basing figures on current prices, the supply to be obtained from outside sources, and alternately for generating plant to be installed.

Dufftown (Banffshire) T.C. has sent out a statement to the ratepayers regarding the proposed electric lighting scheme. The view is expressed that if it can be done without placing undue burdens on the ratepayers, the introduction of electricity into the burgh ought to be proceeded with. The estimated cost of the scheme is £5 500.

The Electricity Commissioners have authorised Plymouth Corporation to borrow £18 183 for the purchase of new electrical plant. This sanction relates to part of a scheme for modernising the electricity undertaking, at a cost of £169 000. Cable extensions to a large number of new points have been decided upon by the Electricity Committee.

A Supply for Mold.

Mr. S. E. Britton recently attended a meeting of Mold U.D.C., and advised the Council on several matters relating to its electricity supply scheme, including the method of obtaining a Fringe Order, the appointment of a manager of the undertaking, etc. The question of laying cables outside the compulsory area was referred to the chairman, the surveyor and Mr. Britton.

The directors of the Uxbridge and District Electric Supply Co., Ltd., have decided that after December next the following shall be the only rates available for domestic supply: (*a*) flat rate of 8d. per kWh for all purposes; (*b*) 4s. in the £ payable quarterly on the net rateable value of premises in Buckinghamshire and 4s. 6d. in Middlesex, plus 1½d. per kWh, for all purposes, minimum 13s. 4d. per quarter.

Seaton P.C. has received from the Rural District Council's surveyor estimates for three schemes of electric lighting for the parish. If underground mains are used the cost is put at £6 463, and for the other two schemes, for overhead lines, the respective estimates are £5 644 and £3 992. The scheme recommended is the £5 644 one, and it assumes that electricity could be purchased from the colliery at 1d. per kWh and sold at 5d.

Maidenhead Electric Lighting Committee is offering the following rate to ordinary consumers as an alternative to the ordinary flat rate: A fixed annual charge equivalent to one-sixth of rateable value of premises, plus 1½d. per kWh, with an increase, in the case of premises outside the borough, of 10 per cent. on the secondary charge for each two-thirds or part of two-thirds of a mile distance from the borough boundary.

As a result of the increased price of coal, Stoke Newington (London) Electricity Committee recommends increases of charges for energy for lighting from 4½d. to 5d. per kWh, for power (scale C) from 4d. and 1d. to 4½d. and 1½d., and (scale E) from 2d. per kWh for first 5 000 per annum, 1½d. for next 5 000, and 1d. for all in excess, to 2½d., 2d. and 1½d., respectively, domestic rate from 1d. to 1½d., and public lighting by 10 per cent.

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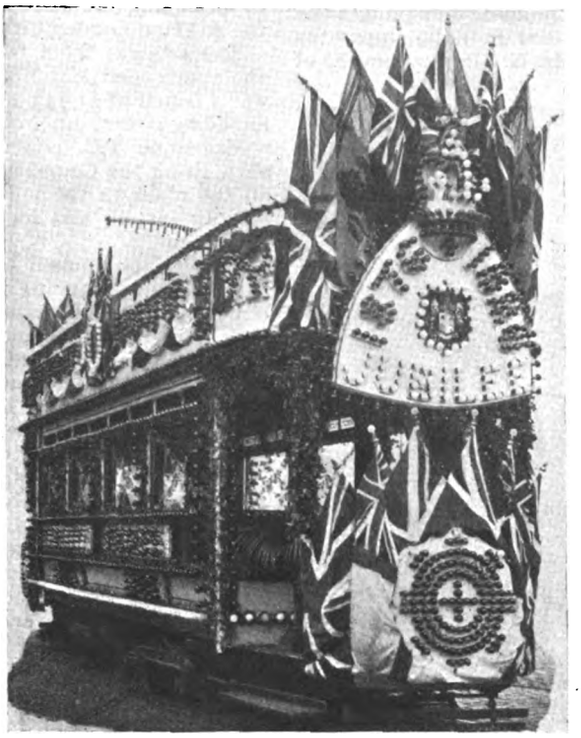
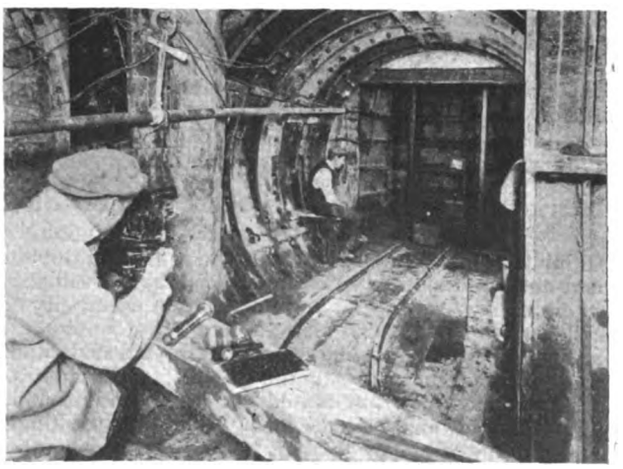
NEWS IN PICTURES

Mr. Z. E. Knapp, whose death is announced on page 423, had for many years been associated with the London "Underground" electric railways, and; as director of construction, was mainly responsible for the construction of many of their extensions, including the recently opened one to Morden. He was 59 years old.



The illuminated tramcar, which proved a popular sight during the Jubilee celebrations at Bury.

Mr. S. L. Pearce, who, as stated on page 431, has resigned from the Electricity Commission to become chief engineer of the London Power Co. The first public intimation of the impending change, which involves the appointment of Mr. T. P. Wilmshurst as a Commissioner, was made in THE ELECTRICIAN last week.



Two interesting pictures showing how a tube railway is constructed, and taken during recent extensions on the London "Underground" system. The first illustration shows the outer survey. From these surface lines the centre lines of the tunnels are calculated. The other photo shows the transference of the centre line below ground; the engineer in the heading is getting his theodolite in line with the two plumb lines in the base of the service shaft.

The first monthly report on the operation of the Thornton electricity undertaking states that 274 lighting, 6 power (industrial), and 20 heating (domestic) consumers had been connected since the supply was started a month ago. The Council has applied for sanction to borrow £10 000 for mains and services, £2 000 for meters, a sum sufficient to cover the purchase of land, and £600 for overhead cables for the Little Thornton area.

The House of Commons has approved Electricity Supply Special Orders in respect to (1) Plympton St. Mary rural district; (2) parts of Conway and Glan Conway rural districts; (3) part of Keighley rural district; (4) Swadlincote urban district and parts of Repton, Hartshorne and Seals and Tutbury rural districts; (5) parts of East Preston, Thakeham and Steyning West rural districts; (6) part of Long Eaton urban district and part of Stapleford rural district; (7) Seaford and Newhaven urban districts and part of Newhaven rural district.

The accounts of the Melbourne Electricity Department for 1925 show that electricity sold was 64 050 044 kWh, a decrease of 1 441 764 kWh compared with the previous year, due to the further transfer of bulk supplies in accordance with the arrangement made with the Electricity Commission of Victoria. The year's revenue was £472 782, increase £14 475, gross profit was £194 357, increase £17 676, and net profit £25 000 available for transfer to Town Fund. Average revenue per kWh 1·73d., against 1·679d. Total working expenses per kWh generated or purchased were 0·976d., against 0·970d., and the total cost, including capital charges, public lamps, etc., was 1·496d., against 1·435d.

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WIRELESS NEWS.

New Irish Radio Traders' Association Registered.

THE Irish Radio Traders' Association has been registered in Dublin as a company limited by guarantee, without share capital, and its objects are to promote and protect the interests of manufacturers and dealers in radio apparatus and parts. The directors include Mr. G. Darnley Smith, of Marconi (Ireland), Ltd., Mr. C. M. D. Lonsdale, of Houghton-Butcher (Great Britain), Ltd., Mr. F. J. Sweetman, of B.N.B. Wireless, Ltd., Mr. G. A. Pemberton, of Brown Brothers (Ireland), Ltd., Mr. J. H. Patton, of Huet Bros., Mr. E. Hart, of the Chloride Electrical Storage Co., Ltd., and Mr. J. P. Digby.

A novel set at the World's Radio Show, New York. A loud speaker is housed on the second floor of the "building."

Rumours that the Earl of Clarendon is to be the chairman of the new British Broadcasting Corporation are so far unconfirmed.

Electrical Progress in Ulster.

Electricity Commissioners' Report Deals with Problem of Demand.

THE Ministry of Commerce of the Northern Ireland Government and the Electricity Commissioners have issued their report on the extension and development of electricity in Ulster during the year ended March last.

Comparing Ulster's problem with that of Great Britain, the report states that by far the greatest proportion of electricity supplied in Ulster is sold by Belfast and Londonderry Corporations, and that the main elements of the Ulster problem lie at present, not in supply, but in demand; in other words, the provision of high-tension transmission lines upon a sound economic basis is contingent upon an adequate load, either actual or prospective, to justify the capital cost involved in their erection. The Commissioners, in considering proposals for new electricity undertakings in Ulster, are insisting in general upon a standardised system which can be easily linked up with any general scheme of distribution which may be developed in the future. During the year consent was given to the erection of new generating stations at Coleraine, Cookstown, Rathfriland, Aughnacloy and Ahoghill, while Portaferry and Portstewart received authority to instal new generating plant. The Ministry confirmed Special Orders made by the Commissioners to the Enniskillen Electric Light and Power Co. for supplying the urban district of Enniskillen and parts of the adjoining rural district; to the Portadown Electrical Co., Ltd., for the Urban District of Portadown, and to the Coleraine Urban District Council for the Urban District of Coleraine and parts of the adjoining rural district.

The growth of the Belfast undertaking involves additional capital expenditure, and the report records the granting of powers to the Corporation to borrow £177 912.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

MIDDLESBROUGH Tramways Committee has asked the tramways manager to report as to the advisability of extending the Linthorpe tramway service so as to serve the Ackland Garden City.

The revenue from the Salford tramways undertaking in the year ended March last was £526 802, and the net result was a deficit of £1 757. Working expenses per tram car mile, including power, amounted to 14·957d.

Maidstone T.C. is recommended to apply for an Order authorising the Council to run trackless trolley vehicles over all the roads in the borough at present served by the light railway system and for a loan of £21 200 for vehicles and equipment.

Exeter City Council has decided to proceed with the preliminaries necessary to an extension of the tramways to the city boundary at Whipton, but the actual extension will depend on a vote of the Council when the estimates are discussed. It has also been decided to double the track from Hamsfield Place to Church Street, at an estimated cost of £1 620.

Electric services have been restored on the Southern Railway Co.'s South London line, which covers the district between London Bridge and Victoria, via East Brixton, Denmark Hill, Peckham Rye, etc., giving four trains per hour in each direction. The East Brixton, Clapham, and Wandsworth Road stations, which have been closed for some months, owing to the coal dispute, have been reopened.

New type tramcars, designed by Mr. P. Priestly, the general manager, and just taken into service on the Liverpool tramways, have transverse seating inside as well as on top; leather upholstery and improved ventilation. They have also sliding axles to facilitate the turning of sharp corners. There is accommodation for 48 passengers on the upper deck and 34 on the lower, compared with a total of 62 on the old cars.

There are now running daily on the London United Tramways 30 new tramcars of the improved type which was introduced on the Uxbridge Road in June last. These cars are equipped with comfortably upholstered seats—both longitudinal and transverse—increased lighting, a brighter scheme of decoration, higher speed motors and other improvements. The company is now engaged in constructing an entirely new tramcar which will be a still further advance on the reconditioned cars mentioned above.

The illuminated tramcar used for Manchester Civic Week Celebrations.

The new system of day and night green and red light signalling has been put into operation at the Belfast terminus of the L.M. & S. Railway. One signal takes the place of five old signals (one for each platform) but under the new arrangement an illuminated figure indicates the platform to which a train is to proceed. Each signal changes to "danger" as soon as a train clears the section in which the signal is situated. In the signal cabin an illuminated chart shows the presence of a train in any section by the extinction of lamps. An independent electric generating plant has been installed and can be used in case of failure of the Corporation's supply.

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COMPANY NEWS.

More Movement in Electrical Share Prices—Rise in London Supply Companies' Quotations—Venezuela Telephone Sale Approved.

A FAIR number of changes are shown by our table this week of prices of electrical shares. In the supply section, rises of ½ and ¼ respectively have taken place in the £5 shares of the St. James's and the Kensington and Knightsbridge companies. In the transport department, Underground Electric Railways £10 shares have touched 4, and South Metropolitan Tramways debenture stock has risen from 65 to 68. District Railway ordinary stock is 1½ up; Metropolitan Tramways debenture stock is 2 points down. In the manufacturing group, Callenders have called a halt. Edison Swan preference have risen 1s. 3d., and Ericssons 7½d., but English Electric ordinary have fallen 9d., G. E. C.'s and Thomson-Houston 6d., and Siemens 3d.

Last Annl. Divd.	Description.	This Week.	Last Week.	1925 to 1926. Highest.	Lowest.
%	**Electricity Supply.**				
10	Brompton & Kensington Ord.	31/3	31/3	45/-	24/-
4	Central Elec. Supp. 4% Deb...	90	90	100	67
15	Charing Cross Elec. Ord. (£1)..	44/4½	44/4½	60/-	10/-
4½	" " 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	49/4½	49/4½	52/6	20/3
6	" " 6% C.P. ..	23/-	23/-	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	58/1½	58/1½	61/3	14/6
6	" " 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	14/-	13½	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	32/-	32/-	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	36/10½	36/10½	41/6	8/-
4½	" " 4½% C.P...	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	" Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	22/6	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord (£5) ..	16½	16½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	45/-	45/-	48/9	18/-
4½	" " 4½% C.P. (£1)	17/6	17/6	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
	" " 6% C.P...	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	140½	140½	123	24
6	" " 6% Pf. Stk.	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69	69	89½	40½
4	" " 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	78½	78½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	50½	50½	73½	20
4	" " 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	" " 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	78½	78½	89	65
4	Lon. Un. Trams. 1st Deb. ..	44½	44½	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	64½	64½	101½	49
5	" " 5% Deb. ..	66½	68½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	61½	61½	84½	19
3½	" 3½ Pf. Stk.	63½	63½	88½	40½
3½	" 3½% Deb.	60½	68½	92½	51
4½	Met. Dis. Rly. Ord. Stk. ..	53	51½	58	12½
6	" " 4½% 1st Pref. ..	77½	77½	91	45
4	" " 6% Perp. Deb. ..	113½	113½	146/12/6	80
—	S. Met. Elec. Trams. 4% Deb	68	65	73½	48½
—	Underground Elec. Rlys. Ord.(£10)	4	3½	5½	21/3
5	Yorks. (W.R.)Trams. Ord. ..	11/6	11/6	27/-	1/-
4½	" " " 1st Deb.	72	72	87	58
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	70/-	70/-	62/-	26/6
6	" " 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	22/6	23/-	23/4	19/7½
7	" " " 7% Deb.	106½	.106½	107½	92
10	Brush Electrical Ord.	26/10½	26/3	29/-	10/-
‡15	Callender's Cable Ord.	67/6	67/6	85/-	22/-
6½	" " 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	" " 7½% B. Pref...	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)..	12/9	12/9	28/9½	1/11
7½	" " 1st Pref...	22/6	21/3	26/-	5/-
10	Elec. Construction Ord. ..	31/10½	31/10½	30/4	6/7½
7	" 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	15/6	16/3	29/3	7/3
6	" 6% C.P... ..	17/6*	18/-	21/3	10/6
—	Ericsson Telephones 7% Pref.	21/10½	21/3	21/-	12/7½
6	Ferranti 6% Pref.	19/4½	19/4½	18/6	16/9
7	" 7% 2nd Pref... ..	18/-	18/-	19/-	13/9
5	" 1st Mort. Deb. Stock..	91½	91½	96½	80½
7½	General Elec. Ord.	30/3	30/9	59/-	13/6
20	W. T. Henley's Ord.	82/6	82/6	86/6	23/3
17½	Johnson & Phillips Ord. ..	66/3	66/3	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	25/7½	25/7½	37/-	13/1
8	" " 8% C.P. (£2) ..	47/6	47/6	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	30/-	31/3	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	30/-	29½	56/2/6	19½
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	74*	75	87½	60
10	Eastern Ord. Stk.	100½	100½	213½	113/2/6
3½	" 3½% Pref. Stk.	66½	65½	84/17/6	49
4	" 4% Deb. ..	79½	79½	103½	60
10	Eastern Extension Ord. (£10)..	10½	10½	21½	10/12/6
4	" " 4% Deb. ..	78½	78½	97½	60
22	Gt. Northern Telegraph (£10)..	27½	27½	42/12/6	19
‖10	Indo-European (£25)	47½	47½	59½	25
—	Marconi's Wireless T. Ord. ..	14/4½	13/9	9/16/3	20/9
7½	" Int. Mar.	20/-	20/-	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	18½	18½	23	11/6/3
4	" " 4% Deb. Stk. ..	78½	78½	10	60/2/6

* Ex dividend.

‡ Plus share bonus. ¶ Plus 3 p.c. in respect of 1921. ‖ Including bonus.

PRITCHETT AND GOLD AND E.P.S. Co., LTD.—Intm. div. 5 p.c., tax free.

ANDHRA VALLEY POWER SUPPLY CO.—Rev. for year ended June 30th, R. 6 083 450; net pft. R. 994 845.

BRITISH ELECTRIC TRANSFORMER CO., LTD.—Pft. for half-year ended June 30th, 1926, £22 906, agst. £25 826.

NORTHERN MEXICO POWER AND DEVELOPMENT CO.—Div. 1¾ p.c. on pref. stk. for quarter ended September 30th.

TATA HYDRO-ELECTRIC POWER SUPPLY CO., LTD.—Rev. for year to June 30th, R. 4 583 636; net pft. R. 2 037 626.

HEAD, WRIGHTSON AND CO., LTD.—Div. on pref. shs. at rate of 6 p.c. p.a., less tax, for half-year ended September 30th.

VICTORIA FALLS AND TRANSVAAL POWER CO.—Net earnings for quarter ended June 30th, before provision for taxation, £249 133.

UNITED RIVER PLATE TELEPHONE CO., LTD.—It is stated that issue of new ord. shs. at par will shortly be made, on basis of one for every six shs. held.

LANCASHIRE ELECTRIC LIGHT AND POWER CO.—Intm. div. for half-year ended September 30th on 7 p.c. cum. participating pref. shs., at rate of 7 p.c. p.a.

BURNDEPT WIRELESS, LTD.—Directors offer for subscription 500 7 p.c. debs of £100 each at par. Special consideration will be given to applications from shareholders, received on or before October 14th.

METROPOLITAN ELECTRIC SUPPLY CO.—Mr. A. W. Tait has resigned trusteeship for holders of 3½ p.c. mtge. deb. stk. Lord Wargrave appointed new trustee in his place, jointly with Mr. W. Sandford Poole.

MADRAS ELECTRIC TRAMWAYS (1904), LTD.—Intm. div. on pref. shs. at rate of 6 p.c. per annum, less tax, in respect of year ending December 31st, 1926, payable at Royal Bank of Scotland, 3, Bishopsgate, London, E.C.2.

VENEZUELA TELEPHONE AND ELECTRICAL APPLIANCES CO., LTD.—At extraordinary meeting on Monday, resolution approving action of dirs. in entering into agreement for sale of undertaking for £425 000 was carried unanimously.

MONTREAL LIGHT, HEAT AND POWER CONSOLIDATED.—On and from November 1st, co. will redeem for cash all pref. shs. at price of $50 per sh. (par value) and accrued div. to that date, upon surrender of certificates representing said shs.

HALIFAX AND BERMUDAS CABLE CO., LTD.—Accts. show credit blce. £28 322, against £18 999, plus £44 790 brt. in. Repairs absorbed £5 559. Intm. div. 5 p.c., tax free, paid, and further div. 5 p.c., tax free, recommended, making 10 p.c. for year; fwd. £62 554.

DIRECT WEST INDIA CABLE CO., LTD.—Credit blce. on working during year to June last £19 697, agst. £12 233, plus £21 537 brt. in. Intm. div. 5 p.c., tax free, has been paid, and further div. 5 p.c., tax free, recommended, making 10 p.c. for year; fwd £35 235.

BROMLEY (KENT) ELECTRIC LIGHT AND POWER CO., LTD.—Result of year's trading, after payment of deb. int., etc., providing for income tax, and adding £639 brt. in, is blce. of £20 108. Intm. div. 4 p.c., tax free, was paid in October last. Further div. 6 p.c., tax free, recommended. Fwd., £11 108.

HURST, NELSON AND CO., LTD.—Gross pft. for year ended July 17th, £95 130. Deducting depreciation £7 248 and adding £16 000 brt. in, makes available blce. £103 927. Placed to gen. res. £10 000. Div. 2s. p. sh. and bonus 6d., both less tax, on ord. shars., paid. After reserving £16 000 for intm. div., less tax, to be paid on May 14th next on ord. shs., £20 372 is carried fwd.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Combined gross earnings of services operated by subsidiary coys. in August were $3 476 995 (increase $671 649); aggregate from January 1st $26 034 604 (increase $6 760 844). Net earnings for August were $1 962 354 (increase $376 524), and for eight mos. from January 1st $14 891 080 (increase $3 870 161).

COMPANIA DE ELECTRICIDAD DE LA PROVINCIA DE BUENOS AIRES, LTD.—An extraordinary general meeting will be held at 48, Place de Meir, Antwerp, on November 12th, to consider resolutions to increase cap. to £1 137 500 by creating 350 000 additl. 8 p.c. non-cum. participating pref. shs. of £1 each, and specifying rights and privileges attaching to such shares. The

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resolutions will also be considered a a separate mtg. of ord. shareholders on the same date and at the same place.

METROPOLITAN ELECTRIC SUPPLY CO., LTD.—A circular to holders of 3½ p.c. mtge. deb. stk. refers to sale of co.'s Willesden power station under London Electricity No. 2 Act, 1925. This deb. stk. (of which £378 000 is outstanding) is secured upon a section of that station. It has been suggested that many holders would like opportunity of exchanging their deb. stk. for British Government security giving somewhat better return and possessing free mkt. and enhanced realisable value. Directors have made proposal whereby each £100 3½ p.c. mtge. deb. stk. will be exchanged for £105 of British Government 3½ p.c. conversion loan.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—Directors state that attention has been drawn to fact that number of shareholders have received circular over signature of Mr. Charles L. Nordon, in which they are urged to press for appointment of a shareholders' committee. Mr. Nordon bases his justification on a number of statements reflecting on past history and present position of company and directors. On July 23rd, 1926, shareholders were informed that investigation was being undertaken by company's auditors (Cooper Brothers and Co.) and by Sir Gilbert Garnsey (of Price, Waterhouse, and Co.). Mr. Nordon states in his circular that terms of reference are severely and unsatisfactorily limited. This statement, the directors remark, is without foundation. No restriction of any kind has been placed upon the work. When report comes to hand it will be considered by board, and recommendation will be made to shareholders for consideration as to best course to pursue.

FERRANTI, LTD.—Mr. A. W. Tait, at the annual meeting last week, said net profit for year to June 30th, after provision for all exes., including allocation of £15 000 to depreciation reserve, was £59 765, agst. £67 645 for previous year. Results were satisfactory, considering disturbing effect of general strike and coal strike, and consequent increase in costs and inability to get required amt. of raw materials. Turnover again showed a substantial increase. In meter department there was an increase in both quantity and value. It had again been necessary to accept lower selling prices owing to keen competition in both home and foreign markets; but they were still making satisfactory progress, and were giving close attention to improvement of product and rearrangement and improvement of plant to effect reduction of cost as well as increase of production. Power transformer department had made very satisfactory progress, and had not only shown a satisfactory increase in turnover but also in profit. Instrument department showed some decrease in output, but board were giving this close attention. Radio department had made satisfactory progress, output for year being double that of previous year. Arrangements had been made recently for developing sale of their product abroad. There had been transferred to general reserve the sum of £35 000, increasing the amount to £200 000, which was almost equal to the total issued share capital. Divs. on 6 p.c. cum. pref. shs. and 7 p.c. second pref. shs. had been paid, and directors now recommended payment of div. on ord. cap. of 20 p.c., tax free, leaving blce. £36 558 to be carried forward. Report was adopted and div. approved.

New Companies.

GENERAL SERVICE SUPPLIES, LTD.—Cap., £3 000. Electrical engineers, etc. Reg. office: 70a, London Road, Croydon, Surrey.

REDISON, LTD.—Cap., £100. Manufacturers of and dealers in wireless installations, etc. Reg. office: 85, Bridge Street, Manchester.

DURRINGTON ELECTRIC LIGHT CO., LTD.—Cap., £3 500. Business indicated by title. Reg. office: Midland Bank Chambers, Salisbury. (Public company.)

M. P. O'BRIEN ELECTRIC LIGHT CO., LTD.—Cap., £100. To carry on the business of an electric light and power company. E. J. P. O'Brien, Edenderry, governing director.

BAILEY AND INCLEDON, LTD.—Cap., £2 000. To adopt an agreement with G. Bailey, and to carry on the business of electrical engineer formerly carried on by him at 101, Great Russell Street, London, W.C.

MATTHEWS ELECTRIC SIGNS, LTD.—Cap., £2 000. Electricians, electrical engineers, manufacturers of electrical machinery and apparatus, etc. Reg. Office: Windsor House, Victoria Street, London, S.W.1.

W. H. PRICE AND NEWEY, LTD.—Cap., £2 000. Electrical and mechanical engineers, manufacturers, merchants and factors of electrical and mechanical goods, etc. Reg. office: 57, St. Paul's Square, Birmingham.

W. R. LOXLEY AND CO. (GENERAL PRODUCTS), LTD.—Cap., £100. Manufacturers and repairers of and dealers in plant and machinery, electrical and general engineers, etc. Reg. office: 106, Fenchurch Street, London, E.C.3.

ROTHMAN'S (INDIA), LTD.—Cap., £6 000. Manufacturers of electrical appliances, whereby sound is recorded or transmitted, etc. Reg. office: 13-17 Underwood Street, London, N.1.

BUSINESS ITEMS.

Changes of Address, Representatives, and Other Developments.

THE North Metropolitan Electric Power Supply Co. has opened new offices and showrooms at Shenley Road, Boreham Wood, Herts.

Victoria Electrical Supplies, electrical engineers and lampshade specialists, have opened new premises at 4, The Exchange, Queen Street, Deal.

A. G. and H. Sibthorp, of 62, High Street, Hornchurch, and Station Approach, Upminster, have opened an electrical department under the name of A. G. and H. Sibthorp and Green.

A European firm established in Rangoon wishes to undertake the representation in Burma of British manufacturers of electric torches and batteries. Particulars from the Department of Overseas Trade. (Reference No. 275.)

Manufacturers of insulating varnishes and varnished fabrics wish to represent, on commission, in the Province of Ontario, a maker of electrical white cotton tape. Applications to the Department of Overseas Trade. (Reference No. 377.)

All communications for "The British Engineers' Export Journal" and Engineering Publications, Ltd., should be sent to the new address: Rooms 244/251, Bank Chambers, 329, High Holborn, London, W.C.2. Telephone: Holborn 0516 (three lines).

Electrical conduits are amongst the various classes of goods which a commission agent in Buenos Ayres notifies his readiness to sell in Argentina for British manufacturers. Further details can be obtained from the Department of Overseas Trade; reference No. 370.

A Georgetown, British Guiana, agent desires to obtain the representation of manufacturers of wireless sets and parts and electrical fittings and novelties, on either a commission or a purchasing basis. Particulars from the Department of Overseas Trade. (Reference No. 274.)

The address of Mr. E. P. Prior, sole agent in Ireland for the Electric Construction Co., Ltd., the New Pelapone Engine Co., Ltd., Measurement, Ltd., the Walsall Hardware Manufacturing Co., Ltd., and Pritchett and Gold and E.P.S. Co., Ltd., is now College Square North, Belfast. Telegrams, "Rheostat"; telephone 5188.

A San Francisco firm, with a branch in Los Angeles, wishes to represent, on a commission basis, manufacturers of power transmission and conveyor machinery, machinery for factories, etc. The firm in question is prepared to buy outright and to cover the Pacific Coast of the United States. Particulars from the Department of Overseas Trade; reference No. 369.

The business formerly carried on as the Zenith Manufacturing Co., has now been incorporated as a private limited liability company, under the title of the Zenith Electric Co., Ltd. This step has been taken in order to provide additional capital and facilities to cope with the steadily increasing demand for the Zenith electrical products. All the assets and liabilities of the former business have been taken over, and the company will continue under the same management and staff as hitherto.

The Lead Market.

Demand Reported Very Quiet with Further Sagging of Prices.

IN their lead market report dated October 2nd, James Forster and Co. state that quiet conditions again prevailed and prices consequently sagged further, closing at the lowest at £31 8s. 9d. for October, £31 7s. 6d. for November, £31 6s. 3d. for December, and £31 5s. for January.

Recent arrivals have been heavy and yet there is little prompt lead pressing on the market, indicating that most of it has passed into consumption. Demand is very quiet and confined chiefly to purchases for prompt delivery. Similar conditions are existing at the moment in the U.S.A. and on the Continent, and as long as this state of affairs continues we are likely to have sagging markets.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BIRD, F. R., 58, Wellesley Road, Clacton-on-Sea, electrical engineer. £91 16s. 8d. September 5th.

JONES, G. Bowen, 6, Quay Street, Ammanford, wireless dealer. £13 9s. 4d. August 7th.

SMITH AND CO., 467, Commercial Road, E., wireless dealers. £11 7s. 10d. July 28th.

Bill of Sale.

WOLSTENHOLME, Arthur, 4, Corringham Road, Wembley Park, electrical engineer. Filed October 1st. £100.

Deeds of Arrangement.

GATH, Joseph Henry, trading as GATH ELECTRICAL ENGINEERING CO., Horton Street, Halifax, and residing at 19, Waverley Terrace, Hipperholme, electrical engineer. Filed September 29th. Trustee, S. Sutcliffe, Fountain Street, Halifax, C.A., and another. Secured creditors, £4 976; liabilities unsecured, £1 397; assets, less secured claims, £1 423.

GRAY, William Lionel, 9, Victoria Parade, and 16, Wilton Road, Muswell Hill, electrician. Filed October 4th. Trustee, W. A. J. Osborne, Balfour House, Finsbury Pavement, accountant. Liabilities unsecured, £2 345; assets, less secured claims, £1 280.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

GATH, Joseph Henry, trading as the GATH ELECTRICAL ENGINEERING COMPANY, Horton Street, Halifax. This debtor has executed a deed of assignment, for the benefit of his creditors, to Messrs. Sutcliffe and Rhodes, chartered accountants, as trustees. The deed was confirmed by a meeting of the creditors on September 28th, when a statement of affairs was submitted which showed unsecured trade creditors of £1,211 and an estimated surplus of £2.

PRESSLAND ELECTRIC SUPPLIES, LTD., wholesale wireless factors, late Kingston-on-Thames. Mr. W. Bronson, I.A., of 157, Cricklade Avenue, Streatham Hill, S.W., the liquidator in the voluntary liquidation of this company, has issued a circular to the creditors in which he states, "It is perfectly clear that there will be nothing at all for unsecured creditors. It is useless keeping you in any suspense. The debenture holder will not get fully satisfied. If by any means there is anything later to report I will write to you, otherwise please take this as my final letter to you." In an accompanying report Mr. Bronson states that prior to December, 1922, Mr. C. Pressland, who was an electrician, inventor and patentee, was in business on his own account. The company was formed as a private limited liability concern, on December 9th, 1922, with a nominal capital of £1 100, all of which was issued. Mr. A. W. Matton subscribed £1 000 for shares, and 100 shares were issued to Mr. Pressland, of which 98 were for a consideration other than cash. Subsequently the company required further capital, and Mr. Matton found £2 500 without security. When Mr. Matton required security debentures were issued over the assets. The trading figures showed that up to June 30th, 1925, the net purchases of the company were £54 239, against net sales of £58 526.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Bankruptcy Information.

BOYD, George, New Road, Mousehill, Milford, Surrey, electrical engineer. Receiving order, September 27th. Debtor's petition. First meeting, October 13th, 11.30 a.m., 29, Russell Square, W.C.1. Public examination, November 2nd, 11 a.m., Guildhall, Guildford.

SMITH, Harold Lawrence, 10, Ordell Road, Bow, electrician. Receiving order, September 30th. Debtor's petition. First meeting October 14th, 11 a.m., and public examination, November 30th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

Notice of Dividend.

TANSEY, Ernest Henry, 65, Factory Road, Hinckley, Leicestershire, wireless dealer. First and final dividend, 1s. 3¾d. per £, payable October 14th, Official Receiver's Office, 1, Berridge Street, Leicester.

Notices of Intended Dividends.

HEREFORD-LAVEY, Josephine Raie, and DE FRECE, Violet, described in the Receiving Order as the RADIO CASH STORES, 371, Upper Street, Islington, London, N.1, and 5, New Station Street, Leeds, and Parliament Street, Nottingham, electricians. Last day for receiving proofs, October 17th. Trustee: C. Latham, 78, New Oxford Street, London, W.C.1.

SQUIRE, William Robert, 11, Steward Street, Spring Hill, Birmingham, electrical engineer. Last day for receiving proofs, October 18th. Trustee: C. Hoult, Official Receiver, 191, Corporation Street, Birmingham.

WOODHEAD, Laurence Arthur, trading as "L. WOODHEAD," 25A, Charles Street, Bradford, wireless dealer. Last day for receiving proofs, October 15th. Trustee, J. O. Morris, 12, Duke Street, Bradford, Official Receiver.

Application for Discharge.

JAMES, Leonard Lloyd, 62, Canterbury Street, Gillingham, Kent, also 137, High Street, Rochester, trading as W. G. JAMES AND SON, electrical engineer. Hearing, November 10th, 11 a.m., Court House, Eastgate, Rochester.

Partnership Dissolved.

SADLEIR AND SAVAGE (Edward William SADLEIR and Thomas SAVAGE), electricians, 6b, Madoc Street, Llandudno, by mutual consent as from September 28th, 1926. Debts received and paid by E. W. Sadleir.

Bankruptcy Proceedings.

MASON, George, and TINSLEY, George Edward, trading as MASON AND TINSLEY, 6, Alberts Terrace, Sherwood Rise, late 94, Upper Parliament Street, Nottingham, electrical engineers. The statutory first meeting of the creditors of the above was held on September 30th, at the Official Receiver's Offices, 4, Castle Place, Nottingham. The statement of affairs showed gross liabilities of £359, of which £336 was expected to rank, and a deficiency of £321. Debtors attributed their failure to trade profits being insufficient to meet their drawings from the business. It appeared that George Mason commenced business without capital, and under verbal arrangement only with another. This partnership was dissolved, and in September, 1924, he took Tinsley into partnership with him. The matter was left in the hands of the Official Receiver as trustee of the estate.

MILNES, Herbert, trading as H. MILNES AND SON, 6, Trinity Street, Huddersfield, electrical engineer, etc. The statutory first meeting of the creditors herein was held on September 28th at the County Court House, Queen Street, Huddersfield. The statement of affairs showed gross liabilities £2 655, of which £1 901 was expected to rank for dividend, against assets of £570. Debtor attributed his failure to lack of capital, ill-health and losses on contracts. It was resolved to appoint Mr. A. Pontefract, accountant, as trustee of the estate.

Metal and Chemical Prices.

TUESDAY, October 5th.

		Price.	Inc.	Dec.
***Copper*—**				
Best Selected	per ton	£64 10 0	5s. 0d.	—
Electro Wirebars	,,	£66 15 0	7s. 6d.	—
H.C. Wire, basis	per lb.	9¼d.	—	—
Sheet	,,	9⅝d.	—	—
***Phosphor Bronze*—**				
Wire (Telephone) basis	per lb.	1s. 1⅛d.	—	—
***Brass* 60/40—**				
Rod, basis	per lb.	7½d.	—	—
Sheet, basis	,,	9½d.	—	—
Wire, basis	,,	10½d.	⅛d.	—
***Pig Iron*—**				
Cleveland Warrants	per ton	£5 5 0	5s. 0d.	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 0 0	—	—
***Lead Pig*—**				
English	,,	£32 15 0	—	10s. 0d.
Foreign or Colonial	,,	£31 7 6	—	7s. 6d.
***Tin*—**				
Ingot	,,	£318 0 0	£6 10 0	—
Wire, basis	per lb.	4s. 0d.	1d.	—
Aluminium Ingots	per ton	£112 0 0	—	—
Spelter	,,	£34 12 6	—	—
Mercury	per bottle	£16 0 0	2s. 6d.	—

Sulphur (Flowers)—Ton £11 10 0 ***Sodium Chlorate***—Per lb. 2¾d.
,, (Roll-Brimstone)—,, £10 5 0 ***Sulphuric Acid*** (Pyrites, 168°)
Copper Sulphate— ,, £25 to £25 10s. per ton, £6 15 0
Boric Acid (Crystals) ,, £37 ***Sodium Bichromate***—Per lb. 3½d.
Rubber—Para fine, 1s. 8½d.; plantation 1st latex, 1s. 9d. to 1s. 9½d.

The metal prices are supplied by British Insulated Cables, Ltd.,

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

244 155 British Thomson-Houston Co., Ltd. (General Electric Co.) Electric welding-systems. (8/9/24.)
244 230 L. H. Peter and Westinghouse Brake and Saxby Signal Co., Ltd. Electrical operation of railway points and signals. (27/10/24.)
244 231 Dubilier Condenser Co., Ltd. (formerly Dubilier Condenser Co. (1921), Ltd.). Electrical condensers. (27/10/24.)
244 234 L. H. Peter and Westinghouse Brake and Saxby Signal Co., Ltd. Alternating current relays. (1/11/24.)
244 237 W. M. Manning. Devices for use in connection with telephonic reception. (1/11/24.)
232 166 J. R. Barnhart. Variable electric condensers. (9/4/24.)
244 244 Siemens Bros. and Co., Ltd., D. A. Christian and W. G. Patterson. Metering of calls in telephone systems. (11/11/24.) (Addition to 200 928.)
244 247 R. Woods. Electrical switches. (21/11/24.)
244 249 M. J. Railing and F. G. Quance. Electric connection fitting. (24/11/24.)
244 251 E. Whiteley and Garnett, Whiteley and Co., Ltd. Electro-magnetic inductance coil holders or mountings. (27/11/24.)
226 556 Telefunken Ges. fur Drahtlose Telegraphie. Radio transmitting circuits. (22/12/23.)
244 272 E. H. Brune. Magnetic separators. (22/12/24.)
230 417 I. P. Rodman. Insulator structures for electrostatic condensers and the like. (18/3/24.)
244 281 Siemens und Halske Akt.-Ges. and K. Giese. Selecting switches for use in telephone systems. (6/1/25.)
244 284 M. Koopman. Grid leaks, anode resistances and the like. (12/1/25.)
243 603 K. F. Henneman and P. Kerkhoven. Switches for electric water-heating apparatus. (1/12/24.) (Addition to 206 834.)
244 294 S. Williams and L. Williams. Wireless receiving apparatus and condensers therefor. (29/1/25.)
228 928 British Thomson Houston Co., Ltd. Electric induction motors. (9/2/24.)
231 904 Siemens-Schuckertwerke Ges. Electric drive for machine tools, particularly planing machines. (7/4/24.)
238 188 M. B. Richter. Alternating-current bell. (5/8/24.)
234 517 Telefunken Ges. fur Drahtlose Telegraphie. Production of oscillating currents by static transformers and the like. (23/5/24.)
236 182 Metropolitan-Vickers Electrical Co., Ltd. Brush gear for dynamo electric machines. (24/6/24.)
235 229 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Manufacture of electric lamps and similar electric devices. (7/6/24.)
239 828 Measurement, Ltd. Adding or differential watt-meter relay. (11/9/24.)
244 348 S. J. Eintracht and E. J. Dickins. Rectifiers for wireless reception. (29/6/25.)
243 310 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Incandescent cathode X-ray tubes. (20/11/24.) (Addition to 208 108.)
244 350 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. X-ray tubes, and installations for operating same. (25/3/25.)
244 372 Lodge-Cottrell, Ltd. (formerly Lodge Fume Co., Ltd.). Electrical gas purification. (29/8/25.) (Addition to 177 117 as modified by 238 480.)
244 384 V. A. Foot. Telephonic apparatus. (6/9/24.) (Divided application on 243 102.)
242 662 British Thomson-Houston Co., Ltd. Electrodes for electron discharge devices. (8/11/24.)
244 388 J. D'A. Clark. Electrical connectors. (11/6/24.) (Divided application on 244 136.)
244 501 V. Planer. Electric stoves for use in the enamelling of electric conducting wires. (18/6/24.)
229 625 Hazeltine Corporation. Electric condensers for neutralising capacity coupling between parts of electric circuits. (20/2/24.)
241 511 P. K. Sen. Induction motors. (15/9/24.)
241 512 Siemens Bros. and Co., Ltd. and J. Berry. Metering in automatic telephone systems. (15/9/24.)
241 525 Igranic Electric Co., Ltd. and A. H. Curtis. Variable inductance devices. (18/9/24.)
222 149 British Thomson-Houston Co., Ltd (J. M. Enders). Spacing of plates of variable condensers. (22/9/24.) (Convention date not granted. Addition to 212 205.)
244 540 W. Peto, H. M. Genese and Pritchett and Gold and E.P.S. Co., Ltd. Electric batteries. (26/9/24.)
244 548 E. M. Johnson and Metropolitan-Vickers Electrical Co., Ltd. Automatic electric circuit breakers. (9/10/24.)
244 552 Standard Telephones and Cables, Ltd (formerly Western Electric Co., Ltd.) Transmission of wave energy for high-frequency signalling. (11/10/24.) (Addition to 243 088.)
244 568 C. Seymour, G. A. Irving and J. C. W. Drabble. Receivers for wireless telegraphy and telephony. (14/11/24.)
225 229 A. H. De Voogt. Means for balancing telephone cable circuits. (23/11/23.)
244 574 P. M. Edinborough and Metropolitan-Vickers Electrical Co., Ltd. Electrically heated appliances. (28/11/24.)
244 576 British Thomson-Houston Co., Ltd. and E. B. Tuppen. Control of electric motors. (3/12/24.)
226 813 British Thomson-Houston Co., Ltd. Electric relay systems. (29/12/23.)
227 104 Metropolitan-Vickers Electrical Co., Ltd. Electrical measuring instruments for alternating current circuits. (2/1/24.)
244 586 Standard Telephones and Cables, Ltd (formerly Western Electric Co., Ltd. (F. Doring). Insulation removing devices. (29/12/24.)
244 587 Standard Telephones and Cables Ltd. (formerly Western Electric Co., Ltd.). Automatic or semi-automatic telephone systems. (29/12/24).

Applications for Patents.

September 13th.

22 502 E. D. G. Barnby. Motor-car electric lighting systems.
22 573 and 22 574 Bowden Wire, Ltd. and A. H. Nisbet. Wireless telegraphy, etc.
22 512 Brandes Laboratories, Inc. Electromagnetic sound producer. (5/3/26, U.S.)
22 544 Joseph Count de Briey. Process of separating molasses and sugar juices by electrolysis.
22 541 British Thomson-Houston Co., Ltd. Transformers. (11/9/25, U.S.)
22 489 A. H. Ford. Fine-adjustment variable electric condensers, etc.
22 519 A. N. Hazelhurst. Electric batteries.
22 558 A. Hurter. Electrodeposition of metals.
22 487 R. Maclaren. Electrical control apparatus.
22 482 R. Nettl. Electric-lamp holders.
22 578 A. E. Pitcher. Wireless receivers.
22 572 H. Sauveur. Electric light fittings, etc. (11/9/25, France.)

September 14th.

22 644 British Thomson-Houston Co., Ltd. Electric remote control systems. (14/9/25, U.S.)
22 646 British Thomson-Houston Co., Ltd. Thermionic discharge tubes. (14/9/25, U.S.)
22 647 British Thomson-Houston Co., Ltd. Thermionic tubes. (8/10/25, U.S.)
22 648 British Thomson-Houston Co., Ltd., and T. H. Kinman. Circuit arrangements for radio receiving systems.
22 664 Detex Distributors, Ltd. and R. Eisler. Wireless coil-holders.
22 594 I. Elliott. Thermionic valve cap.
22 663 H. Gothe. Electroplating.
22 694 L. B. Haigh and Standard Telephones and Cables, Ltd. Telephone systems.
22 668 P. W. Harris and J. Robinson. Radio amplifiers.
22 685 Hazeltine Corporation. Electric coupling systems. (2/7/26, U.S.)
22 619 A. Hinderlich. Mounting piezo-electric crystals.
22 693 H. L. Kirke. Electrical condensers.
22 669 Lissen, Ltd. and R. P. Richardson. Terminals for voltaic batteries.
22 630 G. Marr. Combined electric switch and plug coupling.
22 653 H. J. Round. Thermionic valves.
22 621 Siemens Schuckertwerke Ges. Coil sockets for electric cables. (15/9/25, Germany.)
22 632 Siemens-Schuckertwerke Ges. Means for varying characteristics of electromotors. (15/9/25, Germany.)
22 639 Siemens-Schuckertwerke Ges. Electric switches with variable periods of release. (15/9/25, Germany.)
22 672 Siemens-Schuckertwerke Ges. Electrical rectifying installations. (19/9/25, Germany.)

September 15th.

22 800 A. H. Avery and G. Kent, Ltd. Voltage regulators. (16/6/25.)
22 757 British Thomson-Houston Co., Ltd. Electric power amplifiers. (1/10/25, U.S.)
22 804 Enclosed Motor Co., Ltd., N. W. Gilbert and A. E. Jabet. Cooling arrangements of dynamo-electric machines.
22 747 A. Gourvish and R. E. J. Pressman. Thermionic-valve circuits.
22 748 A. Gourvish and R. E. J. Pressman. Manufacture of wireless receivers.
22 763 W. F. Harkness and R. J. T. Morton. Electric inductances.
22 775 M. F. Higgins and T. G. Nyborg. Electrically-driven shaker conveyors.
22 797 M. A. Juillerat. Electrically-driven time pieces.
22 706 C. B. Kersting and J. P. Prangnell. Thermionic valves.
22 764 Metropolitan-Vickers Electrical Co., Ltd. Current transformers. (1/10/25, U.S.)
22 784 National Carbon Co., Inc. Electrical connection, and method of forming same. (3/3/26, U.S.)
22 796 A. W. Stapleton. Variable electrical resistances.
22 778 A. H. Stevens. Time lag devices for automatic electric controllers, etc.

September 16th.

22 853 C. P. Allinson. Wireless signalling.
22 893 P. W. Baker, Climax Radio Electric, Ltd., R. M. Ellis and C. H. Stave. Means for mounting magnet systems for wireless telephony instruments.
22 898 L. N. Bland. Control of electric apparatus.
22 862 British Thomson-Houston Co., Ltd. Thermionic valve amplifying systems (14/11/25, U.S.)
22 833 L. G. Burton. Electric heaters.
22 901 W. E. Clifton. Circuits for electron discharge devices.
22 867 W. H. Le Breton. Cartons for thermionic valves.
22 881 N. W. McLachlan and W. S. Smith. Electrical regulating and control systems.
22 878 S. C. Miller. Thermionic valves.
22 879 S. C. Miller. Manufacture of vacuum discharge devices.
22 830 D. A. Pearson. Periodically-actuated electric switches.

September 17th.

23 022 W. A. Appleton and J. Joseph. Thermionic amplifying systems.
22 992 Bowden Wire, Ltd. and A. H. Nisbet. Galvanic batteries.
22 940 R. S. Elven. Wireless receivers.
22 950 General Electric Co., Ltd. and R. J. Kaula. Electric socket or coupling elements.
22 960 T. E. Goldup, Mullard Radio Valve Co., Ltd. and L. E. Owen. High resistances and chokes for high-frequency electric circuits.
22 929 R. Holmes. Electrical apparatus for cultivation of plants, etc.
22 994 Kodak, Ltd. Electrical disposition of organic materials. (1/4/26, U.S.)
22 924 G. S. Laughton. Wireless receiving apparatus.
22 980 C. Lorenz Akt.-Ges. Cooling electromagnetic apparatus. (19/9/25, Germany.)
23 023 H. A. Prettejohn. Wireless earthing switches.
22 942 E. Shrubsole. Electrically-heated sterilisers, water boilers, etc.
22 928 V. A. Trier. Electric switches.
22 977 W. Werner. Fuse for electrically operated articles.
23 008 W. S. Worthington. Wireless tuning apparatus.
23 009 W. S. Worthington. High-frequency transformers, etc.

September 18th.

23 057 A. F. S. Kent. Apparatus for wireless communication, television, etc.
23 031 L. J. Price. Wireless receiving apparatus.

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Friday, October 8th (To-day).

Junior Institution of Engineers.—39, Victoria Street, Westminster. Paper, "A Survey of Modern Airless Injection Oil Engines," by Mr. N. J. Griffin. 7.30 p.m.

Monday, October 11th.

Institute of Transport (Midland Local Section).—Queen's Hotel, Birmingham. Ordinary meeting. Inaugural address by Mr. O. C. Power. 6 *p.m.*

Electric Lamp Manufacturers' Association of Great Britain.—Lighting Service Bureau, 15, Savoy Street, London. Lecture I on "Fundamentals of Light Measurement and Control." By Mr. W. J. Jones. 7.30 *p.m.*

Tuesday, October 12th.

Electrical Contractors' Association (Leicester Branch).—Ordinary meeting. Corridor Chambers. 2.30 *p.m.*

Wednesday, October 13th.

Batti-Wallah's Society.—Hotel Cecil, Strand, London. Reunion Luncheon. 1 *p.m.* Address by Sir William Bull, Bart.

Electrical Contractors' Association (Sheffield Branch).—Ordinary meeting. Angel Hotel. Ordinary meeting. 5.30 *p.m.*

Thursday, October 14th.

Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.

Electrical Contractors' Association (East Yorks Branch).—Metropole Hall, Hull. Ordinary meeting. 3.30 *p.m.*

Sheffield Illumination Society.—Paper prepared by the Horstman Gear Co. on "Automatic Control of Street Lighting." 8 *p.m.*

Friday, October 15th.

Birmingham Electric Club.—Grand Hotel, Colmore Row, Birmingham. Lecture on "Radio" by Mr. J. Entwistle. 7 *p.m.*

Electrical Trades Commercial Travellers' Association.—Old Colony Club, Aldwych House, Strand, London. Bohemian Concert. 7.30 *p.m.*

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THE ELECTRICIAN

ESTABLISHED 1861.

THE OLDEST WEEKLY ILLUSTRATED JOURNAL OF

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The Electrician.

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POWER AND THE FUTURE.

STATISTICS show that the use of electricity for all sorts of purposes is steadily increasing throughout the world. The question may, therefore, pertinently be asked: How far is this development likely to affect our present methods of existence and along what directions will probable changes take place?

What may be termed the postulates of the problem are interestingly laid down in an address delivered to the Congress of American Industry by Mr. G. E. TRIPP, the chairman of the Board of Directors of the Westinghouse Electric and Manufacturing Co. He quotes the report of the eight British industrial workers who recently visited the United States to the effect that the reason for the better standard of living enjoyed by American employees is that the men work "as the directors of machinery instead of the slaves of human muscle. In England a man doing the same job would work twice as hard, do half as much and earn half as much." The statement has in fact been made that every American worker has 1·5 H.P. at his elbow, and though there are factories in this country, notably Hadfields, in Sheffield, where the amount is considerably more, there is no doubt that on the average it is much lower. It may, therefore, be taken as axiomatic for our purpose that power increases man's ability to produce those useful and desirable things, which are essential to our welfare and is in fact the very foundation of our civilisation. History shows, too, that without power the people generally are poor, and a hundred and fifty years ago it was only by the strictest economy that a mechanic could keep himself and his children from starvation.

About the same time back, it may be noted, the steam age dawned, and with it came a great increase in the production per worker and a lightening of the burden of labour in countless homes. Wages began an upward movement, which has continued with accelerating rapidity ever since. Capital has also accumulated more quickly. But from the point of view of what is going to happen in the future, perhaps the most important result has been the springing up of cities wherever conditions were especially favourable for manufacturing or trade, and, while one hundred and fifty years ago the bulk of the population of these islands lived on and were supported by the land, they are now concentrated in or near our cities and towns. This flow from the countryside to the town is universal, but has been most rapid in countries possessed of coalfields, and least rapid where the bulk of the fuel has had to be imported or the inhabitants have had to rely mainly on water power. This was the position when, towards the latter part of the nineteenth century, the possibility of using electricity as a motive power both in the factory and the home began to be realised by a few far-sighted pioneers. Since that time its employment for all purposes has largely increased, and as that increase will certainly continue we have now reached the time when we are faced with the question which we propounded in the first paragraph of this article.

The problem may for the sake of clarity be stated in another way. Is progress to be along the same lines as during the steam age? And if so will the evils that arose during that era increase along with the good that it undoubtedly brought about? Will, that is, our cities grow larger and larger and more crowded? Will workmen become more and more dependent on highly specialised jobs and increasingly at the mercy of trade conditions—and more discontented? Will the drain from rural districts continue to make the position of that key industry agriculture more and more difficult and leading to a wider and wider division between country and town dwellers? If these questions had been asked fifteen years ago, when everything seemed to point to greater centralisation, the answers would have made depressing reading. Now, fortunately, it is possible to reply to them in a spirit of greater optimism. That spirit of optimism, we make no excuse for saying, has been engendered by a realisation of what electricity can do in the factory, in the home and on the countryside to improve the conditions under which our inhabitants exist. For new power developments, which have taken place within the period we have mentioned, will, it may confidently be expected, usher in a new economic era in which many of the defects of that which has closed will be rectified.

The most important of these developments is, of course, the increasing availability of electricity. A supply of this commodity is no longer the perquisite of the urban dweller, for it is spreading out into the countryside, and we may hope before many years are past that electricity will be obtainable from the public mains in all parts of the country. Not the least important effect of this will be the decentralisation of industry. No longer will it be necessary for factories to be concentrated in large towns or for the workers in them to be forced to travel greater and greater distances from their homes to their daily work,

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but by removing it to the countryside the factory will become a nucleus round which the workers can live under conditions which, compared with those too often available at present, can only be described as ideal. The advantages of such decentralisation are not only sociological. Rent and rates will be lower and raw materials will be more easily obtainable. This splitting up of the town will be assisted by recent advances in standardisation and interchangeability, and it may follow that centres capable of supplying the needs of the country will be established in certain districts for the mass production of such fittings as nuts and bolts, stampings and light castings. This outward movement will be greatly assisted and indeed will be dependent on improvement in our transport methods. Our main roads are already being made more suitable for motor traffic of all kinds, so that short distance communication will be rendered easier. Is it too much to hope that before long the same policy may be adopted by our railways and that with the conversion of the lines to electric traction it may be possible to give a more frequent service over long distances both for passengers and goods?

The effect of such a movement as we have sketched on the agricultural industry must not be overlooked. One of the early effects of the industrial revolution was the closing down of large numbers of local industries, so restricting the opportunities of the farmer and his family for making a livelihood and limiting his customers to great organisations. While it is true that the farmer's position has been improved by machinery, he has not benefited to the same extent as the town worker, and the results are only too well-known. Decentralisation will, however, help the farmer by providing him with an electricity supply at a cheap rate and, as has been abundantly proved, relieving him of labour, increasing his productiveness and improving his standard of living.

Current Topics.

An Economic Automatic Sub-Station.

THE new sub-station of the Charing Cross Electricity Supply Co., which was officially reopened on Tuesday, is interesting from two points of view. As will be gathered from the description, which we give on another page of this issue, its operation is entirely automatic, the first machine starting up when the bus-bar voltage falls below a certain value and the others following suit in turn when the load exceeds a predetermined value. In the same way the machines are disconnected in sequence as the load falls. Automaticity is, however, carried a step further by the use of a sequence control device which enables the machines to be started up or shut down in a predetermined order, and ensures that if any machine is faulty the next in the series will be started up in its place. This sequence, it is important to note, can be altered while the machines are running. This enables a machine to be shut down for examination without interfering with the operation of the sub-station. More important than these technical features are those which may be conveniently described as economic. Ground space in this part of London is difficult and expensive to acquire. By going underground therefore a great saving in cost has been possible, and this method of dealing with rotary sub-stations in large towns will therefore probably be increasingly employed.

The Prime Minister and the Bill.

THE PRIME MINISTER devoted quite a measurable portion of his speech at the annual conference of the National Union of Conservative and Unionist Associations ast week at Scarborough to the Electricity Bill. This is not surprising, as most of the real as distinguished from the political opposition to this measure has come from his own followers, and the misconceptions about what it is proposed to do badly need correction. As Mr. BALDWIN pointed out, the development on parochial lines which has been usual in this country has retarded progress, and the Bill is therefore designed to remove obstacles which will mean savings on many items in the balance sheet. The attention of a correspondent in the "East London Observer" may be drawn to this statement. In a series of articles he is advancing arguments against the Bill, and what these lack in point they make up for in length. Mr. DUNCAN WATSON has already dealt effectively with the contentions that the Bill is unnecessary, and that the Board will have "a paralysing effect on electricity undertaking." In a further article this correspondent argues that the new scheme will not provide a service at a lower cost than at present, because everyone's peak load will occur at once, and that it is fallacious to suppose that only large stations can generate efficiently. The fact is, of course, that large stations are more efficient than small ones, and that by interconnection not only will the fullest use be made of this efficiency but reserve plant will be saved.

Helping Themselves.

THERE exists a very large body of opinion which contends that to solve its traffic problem London requires more tube railways, and urgent demands are going up from various places in the outer suburbs demanding that these shall be built. To these the "Underground" authorities make reply that they would be quite willing to build them if they could find the money. As the "Financial Times" points out, the problem of finance is crucial, though the money could no doubt be found. Our contemporary therefore puts forward the interesting suggestion that those who want the new lines should be prepared to make substantial contribution in aid of their construction. None of the risks of ordinary capital need be taken, but debentures yielding a fair rate of interest should attract support. This support might come not only from private individuals, but from the local authorities into whose areas the lines would be extended. It might be possible that legislative sanction would be necessary for such a scheme, but it would be a change from the present attitude of everyone waiting for somebody else to do something for them.

A Word for the 1882 Act.

MR. A. M. SILLAR'S presidential address to the National Association of Supervising Electricians, an abstract of which will be found elsewhere in this issue, was mainly devoted to the early history of the electrical industry in this country. This is, of course, the stuff of which presidential addresses are often made, but though many of Mr. SILLAR'S facts are well known, his treatment of them is often novel. For instance, his views on the Electric Lighting Act of 1882 are so unusual as to be almost heretical. Mr. SILLAR began his electrical career with the Jablochkoff Electric Light and Power Co., whose policy it would appear was philanthropical rather than commercial, and the result was that it went into liquidation within two years. In that short period, however, it lighted the Thames Embankment, Charing Cross Station and various exhibitions at unprofitable rates, and entered into negotiations for the lighting of several districts at such fees as 1½d. per arc lamp per hour. The Electric Light Act of 1882 put a stop to this extraordinary procedure, and thus gains Mr. SILLAR'S commendation. But it must also be remembered that it prevented the development of Mr. FERRANTI'S scheme for supplying large portions of London from Deptford and gave rise to many of the ills from which we are still suffering. It is, therefore, rightly held in abhorrence. It may be added, moreover, that such a measure was hardly required to deal with a concern managed like the Jablochkoff Co. That could well have been left to work out its own dissolution.

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International Telephony.

USEFUL work was done at the second meeting of the International Telephone Committee appointed by the International Chamber of Commerce, which was concluded in Paris last week. As a result of a widely-circulated questionnaire, the conclusion has been reached that telephone communication is technically possible between all towns in Europe, and that commerce would be greatly assisted by the establishment of that communication. The present service is, however, inadequate and, generally speaking, inefficient. The demand that exists for such communication makes the improvement of these conditions essential, and special attention was directed to the need for good quality speech, a minimum of delay in establishing communication, and a generally effective service. As a result of this report the matter is to be pursued further, and the measures which must be adopted to promote a more efficient international telephone service are to be studied. We feel sure that the technical departments of the various telephone systems will welcome this move. As we have often pointed out, the problem is more commercial than technical, and perhaps more political than either. The service can be provided easily enough once the difficulties of finance, control and management are overcome.

Anglo-German Trade Conference.

THE organisers of the unofficial conference, which took place at Romsey last week-end, between a number of prominent men from Great Britain and Germany, must have been a little surprised at the interest which it has aroused, and still more amused at the speculations as to what was going to and has taken place. It may therefore be well to utter a note of warning that, in spite of certain of our daily contemporaries, nothing spectacular is to be expected from the conference, though the advantages to both countries from the friendly conversations, which were the keynote of the gathering, cannot be over-emphasised. The conference itself arose from a desire to discover how far it was possible for industry in the leading countries of Europe to co-operate in the rehabilitation of prosperous employment, and not unnaturally, therefore, a considerable portion of the time was occupied by a discussion of the economic conditions existing in both countries, and especially with the difficulties with which productive enterprise has to contend at present. As the main object of the meeting was to examine the prospect of mutual assistance in re-establishing the industries of Europe and augmenting the opportunities of profitable employment, existing agreements for international co-operation were systematically surveyed. An important result of the gathering was the decision to form a standing joint committee composed of an equal number of representatives of both countries to pursue the investigations and to arrange for further conference. That this will be exceedingly useful cannot be denied.

Education in Lighting.

IN addition to their national campaign to educate the public in the advantages of electric lighting the Electrical Lamp Manufacturers' Association are not relinquishing their efforts to instruct those who are actually engaged in the industry in the fundamentals of good lighting. For some years now it has been the practice of the staff of the Lighting Service Bureau to hold four-day courses, and these have been very successful, in spite of the difficulty found by those to whom they should appeal, of sparing time during business hours. This winter, therefore, it has been decided to give a course of lectures fortnightly on Monday evenings, and the first of these, on "Lighting Fundamentals and Principles of Light Control," was delivered by Mr. W. J. JONES this week. There is every prospect that the experiment will be a complete success. About 160 students have enrolled and the attention that they paid to Mr. JONES's clear exposition at the first lecture is an excellent augury to the future. There is every indication that the public want to know more about electricity and electric lighting. It is the duty of every "electric shopkeeper," therefore, to ensure that as many as possible of this staff are in the position to provide this information in an accurate and palatable form.

The Campaign.

PROBABLY the most gratifying thing about the Wiring the Homes of Britain campaign, which is now, of course, in full swing, is the co-operation between all sections of the industry. It is not too much to say that a year ago this pooling of interests would have been miraculous, and that it has occurred is in itself an assurance of complete success. In another column we publish reports from our correspondents in the various centres, and these may be summed up in the phrase, "Everything is going splendidly." Operation is not yet completely frictionless, but that will doubtless soon be altered. The availability of the booklets is not quite so general as it might be, but the printing presses are hard at work. That the demand is large is shown by the fact that 100 000 copies have been disposed of in Manchester alone. Some of the circles have not got to work so quickly as others, principally owing to local activities having been given first place. That, too, is only a temporary state of affairs. It is not too much to say that the Exhibition Houses have been an entire success. In West Hartlepool a builder, after some persuasion, lent a house which he considered unsaleable. It was sold the first day it was used as an exhibition home, and the furniture firm has booked numerous orders. House agents are now "queueing" up to obtain demonstration rights for property in which they are interested. Local committees are taking considerable advertising space in the newspapers, and opportunities are being seized to circulate folders issued by the various manufacturing firms with the booklets. Finally, we learn that the best reports of the progress that is being made appear in THE ELECTRICIAN, and that headquarters have been asking the local secretaries why they must first learn of the activities of the latter through our columns instead of direct. Everything goes well, therefore.

The Cost of It All.

SPEAKING at the Labour Party Conference on Tuesday Mr. J. H. THOMAS said that at the moment 45 000 railway men were out of work and a further 200 000 were only working for three days a week. He was followed by Mr. BEN TILLETT, who said that the Transport Workers' Union had 80 000 unemployed and had spent £1 000 000 on the dispute. The Trade Returns for September show a decrease of £10 054 865 over the figures for the same month in 1925. Coal exports declined by £3 656 000, iron and steel by £1 686 000 and cotton goods by £3 508 000. Imports were generally up and coal especially increased, 3 940 880 tons being received, as against only 295 tons in September, 1925. The adverse balance of trade for the month was £42 961 000, against £26 674 000 for September, 1925, and £42 710 000 last August. For the nine months the adverse balance is £316 740 000, against £273 360 000 for the first nine months of 1925. Electricity supply undertakings are paying twice as much for their coal as in normal times and the difficulties of obtaining supplies are increasing every day. Such figures require no comment, but they require a good deal of action to compensate for their adverse effects. On the other hand the figures for the electrical industry are satisfactory. The imports during September were £405 973, a decrease of £27 320 from the figure in the corresponding month last year, while for the nine months they amounted to £3 390 508, a decrease of £426 215 on last year's figures. The month's exports amounted to £2 084 194, an increase of £679 870 on the August figures and of £547 951 on September 1925. The total exports for the nine months were £13 06 434, only £214 298 less than in the corresponding nine months, in spite of the abnormal trade conditions. Though the general position is by no means good the electrical industry deserves congratulation for holding its own when others are faring so badly.

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BOILING PLATE DESIGN.

Evolution of the Open Type—Some of its Weaknesses and the Efforts to Overcome Them—Employment of the Bar Insulator—Fireclay versus Mica.

By STANLEY F. BICKELL, A.M.I.E.E.

THE inception of the open type boiling plate, whilst providing solutions to many of the inherent problems of the two types of plates previously considered,* viz., the mica element and the cement or enamel-filled plates, brought with it an entirely new set of difficulties, apart from those inseparable from open type elements generally. In its earliest form, which may be styled the refractory disc element (Fig. 1), it consisted of a disc or plate of fireclay, the top surface of which was indented by a number of U-shaped troughs. At the bottoms of these troughs was laid the helical resistor, sufficient clearance being allowed between the top point of the convolutions of the coil and the top surface of the disc to prevent contact with the utensil. The arrangement of these troughs about the face of the disc was effected in many varied ways, examples being parallel, coil and clover leaf formation—the only advantages gained by careful design being simplicity of coil form and a minimum of anchored points, the latter making for cheap assembly as well as increased reliability. Thermal transference was effected by direct radiation and incidentally by conduction *via* the fireclay itself. With flat bottomed utensils results were recorded which closely approximated to those obtained with enclosed type plates under similar conditions, but when applied to normal kitchen usage, where utensils with convex or concave bases appear to be the rule, definite superiority was established in rapidity of operation due to the radiant method of heat transference. In general efficiency, therefore, the change from the enclosed to the open type of plate appeared to be a step forward. Simplicity and cheapness of construction were undoubtedly achieved.

The first weakness to present itself however, and one of a most serious nature, was the total exposure of the resistor

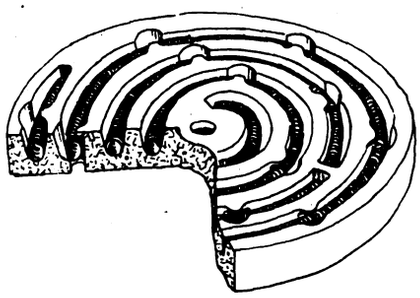

Fig. 1.—Example of refractory disc type boiling plate.

to damage. The spilling or boiling over of water had little effect on the coil, but the more viscid liquids, such as porridge, jam, custard, etc., invariably proved fatal, sooner or later, to the life of the element. The incineration of the semi-solids on the coil gave rise to " hot spots " due to blanketing of the wire, and oxidation was accelerated to a surprising degree at that point. At the same time numerous faults were due to forks, skewers and even hairpins coming into direct contact with the resistor, frequently to the discomfort of the operator where an earthed system prevailed. In some cases this contact was accidental; in others it was traceable to a misguided attempt at the removal of foreign matter from the coil. The result, however, was the same, and frequent burn-outs necessitated the abandonment of the design in spite of its several real attributes.

In endeavouring to overcome the troubles due to exposure of the coil, cement filling was resorted to, but without success, previously described difficulties arising, The obvious solution, and one which has been tried, was the covering of the disc by a metal plate. This was a direct reversion to the enclosed type of plate, and whilst effectively protecting the spiral, it inserted a serious resistance in the transmission passage, and resulted in rapid oxidation of the wire by raising its working temperature.

It is of interest to note that a new plate of the refractory base type recently appeared on the market, due, it would seem, to American influence on British design. Although much ingenuity is apparent in the efforts made to provide adequate drainage, the writer does not view the attempted revival with much enthusiasm since the inherent faults are still uncorrected. This type of plate has enjoyed considerable popularity throughout the United States for some years, but it must be borne in mind that the standardised voltage of 105/110 V which prevails there, permits of a heavy gauge resistor being employed, which provides valuable mechanical strength and increases the resistance to damage. At the same time the low potential to earth and the alternating

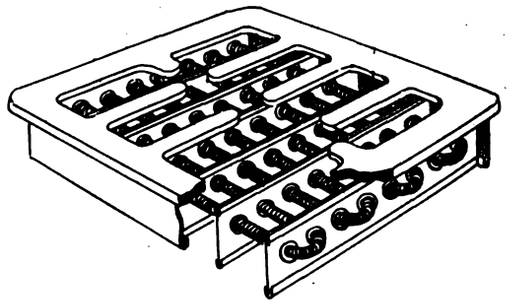

Fig. 2.—An early pattern of open type boiling plate using mica insulation.

nature of the supply are both advantageous factors. Where pressures of 200 to 250 V are found, as in this country, the gauge of the resistor is necessarily reduced, since its length is a more or less predetermined quantity limited by the size of the disc and the interspacing of the troughs.

Following upon the failure of the disc type element to provide a reliable means of heating utensils, a simple and somewhat obvious step in the evolutionary progress of the boiling plate was made with the institution of the bar insulator type. Several forms of this element, varying slightly in design, were evolved, the earliest being one in which the resistor in coil form passed through holes in mica plates (Fig. 2). The mica was strengthened by ribs of steel along its edges and eyelets were employed to bush the holes. Ample drainage was attained due to the extremely open form of construction, but the efficiency was poor and boiling was a lengthy operation. Heat transference was effected solely by radiation and the absence of any refractory base, together with the high convection losses, accounted for its inefficiency. At the same time the coils were supported at some distance from the utensil and a cast iron grid of open design inserted between the element frame and utensil. This was necessary in view of the fragile nature of the frame. Although danger from spilled liquids was not so acute there was still the possibility of semi-solids falling directly on the coils, but the design owed its failure to its slowness of operation rather than to unreliability.

In the next form to be evolved fireclay bars replaced the mica as a dielectric. The coil, instead of being threaded through holes, fell into slots in the bars, a zig-zag formation

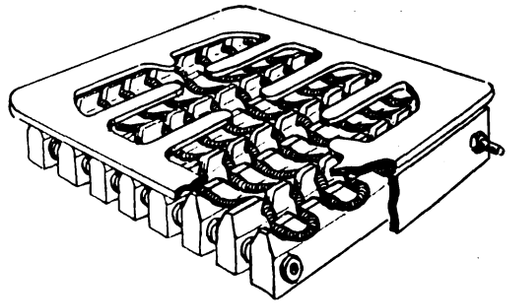

Fig. 3.—Another pattern of open type boiling plate employing fireclay insulation.

being employed, primarily to assist in anchoring the coils; incidentally it allowed of a somewhat longer resistor of heavier section being used, which increased its mechanical strength.

This type of element (Fig. 3) has enjoyed great popularity and still persists in several manufacturers' specifications for want of a better device. Perhaps its greatest attribute is the extreme ease with which a resistor may be replaced. Were it not for

(*Concluded on p.* 448.)

* THE ELECTRICIAN, March 26th, 1926.

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AN UNDERGROUND AUTOMATIC SUB-STATION.

Latest Enterprise of the Charing Cross Electricity Supply Co.—Important Sequence Control Device.

THE Soho Square sub-station of the Charing Cross Electricity Supply Co., which was officially reopened on Tuesday after important extensions and rearrangement had been carried out, is of exceptional interest not only because

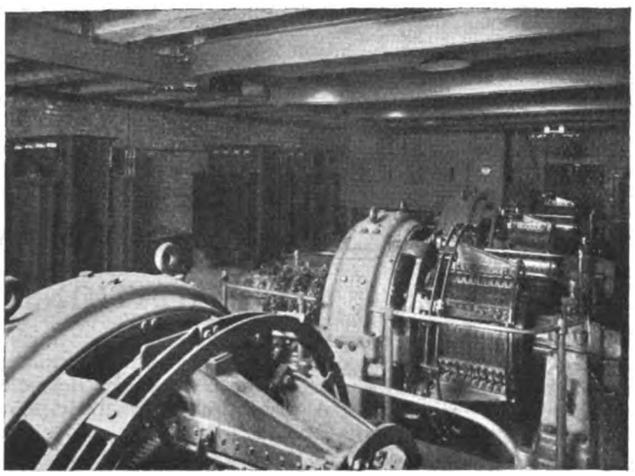

Fig. 1.—View of the sub-station underground. The transformers are seen in the background.

it is probably the first underground automatic sub-station in this country, but also because the equipment embodies a number of features which are of considerable importance in sub-station practice.

The original sub-station at this point consisted of a large street box containing six mercury-arc rectifiers of a total capacity of 200 kW. This equipment having proved inadequate to meet the demand on the system, an underground installation was adopted in 1925, two Metropolitan-Vickers 300 kW rotary converter sets arranged for fully automatic operation being housed in an excavated chamber under the pavement and roadway opposite Carlisle Street on the west side of the square (see Fig. 2). This underground chamber was 28 ft. 6 in. long, 14 ft. wide and 10 ft. high, and all the

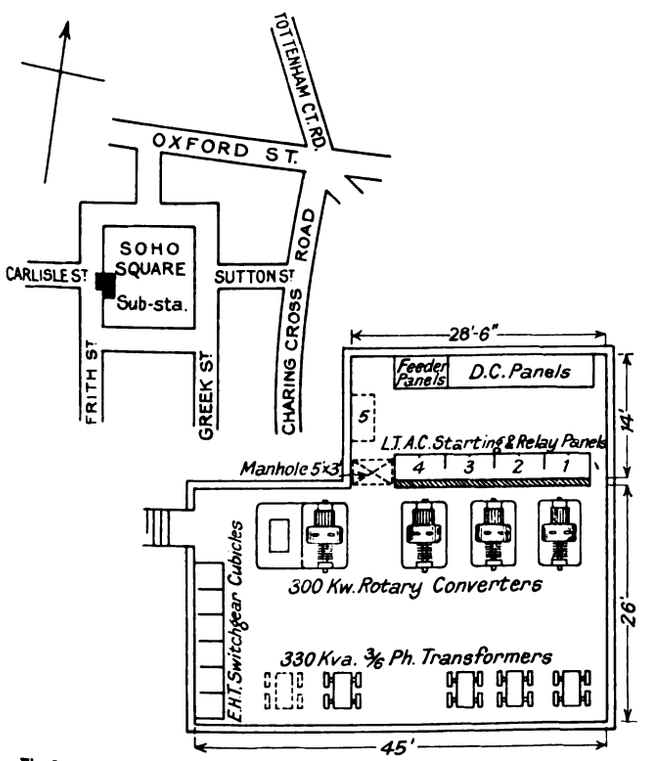

Fig. 2.—Map showing position of new automatic sub-station of Charing Cross Co.

equipment was taken down into it through a pavement manhole 5 ft. by 3 ft.

Considerable extensions and improvements to the sub-station have just been completed. The underground space has been extended by an annexe 45 ft. by 26 ft. and 10 ft. high excavated under the gardens. The sub-station now contains four (but with provision for a fifth) 300 kW rotary converters, with transformers, switchgear, and automatic control gear, to convert the incoming 10 000 V three-phase 50 period alternating current into direct current at 202 to 212 V. The machinery will run entirely without attendance beyond occasional visits for inspection, the station starting up automatically when the voltage falls on the d.c. mains and shutting down as the load falls off. Voltage regulating equipment is provided to maintain the pressure on the direct-current distribution network within half a volt of the desired value. The automatic control gear has been arranged to give sequence control, that is, the five machines may be made to start up and shut down in any desired order. The sub-station is believed to be the only fully automatic sub-station in the world equipped for the sequence control of so many units. The whole of the equipment has been supplied by the Metropolitan-Vickers Electrical Co.

The high tension current is supplied to the sub-station through two feeders at 10 000 V. The high tension switchgear includes two Metrovick type K oil-switches in sheet-steel

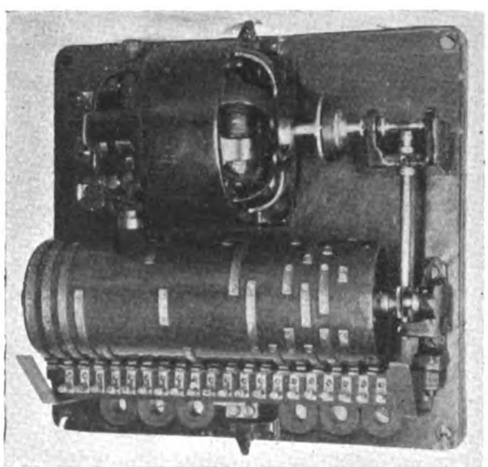

Fig. 3.—Metropolitan-Vickers sequence relay for control of multi-unit, automatic sub-station.

cubicles for the incoming feeders, each unit having a breaking capacity of 150 000 kVA. Four oil-switches control the supply to the machines, provision being made for the addition of a fifth unit. Bus-bar sectionalising switches are provided so that two machines can be operated from each feeder. The high tension current is stepped down to 152 V for the rotaries by 3/6 phase oil-immersed transformers shown in Fig. 1. The cooling radiators for the transformers are arranged as separate detachable units in order that the apparatus might pass through the small entry to the sub-station. The rotary converters are standard Metrovick tap started machines operating at 1 000 revs. per min. and supplying direct current at 202/212 V through the feeder circuit-breakers to the network.

The low tension switchboard has four machine panels, with space for a fifth, each panel being fitted with 1 500 A main contactors and similar contactors in shunt to overload limiting resistances. There is also a separate panel carrying the sequence control gear. The l.t. bus-bars are in duplicate, with change-over switches for connecting each machine to either bus-bars. The l.t. line pressure is adjusted by automatic voltage regulating equipment which maintains the pressure within half a volt of the required value. The complete sub-station equipment, including the voltage regulating apparatus, can be operated manually should occasion demand and provision has also been made so that, if at any time desired, the sub-station can be shut down or prevented from starting by means of a control switch at the St. Martin's Lane sub-station. The automatic control gear shown in Fig. 4

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is of the Metropolitan Vickers standard type, and is arranged to start up the first machine when the bus-bar voltage falls below a certain value and the second and subsequent machines when the load on the bus-bars exceeds a predetermined value. When the load on the bus-bars falls to a value which can be carried by fewer machines than are operating, the last machine in the sequence is disconnected and shut down. In each case, time delay devices prevent operation of the apparatus if the change of conditions is not maintained for a predetermined period of time.

A novel feature which is of special interest and importance is the provision which is made for pre-arranging the sequence in which the machines are to start and shut down. The starting panel for each machine is fitted with a plug receptacle into which a plug carrying sequence control leads for that machine can be fitted in five different positions. According to the position selected, that machine will start up first, second, third, fourth or fifth in order. The plugs have differently arranged contacts and constitute a set, so that whatever the order, a complete sequence is always obtained. The order

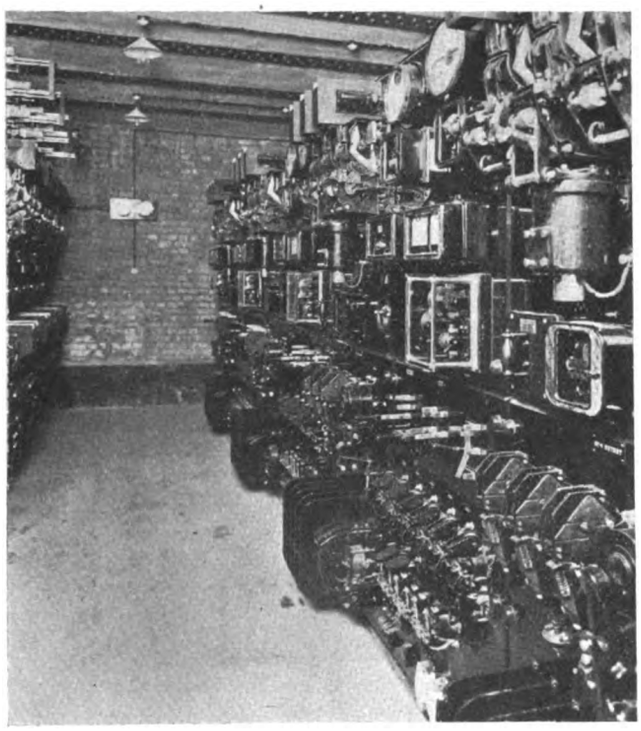

Fig. 4.—Low tension a.c. starting and relay panels.

of shutting down is similarly controlled by the sequence apparatus and is the reverse of the order of starting up. Should any machine be locked out, due to a fault, when its turn comes to start up, the automatic apparatus will immediately start up the next machine in the sequence. In the event of a machine failing to connect in its turn for any reason other than lock out by the protective gear, the next machine in the sequence will be automatically started after a time delay sufficient for the other machine to have operated.

Fig. 3 shows the motor driven drum controller by means of which the sequence control is operated. The various relays cause the motor to drive the drum by stages in a forward or reverse direction as required to start or to stop the machines. It is a point of special importance in the sequence control apparatus here described, that the sequence of the sets can be altered at any time even while the rotary converters are running. By this means any machine can be taken out of its sequence and shut down for examination without interfering in any way with the operation of the sub-station.

Protective gear to meet all contingencies is included in the apparatus. The arrangement is such that while the safety of the equipment is assured, interruption of service is reduced to a minimum. If the load exceeds the safe capacity of the machines, current limiting resisters are automatically inserted for all the rotaries so that the load is limited to a safe value and is shared equally by the machines in operation. Should the overload be prolonged, thermostats operate to cut off the machines until the resistances have cooled, when the rotaries will automatically restart. In the event of any trouble which cannot be automatically cleared, such as the failure of a machine to start or the overheating of bearings, a lock-out relay operates to put the affected machine or machines out of commission until the station has been visited and the trouble remedied. In the meantime the sequence control gear already described maintains the operation of the other machines without interruption.

Ventilation of the sub-station is effected by means of a fan mounted in the air duct. If the sub-station is under sequence control the fan is automatically started when the first machine starts up and is not stopped until the service of the sub-station is no longer required.

The Soho Square sub-station is an interesting example of the way in which the extremely difficult problem of providing space for sub-stations in a part of London, where the cost of building space above ground is practically prohibitive, has been solved by an energetic and progressive policy. The use of such underground automatic sub-stations may well prove the solution to the difficulty of dealing with overloaded networks in other congested areas.

NEW B.E.S.A. SPECIFICATIONS.

THE British Engineering Standard Association have issued two new specifications dealing with indicating instruments and the electrical performance of industrial electric motors and generators with Class A insulation respectively. Both may be obtained from the B.E.S.A. Publications Dept., 28, Victoria Street, London, S.W., price 1s. 2d. post free.

The first specification deals with indicating ammeters, voltmeters, wattmeters, frequency and power factor meters. It supersedes and is more complete than the 1919 issue. It provides for instruments having sub-standard, first and second-grade accuracy, and among the additions the following may be specially noted:—

A clause has been included to provide for satisfactory damping. The table of accuracies has been amplified and, in common with most of the clauses of the specification, exhibits a tendency to make the requirements more stringent. The new specification provides for a dynamometer wattmeter having special accuracy, this having been introduced for use particularly in acceptance tests of electrical machinery. A clause has also been inserted specifying tests for wattmeters and power factor meters for use on unbalanced three-phase loads.

An appendix deals at length with the accuracy to be expected of different types of instruments, a subject upon which but little information has hitherto been available. Suitable methods of testing instruments are also dealt with.

Another appendix gives the drilling centres recommended for shunt ends, these recommendations being based upon recent research which has shown that a large contact area is not in itself a sufficient criterion. A very complete scheme of terminal markings has been drawn up with the object of ensuring uniformity in diagrams of connections issued by different makers.

A further point of interest is the note in the specification which draws attention to the fact that British manufacturers may be licensed to use the trade mark "BESA" to indicate that the instruments are guaranteed to comply with the specification.

The second specification is a revised edition of B.E.S.A. Publication No. 168, which deals with the electrical performance of industrial electric motors and generators with Class A insulation. This specification was originally published in 1923, and forms part of the series of eight specifications which replace Publication No. 72-1917.

The revision is mainly that of arrangement. In order to bring the British specification into the form recommended by the International Electrotechnical Commission, the body of the specification contains only matter defining the performance of the machine on test at rated load.

Information regarding the service conditions under which the machine is suitable for operation at its rated load and the sustained overloads permissible in service under various conditions of cooling air are given in a separate appendix. These permissible sustained overloads have been slightly rearranged in a more convenient form, and it is felt that the new edition should make this already serviceable specification yet more useful to both manufacturer and user.

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THE LEIPZIG FAIR, 1926.

Some Notes on an Instructive Exhibition—Electrically-Heated Hot Water Bottles—German Attitude Towards the English.

By T. F. WALL, D.Sc., D.Eng., M.I.E.E.

THE Leipzig Fair was established in the year 1268 and appears to have had a continuous existence since that time. The bulk of the exhibits are now housed in some 100 large permanent buildings scattered about the town, and the number of these is being continually increased. The engineering exhibits are in a special group of buildings on the exhibition grounds in the south eastern suburb—one of the largest of these being that allotted to electrical engineering.

There are two fairs each year, each lasting for one week. One of these, the spring fair, is held at the beginning of March, and the other, the autumn fair, is held at the end of August. Owing to the expense involved in biennial visits, a number of the largest engineering firms have decided to exhibit only at the spring fairs, and consequently there is not much to see in the domain of heavy current engineering at the autumn fair. As an example of the expense to the exhibitor, it may be mentioned that one stand, occupying about 6 sq. yd. of floor space, costs about £25 for the week.

There appears to be no question that these fairs provide a great stimulus to trade and form a valuable means for establishing foreign connections. At the spring fair this year there were 180 000 visitors, and of these, 18 000 were foreigners from all parts of the world.

In the following, brief reference will be made to a number of the exhibits which it is thought may be of interest to readers of THE ELECTRICIAN.

Small Water Power Installations.

A small and compact water power installation was shown in operation. The dynamo is direct coupled to the turbine wheel and no speed regulator is necessary. The turbine runs at its free speed—the speed increasing as the load comes on and falling again as the load is taken off. The dynamo is so designed that the p.d. remains practically constant at all speeds and loads and no auxiliary device such as accumulators, shunt regulators etc., is necessary for maintaining the p.d. constant. No skilled attendance is necessary, as the only operation for starting and stopping is the admission or the cutting off of the water supply.

Sets are built to give 0·4, 0·75, 1·5, and 3 kW, respectively. A dynamo output of 1·5 kW can be obtained from a fall of

10 m. at 30 litres per sec.
20 ,, 15 ,, ,,
60 ,, 5 ,, ,,

This supply will be sufficient for 30 lamps each of 50 c.p., or will raise 15 000 litres of water per hour to a height of 10 m., or convert 220 litres of cream per hour into butter, or skim 1 500 litres of milk per hour, or drive 4 large smith's bellows.

Electrical Energy from the Heat of the Sea.

There is a special section allotted to the German Institution of Inventors, where a large variety of new inventions was shown. From an engineering point of view, the most interesting of these is that of Dr. Bräuer which comprises a remarkable proposal for obtaining electrical energy from the large temperature difference which exists between the surface and at a reasonable depth in tropical and semi-tropical seas.

This proposal was laid before the first World Power Conference at Wembley, but a good deal of work has been put into the development of the idea since then.

The temperature of the surface of the sea is as high as 27 deg. C. at some parts of the ocean, and may even reach a temperature of 30 deg. C., whilst at a depth of about 200 yards, a temperature of about 7 deg. C. is found. The proposal is to provide a tube reaching to the necessary depth in the sea and by means of a propellor to cause a flow of cold water up to the sea level where the heat engine is stationed. By using a working substance, such as ammonia, the hot water at the surface of the sea can be used to produce the evaporation and the cold water the condensation of the working substance. Drawings were exhibited for a plant capable of generating from 200 to 300 H.P., the total cost of which was estimated at about £2 500. The losses of energy corresponding to the power required for the circulation of the cold water are said to be about 9 per cent. to 12 per cent. of the energy obtained from the heat engine. It is stated that an engine capable of developing an output of 100 000 kW would be a practicable undertaking.

For protecting receiving apparatus from static charges, etc., a special switch is provided with accessories. This comprises a single-pole double-throw switch to the centre of which the antenna is connected. When the blade is in the upper contact the antenna is connected to the receiver through a silver wire fuse mounted in a glass tube. This fuse protects the apparatus if the antenna should come into contact with a heavy current transmission line. Also connected across the receiver to earth when the blade is in the upper contact, is a device for clearing the antenna from static charges of moderate potential, e.g., 200 V. The lower contact of the switch is connected to the earth terminal of the receiver. Across the centre of the switch and the lower contact is a "comb" spark gap which relieves the line of pressures of about 500 V. When the switch blade is on the lower contact, the antenna is connected direct to earth.

Outside the house, the lightning arrester is connected between the aerial and the earth and, in accordance with the official regulations, the cross sectional area of this earth connection must be at least twice that of the aerial, and the earth lead must pass to earth in the most direct manner possible. The lightning arrester consists of a special series of spark gaps and it is claimed that the electrical capacity of this arrester is zero. This feature is an important one for short wave reception, that is, for waves of 100 m. and under.

Another interesting exhibit is an electric "Life Preserver." This is a device for giving a powerful electric shock to any person who attempts to attack one with criminal intent. In appearance it is made and is worn to look like a wrist watch and two leads pass from it up the coat sleeve to a small vest pocket battery. In case of an attack, the dummy watch face is removed and a spark gap is thus exposed. A pressure of 10 000 V is developed at this spark gap and by touching the attacker with this he is rendered unconscious. This device is attracting attention in Germany for use by the police, and large consignments are being sent to South America and elsewhere.

A Tiny Electric Motor.

What is claimed to be the smallest practical motor in the world was shown in operation, its chief purpose being the driving of toy models. It can be operated from a dry cell such as a flashlight battery. The overall dimensions are about 1 in. by 1½ in., and the selling price in Germany is only 2s. 6d.

A hot water bottle was shown provided with a plug attachment so that the water is heated when in the bottle. This is claimed to be a new departure and patent applications in many countries have been filed. It is curious that so useful and apparently obvious a device should not have been introduced before.

A very extensive variety of vacuum cleaners was shown, and in particular one type has two entirely new features which seem likely to be of considerable practical value.

One device is for use when cleaning carpets of the coconut matting type. If pieces of string, thread, etc., get lodged in the recesses of the surface it is not easy to dislodge them with the ordinary type of suction fitting. For such purposes, a brush which, by means of a lever, can be projected downwards, sweeps out the recesses whilst the vacuum mouthpiece sucks up these sweepings. Another attachment is supplied for sweeping up such matter as cotton wool which, when spread over the surface of a pile carpet is very difficult to dislodge by the ordinary type of vacuum cleaner. To meet this difficulty a special additional suction mouthpiece is provided by means of which a blast of air is produced *along the surface* of the carpet, thus very effectively sweeping up the clinging threads. For ordinary purposes this special mouthpiece is closed and is, therefore, inoperative, but by touching a small lever with the foot the special mouthpiece is brought into action.

Oil Fuel Burners.

This is a new method for burning oil for central heating installations, foundry furnaces, hardening furnaces, steam boilers, etc. The oil burner comprises a small boiler which

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generates steam at a pressure of one atmosphere. Before reaching the burner the oil passes through a pipe which is immersed in the water in the boiler and thus the oil is heated and rendered fluid before entering the nozzle. The steam from this boiler drives the oil through the nozzle into the combustion chamber. The apparatus will work on "Masut"—the thick black oil which is the last residue of distillation. Actually, during the demonstration, crude oil was being burnt costing about 16s. per 100 kg. It is stated that next year the Deutsche Gasoline A.G. of Hamburg will be in a position to supply benzene artificially produced from coal at a price of 15s. per 100 kg., as compared with the price of about 30s. per 100 kg. for natural benzene.

A Russian Invention.

The Soviet Republic had an extensive display of their products and an inspection of these makes it clear what vast natural resources are available in Russia—gold, platinum, gems, mica, graphite, and asbestos, whilst skins, furs, fruit, wines, etc., are obtained in large quantities. There was also an exhibition of Russian technical and other books and of peasant handicraft work.

An interesting demonstration was given of an electric filament lamp provided with two separate filaments, each of which may be switched into circuit separately and, alternatively, the two filaments may be switched into circuit together. For the particular lamp demonstrated, when one filament alone is lighted the candle power of the lamp is 40. The other filament lighted alone gives 60 c.p., and when both filaments are lighted together the candle power is 100. The advantages of this invention are that a graded illumination can be obtained economically; further, the life of the lamp as a single filament is greatly increased, because when one filament has been burnt out the other may still be used. The cost of the lamp is said to be about 30 per cent. greater than the corresponding normal type of filament lamp.

Cutting Steel Joists.

A very striking demonstration was given of an electric motor driven machine for cutting through heavy steel girders, channel irons, and the like. The cutting tool is a disc of special alloy steel driven at a very high speed, viz., peripheral speeds as high as 130 m. per sec. being attained. The cutting edge of the disc is milled somewhat like the milled edge of a coin, the depth of the grooves being about 1 to 1½ mm. At regular intervals along the edge of the cutting disc grooves are cut, the correct profile of which have been determined by detailed research. The presence of hard places or sand lumps in the material which is being cut has no detrimental effect on the edge of the cutting disc.

As examples of the kind of work which can be done with this cutting machine, the following will serve: The diameter of the cutting discs varies from about 20 to 50 in., according to the work which is to be done. With a cutting disc of 50 in. diameter it is possible to cut through a steel bar 22 in. by ¼ in. in 30 sec., whilst a bar of section 22 in. by ¾ in. may be cut through in 90 sec. A steel rod of square section of 2½ in. side may be cut through in 30 sec. whilst a steel rod 4½ in. by 4½ in. may be cut through in 90 sec.

The Planetarium.

The most impressive sight in Leipzig to-day is, without doubt, the newly completed planetarium which has been constructed by the firm of Zeiss. This comprises a dome 80 ft. in diameter, the inside of which is covered with white material which provides a suitable ground for the projection of the images of the stars and planets. A projection apparatus weighing in all about 2 tons is erected on a movable carriage placed in the middle of the floor. From this apparatus it is possible to project on to the dome the relative positions and magnitudes of a total of over 5 000 stars for both hemispheres. By mean of motor driven parts, the simultaneous movements of the fixed stars, the sun, the moon, and the planets relative to the earth for the whole year in both hemispheres, may be seen. Further, the total motion corresponding to a whole year can be demonstrated in four minutes, one minute, or even seven seconds, by suitably adjusting the speeds of the parts of the projection apparatus. It is indeed a most impressive sight to watch the procession of the stars with the sun, moon, and planets in their correct relative positions, the whole movements for the complete spring, summer, autumn, and winter seasons taking place in a few minutes.

As an educational implement the value of the planetarium is incalculable, and, in particular, dwellers in the northern hemisphere are enabled to become familiar with the appearance of the star-lit heavens of the southern hemisphere. As a means for providing an intelligent description emphasising to the average person the majesty of the panorama of the stars, it is a triumph of contructional skill.

Lecture demonstrations are given several times daily, and although the cost of the equipment must have been enormous, the funds have been provided by the city, and as the demonstrations are very popular the income derived from the charge for admission will probably prove it to be a profitable undertaking.

Pre- and Post-War Germany.

To those who knew Germany before the war, the most noticeable change is the almost complete absence of any sign of the military in the streets. It is now as rare an experience to see a soldier in the streets of a town in Germany as it is in this country. It is a surprising fact that the German people have settled down so completely under the republic, in view of the relatively short time which has elapsed since the shattering upheaval of the revolution.

The average German realises that he now has a greater measure of personal freedom than under the old order and it is extremely unlikely that he will ever want to revert to the former condition of things. At the same time there is no doubt that a strong party does exist who desires a return to a monarchical government, and this party is likely to be a source of concern to those who have the German people's interests at heart.

The nation has acquired a reputation for fair and honourable business dealings, and they no doubt recognise that this is the only sure way to recover their commercial prosperity. They work hard and for long hours, and give the impression of robust, primitive, and inexhaustible energy. Sports meetings are very popular and the recent reception of Vierkötter at Berlin after he had swum the Channel was of a kind which was formerly reserved for royalty. The English people appear to be well liked everywhere, but there is a deep rooted and widespread feeling against the French which cannot be disguised.

ELECTRIC LOCOMOTIVES FOR INDIA.

IN addition to the 41 electric freight locomotives the Metropolitan-Vickers Electrical Co. are building for the Great Indian Peninsula Railway, we understand they have also an order for a high speed electric passenger locomotive, which contains a number of interesting features.

The locomotives will be of 4-6-2 type. It has three driving axles, one four wheel bogie truck, and one two-wheel pony axle working in conjunction with the nearest driving axle, so as to virtually form a four-wheel truck.

The locomotive will be used for high speed service, and will be mechanically safe up to a speed of 85 miles per hour. For speeds of this magnitude it is necessary that as little dead weight as possible should be carried on the axles, and for this purpose the motors and their gearing will be rigidly mounted on the frame and will transmit their power to the driving axles through the universal motion flexible link drive which is capable of accommodating the route of movement between axles and frame; all the weight is thus spring borne and the centre of gravity is comparatively high so that the truck is thereby relieved from shocks.

The locomotive will be fitted with six 360 H.P. motors and provided with the Metro-Vick standard electro-pneumatic control.

It is the ultimate intention to operate the passenger locomotives in conjunction with some of the freight locomotives mentioned, on the section where the railway crosses the Ghats, and where average gradients of 1 in 40 are encountered over long distances. On these gradients a passenger train will be assisted by a freight locomotive operating as a banking engine, and the characteristics of the two locomotives have to be such as they will operate together with a proper sharing of the load.

The weight in working order of the passenger locomotive will be about 92 tons, of which about 58 tons will be adhesive weight, i.e., about 63 per cent. It may be remembered that this new electrification is an extension of the already electrified tracks in Bombay itself, and is to operate on a 1 500 V overhead wire system.

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H.T. CABLE MANUFACTURE.

Some Notes on Recent Progress—Increasing Use of 60 kV Three-Phase Cable—Impracticability of Graded Insulation.

By M. HOCHSTADTER.

THE following article is based on a report on a paper which was presented by Dr. H. Meurer as a communication from the Felten and Guilleaume Carlswerk A.G., to the recent Convention of Electricity Authorities in Munich

The application of three-core stranded cables, especially of the H type, for three-phase transmission at 50 to 60 kV has already passed the experimental stage, a considerable quantity of such cable, partly for submarine purposes, having been laid. The impregnation of the relatively thick walls of insulation for cables up to, say, 110 kV does not present great difficulties. This is shown by the ionisation characteristic of a three-core type H cable with a copper cross-section of 185 sq. mm. with 15·5 mm. wall thickness of insulation of the cores and a diameter of 104 mm. under the lead sheath. The low value of the loss angle and the almost horizontal characteristic up to a phase voltage of 125 kV, corresponding to a line voltage of 220 kV, point to a well dried and well impregnated cable. This in itself is not novel, for cables with 12 to 17 mm. of insulation have been repeatedly made, and when tested showed equally good ionisation characteristics up to a still higher maximum stress than the value of 8 kV per mm. of the present case.

Reducing Insulation Thickness.

For mechanical and other reasons it is eminently desirable to reduce the thickness of insulation for high voltage, e.g., 110 kV cables. Not only would such an improvement lighten and cheapen cables for very high voltages, but also for medium voltages. Now, Dr. Meurer describes such a method for reducing the thickness of the insulation without lowering the factor of safety of the cable. He starts from O'Gorman's idea of graded insulation, in which the consecutive layers have decreasing dielectric constants from the interior to the exterior. However, this proposal has so far proved to be impracticable on account of the lack of suitable materials for grading. Meurer grades without the introduction of any new material into the cable, other than paper and oil, the necessary constituents of impregnated paper insulation. He obtains grading by varying the ratio of paper to oil in the several layers by using paper of different densities for the several layers. To obtain the desired result the ratio of paper to oil must decrease towards the exterior, or, in other words, denser paper must be used near the conductor than at the surface of the insulation. Meurer gets the denser paper by subjecting the normally machined paper to a rolling process, by which it is highly compressed. The grading may be carried out in three stages: the layers next to the conductor consisting of fully compressed paper, the middle group of layers of semi-compressed paper and the outside group of non-compressed paper, all three groups being fully oil impregnated. Thus, bearing in mind that the dielectric constant of cellulose is about 6, and that of impregnating oil 2·5, it can be seen that it is possible to grade the dielectric constant of the mixture paper, plus oil, to a certain extent. By this means it is possible, according to Dr. Meurer, to reduce the maximum gradient of the layers nearest to the conductor by about 13 per cent.

Compressed Paper.

The use of compressed paper brings about another very important advantage, since it has a higher dielectric breakdown strength than the same paper before compression. This advantage results in an increase of 15 per cent. in the breakdown strength of a cable manufactured according to Meurer's proposal of three-stage grading. This, together with the aforementioned 13 per cent., gives an approximate total improvement of 25 per cent. in the factor of safety compared with a cable made with non-compressed paper only.

During the year 1925 a number of three-core cables for 25, 30 and 55 kV, all of the " H " type and graded according to Meurer's proposal, have been manufactured. The 55 kV cable has a length of 28 km and contains a submarine part of 5·4 km length for connecting the high-voltage systems of Sweden and Denmark through the Oeresund. The cable has a copper section of 95 sq. mm. per conductor, capable of transmitting a current of 200 A per phase in continuous service. The diameter under lead sheath is 79·3 mm., the overall diameter of the submarine cable 112 mm., and that of the land cable 103 mm.

An experimental line of three single-core type " H " cables with graded insulation, and specially armoured for 110 kV three-phase transmission, has been put in service as part of an overhead transmission line with insulated neutral point.

The reporter believes that the grading of the paper according to its density as measured by the resistance to the passage of air has first been proposed and applied for high tension cables by the Societa Italiana Pirelli, Milan.

Papers of various density may be obtained by different methods besides calendering, for instance, already in the paper mill, by using different kinds of raw material, or by different treatment during manufacture. Actually, papers of different makers are seldom to be found of the same density, and the paper mills are able to supply both machined and calendered papers the density of which, as measured by the passage of air, varies between wide limits.

From the article no conclusion can be drawn as to the definite results of paper grading in high-tension cables.

REVIEWS.

Combustion in the Power Plant. By T. A. MARSH. (London: Constable and Co.) Second edition. Pp. xi + 247. 12s. net.

Mr. Marsh deals with combustion problems in a very able manner and the reader will soon gather that he speaks out of a full heart and experience gained in many years contact with actual trouble problems. We gather he is one of the principal engineers of the Combustion Engineering Co., and as his work deals largely with boilers in actual operation, nearly all his discussions are applicable, though based on American practice, to all countries and all fuels.

We are much pleased with and interested in the number of curves giving empirical though practical data on many little known qualities met with in boiler design and operation. We could wish that the " argot " of the American combustion engineer could be accompanied by a glossary, because we are sure that many of the " snappy " expressions he uses have a real value. Some we have frankly abandoned as untranslatable. One question boldly printed which intrigues us much is " What to do when boilers pop." Other questions which apparently every fireman should be able to answer before they were asked, would, if put to us only receive Lewis Carroll's answer " Rilchiam." (Preface to the " Hunting of the Snark.") However, we much admire what the writer calls and recalls his gospel, which is sufficiently set out in the quotation " Get the religion of the gospel of ' Clean ' and ' Tight ' if you want to reach the heaven of increased salary."

We heartily recommend this book to all practical boiler men and also to connoisseurs of engineering literature (of which we have a few even in Britain). They will be both edified and -nstructed. W. M. SELVEY.

Practical Ultra-Violet Light Therapy. By T. CLYDE MCKENZIE and A. A. KING. (London: Ernest Benn, Ltd.), pp. 108. 6s. net.

This handbook, which is confidently recommended in a foreword by Sir John Robertson, the Medical Officer of Health for Birmingham, is designed to give the ordinary general practitioner a succinct but sufficient account of the most recent practice and methods in ultra-violet therapy. The general account of the nature of light and energy, with which the book opens, is clearly written. The lamps described are mercury vapour arcs, only passing reference being made to carbon and tungsten arcs, and the authors pin their faith to their own adaptation of the atmospheric mercury vapour type. They state that although its robustness has been proved by deliberate maltreatment, it has never broken in practice. When irradiations are conducted with the lamp suspended over the body of the patient this is obviously an important consideration. At the end of the book the authors describe a practical test for the actinic strength of the lamp which should have a wide use. The illustrations and general get-up of the book are excellent. L. T. M. G.

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Boiling Plate Design.

(*Concluded from page* 442.)

this redeeming feature it is likely that it would have shared the fate of its predecessor long ago, since in operation it is slow and inefficient. Cheapness in construction assisted its popularity to a large degree. The greatest fault connected with it, however, is its proneness to damage by the spilling of liquids. At each point of contact between the coils and their supports exist potential receptacles for the accumulation of foreign matter. Large drainage ducts and knife edge coil supports do not mitigate this trouble which, coupled with its inefficiency, is sufficient to stamp it as a type having little future possibility of development.

Before proceeding to the consideration of the more modern designs an American boiling plate of somewhat unique construction is worthy of notice. From Fig. 4 it will be seen

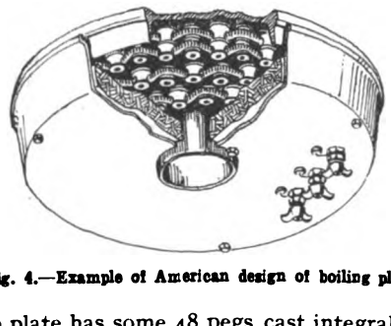

Fig. 4.—Example of American design of boiling plate.

that the top plate has some 48 pegs cast integral on its lower face. Each peg is encircled by a steatite insulator around which the coil resistors are interlaced. By following a zig-zag path the coil is arranged, under tension, to make intimate contact with the insulators along a considerable portion of its length, thereby facilitating the conduction of the heat direct to the top casting. A thermal insulating block holds the steatite reels in position against the underface of the plate, and a steel housing seals the whole more or less hermetically. The restriction of the circulation of air undoubtedly retards oxidation. Early troubles with this design were due to cracking and buckling of the cast plate, which when in operation attained red heat. This was rectified by the formation of a heavily flanged hole through the centre of the casting which not only took up the severe stresses of sudden construction and expansion but also acted as a funnel when the plate was uncovered by a utensil, through which a cold air stream flowed, cooling the plate at its hottest point. The working temperature of the resistor was at the same time reduced to a minimum by the imposition of a second coil below the original coil, the studs being lengthened to accommodate the second layer of insulators. This method enabled double the length of wire to be employed for heat diffusion, with a proportionate reduction in the loading per unit length.

In this design, however, an unexpected fault arose, due to the expansion of the coil under heat. This took two forms, which together resulted in the contact of the coil with the top plate. The first effect was the lengthening of the coil and loss of the tension which held it against the insulators. The second was a twisting along the coil axis, resulting in a helical coil form. This latter effect was sufficient to lift the already loose coil at various points until contact with the top plate was established. At the same time the first effect destroyed one of the primary features of the design, namely, the intimate contact between resistor and insulators. This resulted in overheating of the coil and subsequent burn-out.

Another frequent fault is attributable to the use of cast iron for the top plate. Constant attainment of red heat results in the formation of scale, which in curling back or falling off is prone to make contact with the coil. The substitution of a nickel-chromium alloy is indicated, and were scaling the only fault the extra expense involved would be justified.

Despite the ingenuity of this design, its rapid heating and high efficiency characteristics, it has not solved the boiling plate problem, owing its failure in this respect to unreliability resulting from the particular method of coil suspension adopted.

From Batteries, Ltd., Crabb's Cross, Redditch, a list (No. 7/26) is to hand, giving particulars of the Nife steel-plate accumulator, which it is claimed is an ideal battery for motor cycles, as it contains neither lead nor acid, and is unaffected by the most violent vibration.

CORRESPONDENCE.

THE DETECTOR PROBLEM.

[To the Editor.]

Sir,—Although I invariably read with the greatest interest Mr. L. B. Turner's "Notes on Wireless Matters," and although I know Mr. Turner's capabilities much too well to venture on any serious controversy with him, I cannot help feeling that in your issue of October 8th he has treated the detector problem rather too light-heartedly. He has quite successfully shown that there is little choice between the three types of detector (crystal, anode rectification, and grid rectification) as regards "time lag," but there are other equally important points.

For example, there is the matter of the introduction of harmonics of the audio frequency, as regards which it may be stated that with a properly arranged crystal detector they are entirely negligible; with a grid rectifier they are perceptible but not obtrustive if the H.F. carrier wave is reasonably large and the modulation percentage small; for the anode rectifier, the second harmonic is the only one of any importance, and this will probably have a percentage of the order of quarter the modulation percentage.

Again, there is the question of distortion due to the varying impedance of the output circuit coupling (transformer, etc.). This is only important if the impedance of the coupling is not large compared with the output impedance of the detector; since the output impedance for a galena crystal is of the order of 100 Ω; of a grid rectifier, of the order of 20 000 to 40 000 Ω; and of an anode rectifier, of the order of 100 000 to 500 000 Ω, the advantage obviously lies with the crystal.

Lastly, there is the very important matter of the effect, if any, of the audio frequency on the efficiency of rectification. This is negligible in the case of the crystal and that of the anode rectifier, but in the case of the grid rectifier may cause a falling off with rising frequency of the order of 200 or 300 per cent. even under good conditions. It is true that this falling characteristic may occasionally be useful, since transformer and other forms of coupling tend to have a rising characteristic; but this does not alter the fact that it is distortion, and severe distortion at that.

The points which I bring forward are, of course, all well known; if authority is needed, they will all be found fully dealt with in the two series of articles on rectification by F. M. Colebrook in "Experimental Wireless."*—I am, etc.,

Blackheath, S.E.3. P. K. Turner.
October 11th.

A NATIONAL WIRELESS WEEK.

[To the Editor.]

Sir,—Arising out of a suggestion made by the writer, the period dated November 7th to 13th is to be set aside as a "National Wireless Week." A very excellent programme has been arranged by the British Broadcasting Co., and the idea is that every owner of a wireless set should, during that week, invite his friends to come and listen. In other words, every wireless set owner is asked, like the Boy Scout, to do a daily good deed in this manner. A large number of people do not realise that a wireless set has long ceased to be merely an expensive toy, but is rather a means of receiving song, sound and speech for the purpose of instruction and entertainment. So, during this week they are to be given an opportunity to really hear what modern reception is like.

It is hoped that every reader who has a wireless set will put it into first-class order and then make a special point of inviting his friends to come in and listen during this National Wireless Week. Incidentally, this is also the Birthday week of the B.B.C. Again, during the same period, Armistice Day occurs. A wonderfully inspiring memorial programme has been arranged for that occasion, which should not be missed by anyone, particularly those who do not possess a good wireless set. So, in the words of the slogan adopted for

NATIONAL WIRELESS WEEK
November 7th–13th,
"LET YOUR FRIEND LISTEN."

—I am, etc.,

East Grinstead. R. Borlase Matthews.
October 11th.

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* F. M. Colebrook, B.Sc., A.C.G.I., D.I.C.: "The Rectifying Detector," E. W. and W. E., March, April, May, 1925; "The Rectification of Small Radio Frequency Potential Differences by Means of Triode Valves," E. W. and W. E., November, December, 1925; January, February, 1926.

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NEWS IN BRIEF.

World Copper Combine Formed—Salford Cable Order Placed Abroad—Disastrous Fire in Sydney—New Zealand Again "Buys British."

BLACKPOOL Tramways Department will buy an electric crane.

An electric bed lift has been presented to Liverpool Royal Infirmary.

A massage and artificial sunlight clinic has been opened at Fairlight Hall, Tooting.

It is reported from New York that the proposed world copper combine has now been inaugurated.

Epsom U.D.C. has invited tenders for an extension of its electricity works at Bromley Hurst.

The strike of employees of the Indo-European Telegraph Co. in Soviet Union territory is reported to have terminated.

The Mines Department states that the Blackpool illuminations can be resumed immediately a coal settlement becomes certain.

A recent survey of 123 American schools showed that 74 were inadequately lighted, and that the remaining 49 were only fairly well lighted.

Between 5 and 10 per cent. of the 6 371 617 farms in the U.S.A. have a supply of electricity available either from central stations or from private plants.

Osaka (Japan) municipality proposes to construct a high-speed electric railway system, part of which will be underground. The cost is estimated at 200 million yen.

The Institution of Civil Engineers' "James Forrest" lecture will be given by Senatore G. Marconi on October 26th at 6 p.m. The subject is "Radio Communications."

To supplement the hydro-electric plants to be developed along the Shinanogawa (Japan), the construction of a steam station at Tsurumi with three 20 000 kW sets is contemplated.

An historical sketch of the development of the electric lamp was presented to the Paisley Association of Electrical Engineers by Mr. H. R. Heys at the opening meeting of the session.

During Tewkesbury shopping week in December, the Shropshire, Worcestershire and Staffordshire Power Co. will hold an electrical exhibition with demonstrations in a local hall.

Sir Hugo Hirst will preside at a luncheon of the Institution of Fuel Economy Engineers at the Connaught Rooms, London, next Wednesday at 1 p.m. Sir Robert Horne, M.P., will speak.

The Swedish Telephone Director, M. Lignell, states that telephone connection between Stockholm and London, via Germany, will probably be effected during the present autumn.

Members of the Glasgow and District Branch of the Electrical Association for Women visited the Paisley power station last week and were conducted over the plant by Mr. W. Blair Smith, engineer and manager.

Applications for space in the British Industries Fair have been received in such large numbers that already both the London and Birmingham sections are considerably larger than they were at the opening of the Fair this year. The total area applied for exceeds 250 000 sq. ft.

Protesting against a contract being given to a Dutch firm for electric cable when it could be bought in Manchester at slightly increased prices, Coun. Worthington at last week's meeting of Salford Town Council moved that the Electricity Committee should reconsider the matter. By 39 votes to 17 the Council decided to accept the Dutch tender.

Mr. W. J. Liberty, Public Lighting Superintendent of the City of London, lectured on "The History of Artificial Lighting" at the Society of Engineers last week. He stated that in about 500 miles of streets in London alone there were 30 000 gas and electric lamps lighted by the local authorities, while there were 160 000 electric lamps in the tube railways.

The "Liverpool Daily Post" and "Echo" exhibition of Liverpool's industries is to be held at Owen Owen's old building, London Road, Liverpool, from October 15th to 30th. The front of the building will be illuminated each night by a flood light of 250 000 c.p. and from the roof a 100 000 c.p. searchlight will play on the night sky. It is said that these illuminations will be carried out without in any way infringing the emergency regulations.

Reading Corporation is about to instal electric lighting in its maternity home at a cost of £350.

Tenders for the erection of sub-stations have been invited recently by Halifax and Salford Corporations.

M. Loucheur visited Brussels on October 7th, it is believed with the object of forming an electricity cartel similar to the steel cartel.

Extensive damage is reported to have been done by fire at the five-storeyed building in Sydney of the Australian General Electric Co.

HOW TO SELL A HOUSE.

IF you know a builder with houses to sell you can sell them for him, and at the same time render a service to the Better Home Lighting Campaign cause. The way to do this is indicated on page 452.

Communication with South Russia, Iraq, Persia, India, and the Far East by the Indo-European Telegraph Co.'s route has been restored.

A junior technical officer, with knowledge of the design of electrical apparatus, etc., is required at an Admiralty experimental establishment.

Edinburgh Corporation approved, last week, the recommendation of the Electricity Committee to make a contribution of £200 towards the expenses of the E.D.A.–E.L.M.A. Better Home Lighting Campaign.

Cabling from New Zealand on Tuesday a "Daily Mail" correspondent stated that the Auckland Electric Power Board has given additional contracts for £30 000 to British electrical firms. Swiss and German tenders were higher than the British offers.

Mr. J. L. Baird delivered a lecture on his television apparatus in London last week, when the information given was substantially the same as that which has been published previously. An interesting statement, however, was made in regard to the light-sensitive cell, viz., that, to overcome the sluggishness of the selenium cell, Mr. Baird uses visual purple—the actual substance of the retina of a human eye. It is stated that before long television apparatus will be on sale at about £30.

Overseas Trade.

Electrical Exports for Nine Months Exceed Imports by £9 670 726.

IMPORTS of electrical goods into this country in September were valued at £405 973, a decrease of £27 320 compared with September, 1925, and imports of the same classes of goods in the nine months ended September last amounted to £3 390 508, decrease £426 215. Compared with August of this year, however, last month's imports show an increase of £40 399.

The value of the electrical exports for September was £2 084 194, an increase of £679 870 over those for August of this year, and £547 951 over September of last year. The total of this year's electrical exports, from January to September inclusive, is £13 061 234, only £214 298 less than the total for the corresponding nine months of last year; up to the end of August the decrease was £762 249.

Comparing exports with imports, it is seen that the former exceed the latter by £1 678 221 for September alone, and by £9 670 726 for the nine expired months of the present year.

Notable increases are shown by exports during September of electric wires and cables, rubber insulated, other than telegraph or telephone wires or cables, total £138 764 (increase £20 918), ditto, with insulation other than rubber, total £172 615 (increase £90 170); submarine telegraph and telephone cables, total £668 510 (increase £243 597); telegraph and telephone instruments and apparatus, total £257 528 (increase £54 145); and electrical instruments, other than telegraph and telephone, total £31 229 (increase £7 768).

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ELECTRICITY IN SOUTH AFRICA.

Special "Electrician" Interview with Member of Electricity Supply Commission—Unification of Supply—Railway Electrification Progress.

TROUBLES experienced in this country in the erection of overhead transmission lines are trifling when it is remembered that in South Africa many of the lines are passed under by teams of 24 oxen, the driver of which has a whip long enough to reach the leading animal!

An "Electrician" snapshot of Mr. A. M. Jacobs in his London office.

This was mentioned by Mr. A. M. Jacobs—a member of the Electricity Supply Commission of the Union of South Africa, during an interview in London with a representative of THE ELECTRICIAN—in expressing surprise that overhead transmission is so little used in Britain when compared, say, with the U.S.A. and Japan.

The South African Electricity Commission, it should be explained, is rather different from our Electricity Commission, which corresponds to the Electricity Control Board in South Africa, which is a Government organisation and is directly controlled by the Government. The South African Electricity Supply Commission is not a Government organisation. It has—like any private undertaker—to apply to the Electricity Control Board for licences to establish undertakings. But, in addition to undertaking its own works, the Commission can act as adviser to the four Provincial Administrations.

Whenever a municipality wishes to embark on an electricity scheme, and wants to raise a loan, the Provincial Government are, of course, anxious to see that the municipalities do not proceed with unremunerative undertakings, and they refer all these schemes to the Electricity Supply Commission.

If the Commission reports unfavourably upon a scheme the Administrations do not sanction the raising of the loan. Thus, the Commissioners exercise a powerful influence on the development of electricity undertakings in the country. They do not encroach on the field of the consulting engineer, by preparing schemes for municipalities, but they criticise any scheme submitted for their approval. They keep in view the necessity for uniform development throughout the country, and they "head off" any schemes which would not fit into the final central scheme. They hope, said Mr. Jacobs, to steer clear of the conditions in this country, where the large number of voltages and frequencies will make unification of electricity supply a very difficult thing. The standardised voltage in South Africa for new plants is 220, both for d.c. and a.c., and the frequency is 50.

The Long View.

Mr. Jacobs has not had time closely to study the British Government's Electricity Supply Bill, but, with regard to the opposition offered to the measure by the owners of some of the larger and more efficient existing undertakings, he observes that whenever an established producer is faced with the possibility of having to give way to a new arrangement he brings forward estimates made on the most favourable assumptions, whereas in considering questions such as that of developing a general supply for the country one has to take a longer view and consider what one's average costs are going to be, including all reasonable capital charges, over the period of useful life of the equipment. He has little doubt that if the region for an electrification scheme is chosen properly and there is the necessary density of load in the part in which a scheme is to commence, a string of small isolated power stations cannot possibly make the same showing as one central station, operating with larger units, and likely to secure a higher degree of skill throughout than a small power undertaking can possibly get for itself.

Questioned as to the electricity position in South Africa, Mr. Jacobs said the Victoria Falls and Transvaal Power Co. is the Electricity Commissioners' biggest customer. Johannesburg Municipal Council, which, of course, has a generating station of its own, has for a long time desired to maintain an independent position, but the Electricity Commission is of opinion that the Council could obtain any further requirements more cheaply by taking a bulk supply than by extending its own generating plant and that the most convenient and cheapest plan would be to take it from the Victoria Falls Co.'s Rosherville station, which is only a few miles distant from Johannesburg. The company takes from the Commission's Witbank station a bulk supply which is transmitted along a line linking the Witbank station with the company's Brakpan, Simmerpan, Rosherville and Vereeniging stations. If, however, the Johannesburg Council prefers it, the Electricity Supply Commission will construct a line from Witbank to Johannesburg, and supply the Council's needs at the lowest possible price, which, of course, would be somewhat above the normal charge, in cosnequence of the extra length of new line. Mr. Jacobs does not know how far negotiations, which were starting when he left South Africa, have proceeded since that time.

The Commissioners (Mr. Jacobs pointed out) have no compulsory powers to compel Johannesburg Council to take a supply from anybody, but they have advised them to consider the question carefully, and see whether it would not be to their advantage to take their supply from the company's mains, or, as an alternative, from the Commissioners.

In addition to their 60 000 kW station at Witbank, the Commissioners have a 30 000 kW station at Salt River, near Cape Town, which has come into being principally to furnish the Government Railways with energy for traction on the suburban lines, but they have taken the opportunity, having a power station there, of building a network of 33 000 V lines to supply energy in the surrounding district. There are about 43 miles of these 33 000 V lines under construction for giving supplies in rural areas. Already they have a few of the larger municipalities and a fair industrial load on the lines to begin with.

A Peculiar Problem.

The problem of giving a supply throughout South Africa is a peculiar one. The towns are small and separated by great distances, so that it is almost impossible at present to undertake any scheme of feeding a large number of small towns from any large central power station. There are many small towns which could be fed from the Commissioners' Middleburg, Queenstown and East London power stations, but the demand is too small at present.

The Commission has just taken over the Colenso (Natal) power station from the Government, and will be completely responsible for its operation, and for the supply of energy to the electrified section of the railways. The Government (said Mr. Jacobs) does not want to go in for the electricity business, and the Electricity Commissioners have been chosen as electricity suppliers to the Government. The Commission buys the Colenso station from the Government, and will sell it the energy as near cost price as possible.

In Natal the Commission is supplying energy to the towns of Glencoe, Ladysmith, and Estcourt; Mr. Jacobs thinks Pietermaritzburg has since been added. The power station in Natal is at Congello, near Durban, and it will be in a position to supply the necessary power if the Government decides to continue the electrification of the railway from Pietermaritzburg to Durban.

Mr. Jacobs thinks railway electrification will justify itself in South Africa, as everywhere else, and he hopes to see it continued. Congello will be the first power station in South Africa to operate entirely with pulverised fuel. International Combustion, Ltd., is supplying the pulverised fuel equipment, and will also be the principal contractor for the boilers and several other parts of the work.

On the subject of imports of electrical goods into South Africa, Mr. Jacobs remarked that the reputation of the British manufacturer is very high, not only in South Africa but in many foreign countries, as he can testify from personal observation. This country secures a pretty large share of the trade in electrical goods with South Africa.

South Africa is in an advantageous position with regard to fuel, good coal being obtainable in all parts of the Union at prices seldom exceeding 30s. a ton.

Mr. Jacobs expects to be leaving England in about a fortnight, and will pay a short visit to the Continent before returning to South Africa.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

MR. O. P. Johnson, charge engineer at the Bridlington electricity works, has been presented with an oak dining room clock to mark the occasion of his forthcoming marriage.

Mr. Vernon Hope, who is to be Mayor of Macclesfield.

Mr. Vernon Hope, managing director of Parmiter, Hope and Sugden, Ltd., electrical manufacturers, of Longsight, Manchester, has accepted the mayoralty of Macclesfield for the coming municipal year. Mr. Hope, whose portrait is reproduced herewith, lives at Upton Hall, near Macclesfield, where he has been a member of the Town Council since 1919.

Mr. T. Gill, of Nelson, left for Rangoon last Friday to take up an appointment as assistant electrical engineer to the Rangoon Electric Supply Co.

Mr. A. M. Eagleston, electrical engineer, of St. Clement's, Oxford, represented the Oxford Rotary Club at the Margate conference.

Mr. Charles Edison has succeeded his father, Mr. Thomas A. Edison, as president of all the Edison Companies.

To celebrate his recent marriage at Stafford, Mr. Peter Fayle Grove has been presented by his colleagues at the works of the English Electric Co. with a silver entrée dish.

Mr. Harold Warren, second son of Mr. W. T. Warren, of the Brightlingsea Electricity Supply Co., Ltd., was married last week to Miss R. V. Stone, only daughter of Mr. Douglas Stone, of Regent Road, Brightlingsea.

As a souvenir of his completion of 44 years' service with the Government Telegraph Department, Mr. E. Lack, assistant staff engineer of the Engineer-in-Chief's Department, G.P.O., who has just retired, has been presented with a wireless receiving set.

Mr. F. Nicholls will succeed Mr. G. H. Lake as deputy borough electrical engineer at Derby. Mr. Nicholls has served in a number of supply undertakings, including Heston and Isleworth and the Birmingham Corporation Electricity Department. He went to Derby in 1919 as boiler house engineer.

Mr. P. L. Gill, A.M.I.E.E., has been appointed assistant electrical engineer in the Electrical Engineering Department, Admiralty. Mr. E. F. Kent and Mr. H. Martin have been appointed senior electrical engineers, Chatham and Portsmouth Yards respectively; Mr. J. Thomson, electrical engineer, Portsmouth Yard; and Messrs. L. G. Bolton, G. L. H. Brough and H. D. MacLaren, assistant electrical engineers, Dockyard Department, Admiralty, Devonport Yard and Sheerness Yard respectively.

Mr. Eric C. Dunstan, of the B.B.C. headquarters staff, has been appointed general manager of the recently formed Indian Broadcasting Co. The appointment was made as the result of an application by the directors of the Indian Broadcasting Co. to Mr. Reith, managing director of the B.B.C., to recommend a member of his staff who was familiar with all branches of broadcasting work and who would be competent to fill the new position. A portrait of Mr. Dunstan is given on our picture page this week.

Hackney (London) Borough Council Establishment Committee recommends that Mr. E. K. Wilkinson (assistant power station superintendent) be promoted to the position of power station superintendent at a salary in accordance with Grade 3 of the National Joint Board schedule, subject to sliding scale adjustment, at present £597 11s. per annum, for a probationary period of 12 months. The Committee also recommends confirmation of the appointment of Mr. A. C. Bostel as sales manager in the Electricity Department.

By a large majority Derby Town Council has adopted the Electricity Committee's recommendation to appoint Mr. G. H. Lake, deputy borough electrical engineer, as borough electrical engineer in the place of Mr. T. P. Wilmshurst, who, as previously announced, is resigning to become an Electricity Commissioner. Mr. Lake has been with the Derby undertaking for twenty years and was strongly recommended for the position by Mr. Wilmshurst. A recommendation that the vacant post should be advertised was defeated.

At Stockton last week the chairman of the Electricity Committee, Councillor Fairless, declined to move the adoption of his committee's minutes because he disagreed with a recommendation that Mr. E. T. Seymour should be appointed mains superintendent at a salary of £451 8s. Councillor Fairless contended that the post should have been advertised, but it was replied that the committee had acted on the advice of their manager, in whom they had the fullest confidence. The minutes were passed. These also included the appointment of a mains assistant at £218 8s.

On his retirement on superannuation at the age of 70 years, after 33 years with the Wolverhampton Electricity Department, Mr. James Dudley was last week presented by Mr. Morgan, the borough electrical engineer, on behalf of the staff and employees, with a case of pipes and a purse containing twenty guineas. Mr. Morgan recalled that Mr. Dudley had been present at the opening of the station by Lord Kelvin in 1894. Mr. Dudley, in acknowledging the gifts, gave some interesting reminiscences, and mentioned that he had assisted in building the first electrically driven motor car.

Sir Charles A. Parsons, F.R.S., has been awarded the Kelvin Medal for 1926. The presentation will be made at the Institution of Civil Engineers on October 26th by Sir William Ellis, the president of the Institution. The Kelvin Gold Medal, it may be recalled, was established in 1914 as part of a memorial to the late Lord Kelvin, and is awarded triennially by a standing committee, consisting of the presidents of the principal representative British engineering institutions, for pre-eminence in the branches of engineering with which Lord Kelvin's scientific work and researches were closely identified. The first award was made in 1920 to Dr. W. C. Unwin, F.R.S., and the second in 1923 to Prof. Elihu Thomson.

USING THEIR NAMES.

PEOPLE who have had Competition Booklets from you gave you their name and address in exchange. Are you making use of these names? If you want to make the best use of them a Bradford contractor's tip, given on page 452, will interest you.

Mr. William Mackintosh, who, as briefly announced in THE ELECTRICIAN last week, is the new president of the Electrical Contractors' Association of Scotland, is the general manager and a director of William Douglas and Co., Ltd., one of the pioneer electrical firms of Edinburgh. Mr. Mackintosh, whose portrait is reproduced on our picture page this week, has been a member of the Association's Central Board for many years and has acted as chairman of the Edinburgh Branch. He is a popular member of the Rotary movement and belongs to the Ancient and Honourable Body of the High Constables for the City of Edinburgh. Mr. Mackintosh succeeds Mr. R. A. Ure, who held office as president for two years. Mr. James Allan is the new vice-president.

Forty Years Ago.

Some Interesting Gleanings from "The Electrician," of October 15th, 1886.

IN a glance through the pages of THE ELECTRICIAN of October 15th, 1886, it is noted that:—

It was decided to light by electricity the American Statue of Liberty.

* * * *

Considerable interest was being shown in the Sprague electric railway system.

* * *

The Northern District Telephone Co. had just opened a public call office in Newcastle.

* * *

It was decided to light the Olympia (London) exhibition hall, then nearing completion, by electricity.

* * *

A schoolmaster punished pupils by means of a "static machine," with which he "sparked" their hands!

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"WIRING THE HOMES OF BRITAIN."—VII.

Growing Public Interest in Better Lighting Campaign—Four Demonstration Houses for Birmingham—Burton Contractors' Contribution.

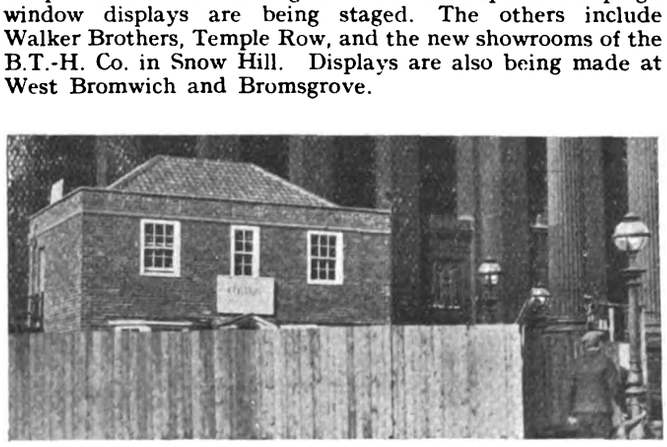
"EVERYTHING going splendidly"—this briefly sums up the progress of the Home Lighting Campaign in the South Midland area, writes a special correspondent of THE ELECTRICIAN. The circulation of the competition booklets throughout the area in the first eight days of the campaign amounted to well over 50 000, and the number disposed of has shown a substantial increase each day, a fact which alone is indicative of the rapidly growing public interest. It has been quite remarkable how many members of the public have congratulated traders upon the scheme, and expressed appreciation of its objects.

Punishment Fits Crime.

Circle committees are now working at Birmingham, Stoke-on-Trent (including Newcastle-under-Lyme and the Potteries generally), Burton-on-Trent, Derby, Tamworth and Nottingham. The latter has become a centre of considerable enthusiasm. The preliminary meeting there was largely attended, and somewhat curiously it was held in the Police Court buildings. After all the evidence on behalf of the campaign had been heard, all present pleaded guilty to being enthusiastic about it, and were sentenced to six months of hard and enterprising labour for the campaign!

With one exception each Circle has for its chairman the engineer of the local supply undertaking. During the past week, meetings have been held with a view to the formation of Circles at Walsall and Wolverhampton; and meetings are to be held this week at Bromsgrove and Worcester. A further meeting will be held at Nottingham on October 21st.

Mr. J. L. H. Cooper, the organising secretary for the area, tells me (our correspondent adds) that he hopes to have about fifteen Circles in full working order by the end of the present month. Mr. Cooper is working strenuously for the campaign, and it is gratifying that he has such active co-operation from the Birmingham Electricity Supply Department. The staff of the Corporation showrooms were addressed by Mr. Cooper upon the objects of the campaign recently, and everyone there is now working enthusiastically to ensure its success. As previously stated, the Corporation showrooms are among the premises in the Birmingham area where special campaign window displays are being staged. The others include Walker Brothers, Temple Row, and the new showrooms of the B.T.-H. Co. in Snow Hill. Displays are also being made at West Bromwich and Bromsgrove.



Liverpool's exhibition electric house which opens to-morrow (Saturday).

Arrangements are being made for the opening, in the very near future, of four demonstration houses in Birmingham, and it is hoped that one will be opened also at Bromsgrove, where the Shropshire, Worcestershire, and Staffordshire Electric Power Co. are pushing the campaign at their local branch.

At Birmingham, Nottingham, Burton-on-Trent and Stoke, local contractors are arranging to have their names inserted beneath the E.D.A. display advertisements.

At Burton-on-Trent the campaign is being conducted on vigorous lines. Upon the suggestion of Mr. T. Hall, the chairman of the local committee, nearly 20 000 circular letters are being sent to householders in the district, calling attention to the campaign and the competition. The names of local contractors are included in these circulars. It has also been decided to post bills advertising the campaign on all the public buildings, and arrangements have been made for showing the six special window displays in the Corporation showroom windows.

The Corporation has intimated its willingness to spend a substantial sum of money upon the campaign, and the local contractors have decided to contribute a sum of £5 each towards the advertising. It is hoped to have an all-electric house ready shortly.

In the Newcastle-on-Tyne area, where so much work has already been done, there is no abatement, but rather intensification of efforts to extract full value from the campaign.

An additional two Circles have been arranged by the No. 7 area, Whitley Bay and Blyth having been split off from Tynemouth and North Shields, while Seaham Harbour and Houghton-le-Spring have separated from Sunderland; in all, there are to be twenty-two circles in this area, eleven of which are already in full operation.

Demands for booklets are large, and continue to increase as the campaign becomes better known. Up to last Thursday the Newcastle-upon-Tyne Electric Supply Co., Ltd., had given away over 500 booklets, and other firms had disposed of a goodly number.

A striking demonstration of the co-operation of electrical interests in this area was supplied by a full page in the "North Mail and Newcastle Chronicle," on October 6th, containing among other things a full double column joint announcement by local electrical contractors, a large announcement by the N.E.S. Co. (both reproduced on the opposite page), and an interesting article on the competition, and the advantages of electric lighting in the home.

Hartlepool House Sold.

Mr. R. E. Robson, whose enthusiastic support of the campaign has been referred to in recent issues, informed THE ELECTRICIAN on Monday that the demonstration electric house at West Hartlepool, although lent to Mr. J. H. Parker by the builder, as it was considered unsaleable, was actually sold on the first day of its use as an electrical home. This is a splendid testimony of the interest which has been aroused in the campaign, and it also furnishes Circles in other areas with a very strong argument to induce builders to lend their houses for demonstration purposes.

"The energy of Mr. E. S. Evans, the district officer," Mr. Robson said, "is remarkable. He is travelling from Berwick, to Whitby and right away over the Lake District to Whitehaven and Workington on his motor cycle, and has to travel at a speed of eighty miles an hour many times to be in time for his various meetings. I met him one day in Newcastle after 11 a.m., and he was just then going to Berwick where he had to address a meeting, and be back in Newcastle for another one at 6 o'clock in the evening."

Mr. Harry Moss, a well-known Bradford registered contractor and E.C.A. member, in sending us the photo of his window display (reproduced on the opposite page), reports that he is receiving a good number of inquiries for the competition booklets, all of which he has over-printed on the back cover with his name and address. The display of special posters on the upper storeys of the building forms a striking supplement to the campaign window.

A useful hint can also be derived from the statement by Mr. Moss that in distributing the competition booklets every endeavour is made to find out whether the applicants are already electricity consumers or not. These replies are being tabulated, and so far it has been found that fully 50 per cent. of the people asking for booklets are not yet electricity consumers.

Another good idea adopted by Mr. Moss is to enclose with every competition booklet copies not only of the special small E.D.A. brochures, but also of similarly shaped folders issued by various manufacturing firms, and dealing with domestic electrical appliances. So that by the time he has distributed 1 000 competition booklets, he will have also supplied competitors with another 4 000 pieces of electrical propaganda.

For the past seven weeks THE ELECTRICIAN has devoted a considerable amount of space to the campaign, and campaign enthusiasts find in each issue the latest news of campaign progress. Contractors and supply undertakings who, like Mr. Moss, discover some useful way in which they can elaborate

(Concluded on page 466.)

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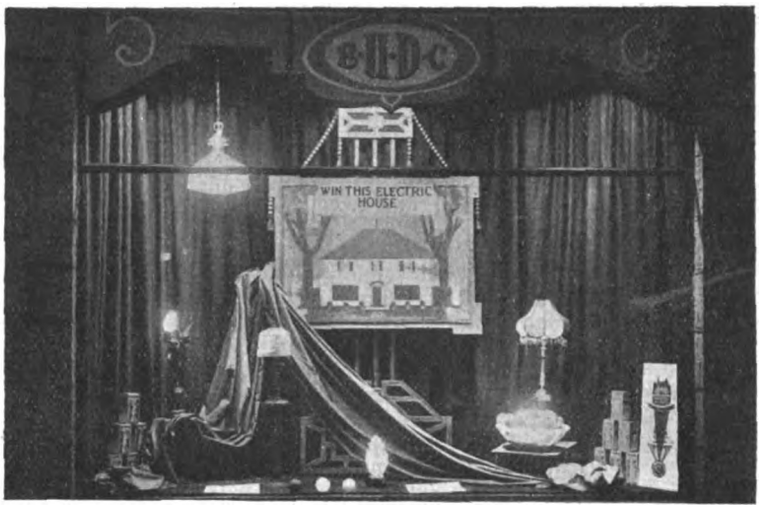
A Message to You
WE have taken this space to announce the publication of the £2,000 Electric House Competition Booklets—which now are waiting for you.
They can be obtained free, at any of the Electrical firms below.
BE SURE & OBTAIN YOUR BOOKLET!
You simply must enter for this entirely new competition. A beautiful All-Electric House, or £2,000 in cash is waiting to be won. The rules for this easy competition are fully explained in the Competition Booklet. Be sure and send in your entry. The chance for such a splendid prize is so rare that it should be seized at once.
THIS HOUSE OR £2,000!
ELECTRIC LIGHTING IN THE HOME
GET YOUR COPY FROM ANY OF THESE ELECTRICAL FIRMS TO-DAY.
Cairns, R. W.,
Falconer, Cross & Co., Ltd.,
Fletcher Bros.,
Gray Bros. (Newcastle) Ltd.,
Jesmond Electrical & General Engineering Co., Ltd.,
Ramsey, Chas. & Co.,
Robson & Coleman,
Robson & Coleman,
Wilson & Ridley,
In the meantime, have you thought what electricity means, and how it can improve and beautify your home? Why not use electricity—the modern method of lighting, heating and cooking. Remember, membership of the Electrical Contractors Association is sufficient guarantee in itself that electrical work of any kind is carried out with sound workmanship, the best of materials, and at strictly competitive prices.

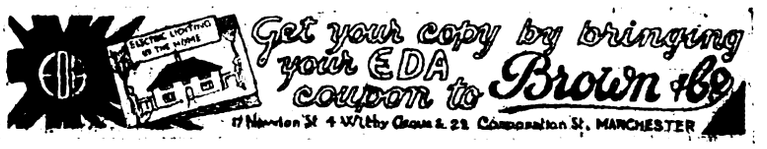
THE CAMPAIGN IN PICTURES



TO the left is reproduced a striking co-operative advertisement by Newcastle contractors, occupying two full columns. Above is a photo of the first standard campaign window display arranged by the Bingley Electricity Department.

FREE
Electric House or £2,000 cash
-and it may be yours!
COULD you choose suitable Electric Light fittings for the various rooms of a house—if the fittings and the positions were shown to you?
No Entrance Fee and Free to all
"HOME LIGHTING BALLOT" COMPETITION.
NESCO
Dial House, Northumberland Street
NEWCASTLE-UPON-TYNE

ABOVE is pictured a fine campaign display by a Bradford electrical contractor. To the left is a "NESCO" advertisement, and below is an advertisement published immediately beneath one of the E.D.A. — E.L.M.A. Competition announcements.


EDA
ELECTRIC LIGHTING IN THE HOME
Get your copy by bringing your EDA coupon to Brown & Co
17 Newton St & Withy Grove & 23 Corporation St. MANCHESTER

ON the opposite page we give our seventh consecutive weekly report on E.D.A.-E.L.M.A. Better Home Lighting Campaign progress. Special correspondents of "The Electrician" have given first-hand accounts of what is being done in the various districts, and from these reports it is apparent that excellent progress is being made, although there is still a need for more electrical circles and more demonstration electric houses. Above we illustrate some of the ways in which electrical contractors and supply undertakings are utilising the campaign for their own benefit.

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THE ELECTRICAL INDUSTRY IN 1882.

N.A.S.E. President's Backward Glance—Progress Hindered by Wildcat Schemes of Company Promoters—Apologia for 1882 Act.

FOR his presidential address to the National Association of Supervising Electricians—delivered in London last week before a large attendance, including two past-presidents, Messrs. J. S. Highfield and A. H. Dykes—Mr. A. M. Sillar chose a subject of particular interest to the newer members of the industry, and related "Some Early History of the Electrical Industry in this Country," which, he said, he had entered "in a very humble position" in 1882, the year of the Crystal Palace Electrical Exhibition.

Electric Lighting "Boom."

The beginning of that year, Mr. Sillar thought, was the most critical period in the existence of the industry. Given sound business organisation, progress would have been rapid, but the "electric lighting boom" introduced by company promoters harmed the industry more than the much-abused Electric Lighting Act of that year. Any figure was paid for almost any patent or concession, and in six months sixty-eight companies were registered, with an aggregate capital of over £20 600 000, mostly supplied by small investors, most of whom lost their money. Very few of the patents for which immense sums were demanded and paid were for anything except detailed devices or components which, being quickly replaced by new inventions, rapidly became worthless.

A few of the companies, such as the Edison and Swan companies, possessed valuable master patents, but these were exceptions. A few of the 1882 companies were on sounder lines, like Callender's and Henley's, which were started in or before that year; and there were others which had since passed through hard times, but still survived.

Examples of the high prices paid in those days for insignificant patents quoted by Mr. Sillar included an electro magnet, operating, rather inadequately, a series of contacts in mercury, which would enable a circuit of fresh candles to be switched from a distance by means of a switch wire, to take the place of a circuit nearly burnt out. This ornamental, but rather unpractical, device was bought for £3 000 cash, but was never used. Then there was Paul Jablochkoff's ingenious "Eliptic" motor which, though claimed to have an efficiency of over 50 per cent., proved, on test, to have only just over 7 per cent; and to be more useful as heating apparatus than as a motor. This, too, was bought for £3 000. But both these patents were probably better worth the money paid than the majority of others.

Electric street lighting in those days was mostly carried out at a loss, but there were some *bona fide* installations.

Of incandescent lamp installations, that at the Savoy Theatre was notably good; but to-day it was amusing to think that to obtain 75 kW it required in those days thirteen belt-driven generators, comprising six alternators, six separate exciters, and one generator for the arc lamp.

In those days generators had a remarkably small capacity, and in 1880 Edison said he had found that the best generators were from 5 to 7 H.P., giving eight incandescent lamps per H.P., say, 3 to 4 kW. In 1882 the American "Jumbo" machine, described at the time as "colossal" and "enormous," had a capacity of 65 kW, though up to 1884 few machines gave more than 20 kW until Ferranti produced his 65 kW, 1 000-light alternators. In 1887 the Brush Co. were supplying 75 kW alternators, but believed that that was the limit to which it was possible to go; and it was not until about 1900 that 1 000 kW was reached.

Undue Optimism.

Early cases of undue optimism included the offer of the Jablochkoff Co., in 1882, to light all Chelsea on five-lamp arc circuits, and the offer, in the same year, of an American citizen to harness Niagara and transmit 2 000 000 H.P. through 10 000 miles of cables to sixty-five prominent cities between Boston and Chicago; this at a time when a 65 kW set was "colossal," and the highest voltage in use was 2 000.

An examination of early electrical machinery design showed extraordinary resemblances between certain original apparatus and its counterpart to-day. The alternating Gramme generator as it was in 1882, was remarkably like a generator coupled to an up-to-date turbine.

The company promoting and wild speculation of 1882, said Mr. Sillar, was directly responsible for a setback to the industry, which hampered it for many years. And it was not likely that capital could be obtained for even the most promising undertakings after a lesson of that kind, until the public had had time to forget.

It was, therefore, not unnatural that Parliament should have been influenced by the existence of so many irresponsible companies anxious to acquire a holding in the towns, and that the conditions laid down by the 1882 Act should have been so stringent as practically to block the progress of electricity supply. "If," he concluded, "it had not been for the effects of that year, this country would have been ahead of all others in electricity supply, instead of occupying, as it has, the third or fourth position."

Indian Trade.

British Electrical Manufacturers in the Leading Position.

CRITICISMS of lack of enterprise in catering for export markets, so frequently justified by consular officers in certain countries do not apply to British electrical exporters, according to Mr. T. M. Ainscough, H.M. Senior Trade Commissioner in India, who, in an interview in London with a representative of THE ELECTRICIAN, spoke in very gratifying terms of the British electrical export trade with India and the representation of British firms in that country.

Mr. Ainscough mentioned that practically all the big British electrical firms have their own offices in India, and in many cases half a dozen offices and stores, and his experience was that they kept well informed of new and prospective electrical development, such as the hydro-electric scheme now being carried out on the Uhl river in the Punjab, and the considerable developments which are expected in Madras.

British electrical exporters are supplying a large proportion of India's electrical requirements, and are maintaining this position; in fact the British share of the trade in electrical machinery last year was 83 per cent. compared with the United States, 8 per cent., and Germany, 5 per cent. This satisfactory position and expanding business are largely due (Mr. Ainscough said) to the splendid service given by the Indian branches and agents of British electrical manufacturers. There are very few industries as well represented in India as the electrical industry.

In fact, Mr. Ainscough added, the only Indian contracts of any moment that we lose, go to certain continental firms who grant exceptional financial and credit facilities which sound British houses do not feel justified in granting.

Victorian Electricity Commission.

Commissioner's Report on the Prospects of the Electricity Undertaking.

MR. W. H. Sawyer, a Commissioner appointed to report to the Victorian Assembly on the "status and affairs of the State Electricity Commission of Victoria," states his opinion that the electricity undertaking is, as a whole, economically sound, and, by virtue of the importance of electrical energy to the State, it must go forward. To-day it is not directly financially profitable. The estimates given him profess to show that it will become directly profitable during the calendar year 1927. From these estimates and this assumption he differs.

He agrees with the estimates as to the revenue expected within the next few years, but believes that the operating expenses will be greater than have been assumed. By the year ending June 30th, 1930, there should be a net profit on the present combined undertaking, and on practically every present separate undertaking. Mr. Sawyer recommends postponing a decision as to the building of any major power plant extension until a more thorough study can be made; also, that the proposed extension to the briquette plant be postponed until the coal-winning situation is more definite as to appreciably reduced costs of coal winning. He also recommends retail distribution by the Electricity Commission, the selling of electrical appliances on time payment, and the creation of a Power Advisory Council.

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CONTRACTORS' YEAR BOOKS.

Useful Handbooks for Contractors—English and Scottish Organisations Show Increasing Support of Registration.

SIGNS of the continued growth and development of the Electrical Contractors' Association, and its allied organisations, the N.E.C.T.A. and the N.F.E.A., are furnished by the new edition of "The Electrical Contractors' Year Book," which has just been published by the Electrical Contractors' Association, 15, Savoy Street, London, W.C.2, at 5s.

Last year the increased size and utility of this valuable reference book were remarked upon in these columns, and the present issue has been further expanded and revised.

There is, of course, the usual list of members of the various branches and sub-branches, which now number 51. Since the last edition a new sub-branch—Tunbridge Wells—has been added, the Worcester sub-branch has been amalgamated with the Birmingham branch, and the bulk of the members of the Barrow-in-Furness sub-branch has been added to a new section of "members of the Manchester Branch outside Manchester." Doncaster is now a branch instead of a sub-branch.

Practical support of the National Register of Electrical Installation Contractors is increasing steadily, and of the E.C.A. membership no fewer than 571 are registered. As there are only 388 registered contractors who are not also members of the E.C.A. organisations, the Associations' claim that they have as members the majority of the best contractors in the country is amply supported by facts.

Of the total of 571 registered E.C.A. contractors the London branch furnishes 97, and is thus far ahead of other branches. Manchester and Salford takes the second place, with 27, Liverpool is third with 25, and Birmingham and Newcastle-on-Tyne tie for fourth place with 23, closely rivalled by Leicester with 22. It is interesting to note that in the Ealing and Tunbridge Wells sub-branches every member is registered. This is an example which will surely be emulated by other branches long before next year.

New Features.

A convenient new feature of the book is an alphabetical list of members giving the name of the branch to which each belongs. It facilitates reference by those who are uncertain as to which branch, for instance, Mr. E. Mercer, of Castleford, belongs to.

Other new features well worth including are the stimulating presidential address of Mr. T. E. Alger, details about the Associations' first annual conference at Brighton, and a section describing what the E.C.A. is doing in apprentice training.

The usual sections dealing with wages rates and variations for the various districts; working rules; an article on "Law for Electrical Contractors"; and the rules and regulations of the National Register are also included. The E.C.A. Trading Policy is reproduced for reference, and the "Memoranda for Guidance in Negotiations with Supply Authorities" is a section to which contractors will often turn.

Incorporating a desk diary with two days to a page, the new "Year Book" of the Electrical Contractors' Association of Scotland (published by Thomas Allan and Sons, 43-51, Elder Street, Edinburgh, at 3s., or 3s. 6d., post free) is of a larger format than its English counterpart, the pages measuring 11 in. by 8½ in. The list of members of the Association is arranged by branches, of which there are four, i.e., Glasgow, Edinburgh, Aberdeen and Dundee.

Besides sections dealing with the development, objects and scope of the Association, reference is made to the social side and to the registration of apprentices. The working of the Scottish apprenticeship system is described; the Association supplies a suitable form of indenture, and a register of apprentices is kept. On the expiration of the apprenticeship an official discharge certificate, which has to be signed by the employer, is issued by the Association.

The usual valuable reference features, such as model conditions of tender, tabular statistics regarding Scottish electricity supply undertakings, the "Scottish Mode" for the measurement of electrical work, a list of architects in Scotland, and a useful section dealing with overhead charges—to mention only a few—are retained, and this year maps of the supply areas of Scottish electricity undertakings are included.

A separate list is given of Scottish contractors who were on the National Register of Electrical Installation Contractors on August 1st, 1926, the total number in this category being 79. If, as we assume, all the contractors mentioned in this list are members of the E.C.A. of Scotland, this separate list might be left out of future editions and registered contractors could be differentiated from the unregistered by the insertion of a letter "R" against their names in the general list, as is the practice in the English contractors' "Year Book."

The National Register.

Only Eleven Contractors Accepted by Executive Committee in October.

AT last Friday's meeting of the Executive Committee of the National Register of Electrical Installation Contractors, held at 1, Lincoln's Inn Fields, London, W.C.2, the exceedingly small number of twelve applications from electrical contractors for admission to the Register was considered. Only one of these applications was found to be unsuitable, and the remaining eleven names were added to the Roll, thus bringing the total strength of the Register, exclusive of duplicated entries, up to 959.

THE WISE MEN OF BURTON.

WITH an established reputation in another direction Burton-on-Trent also maintains a high standard for sagacity and enterprise on the part of its electrical contractors, who are all contributing towards the cost of advertising the Better Home Lighting Campaign locally. The Newcastle-on-Tyne contractors have done it too. Why not follow their example?

This rate of growth can hardly be regarded as satisfactory, and we would again repeat our advice to existing registered contractors to try to obtain further applicants for registration. Since July the total additions to the Register have been 29, and if this rate is not materially speeded up within the next two months the year will close with membership still well below the thousand mark.

Any contractor reader of THE ELECTRICIAN who has not yet applied for registration can obtain full particulars from Mr. T. Trimnell, the secretary of the National Register of Electrical Installation Contractors, at 1, Lincoln's Inn Fields, London, W.C.2. The qualifications required are possessed by every contractor worthy of the name, the cost is trifling, and the benefits are inestimable.

The list of contractors whose applications for registration were accepted by the Executive Committee at the October meeting is given below:—

Appleby and Miller, 394, Stanhope Road, South Shields; Cole Bros., 16, York Terrace, Clapham, London, S.W.4; Co-operative Wholesale Society, Ltd., Trafford Park, Manchester; Creemer, W. J., 7, Working Street, Cardiff; Fenton, John E., 44-46, Canmore Street, Dunfermline; Hall and Stinson, Ltd., 70, Effingham Road, Sheffield; Hugh Brown and Co., 17a, Blythswood Square, Glasgow; Johnson and Tanner, 2, Park Terrace, Worcester Park, Surrey; Lomax, F., 15, Trevelyan Street, Eccles; Silcox, H., 5, Fountain Buildings, Lansdown Road, Bath; Spray, Edgar Charles, 13 and 59, Harbour Street, Whitstable, Kent.

Electrical Contracting Wages.

DECLARING that the variation in cost of living justifies a 20⅝ per cent. reduction in basic wages in the electrical contracting industry, the National Federated Electrical Association and the Electrical Trades Union, under the National Wages Agreements of 1920 and 1921, announce that up to and including the period covered by the first pay day in January, 1927, the nett hourly rates of pay applicable to the respective grades of the Agreements are as follows: Grade A, 1s. 10d. (this rate includes a travelling allowance; no further allowances are to be paid except as provided by Rule 9 of the London Rules dated February, 1920); Grade B, 1s. 7¾d.; Grade C, 1s. 6¼d.; and Grade D, 1s. 5d.

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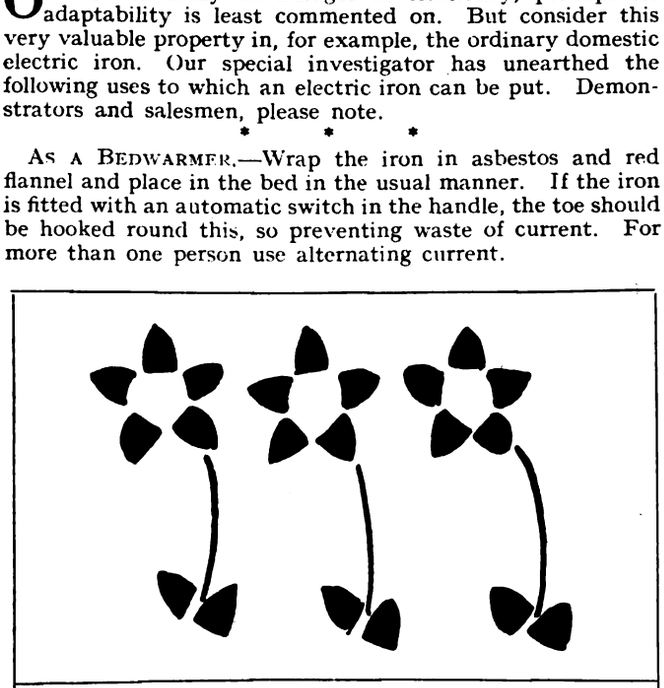
IN LIGHTER VEIN.

Some Original Hints on the Adaptability of Electric Irons.

OF all the many advantages of electricity, perhaps its adaptability is least commented on. But consider this very valuable property in, for example, the ordinary domestic electric iron. Our special investigator has unearthed the following uses to which an electric iron can be put. Demonstrators and salesmen, please note.

* * *

AS A BEDWARMER.—Wrap the iron in asbestos and red flannel and place in the bed in the usual manner. If the iron is fitted with an automatic switch in the handle, the toe should be hooked round this, so preventing waste of current. For more than one person use alternating current.



Simple stencil designs executed with an electric iron. Directions below.

STENCILLING.—Take a nice hot iron and hold it firmly against the cloth. Use the edge of the iron for the fine lines, etc. The designs (shown in the accompanying illustration) will be permanent and will not wash out or fade.

* * *

AS A POULTICE.—The modern housewife can avoid the trouble of making poultices, as vigorous application of the electric iron is an excellent substitute.

* * *

SOLDERING.—The makers of the electric iron have, with unusual foresight, provided extra heat at the tip for soldering. This is a boon to the average householder, although few are aware of this unique provision and struggle with a dirty copper soldering bit, when there is very often a nice clean iron in the house. For soldering joints or re-tinning and uncorrugating sheet iron the electric iron is unsurpassed.

* * *

MAKING COFFEE.—Coffee beans can be roasted and ground in an instant with no other equipment than an electric iron. Grasp the iron firmly with the right hand, and, holding the bean with the left, pound it vigorously with the hot iron. Owing to the force of gravity and various other chemical actions, the bean is ground down and roasted at the same time.

* * *

MAKING PASTRY.—The tedious operations of (*a*) kneading the dough, (*b*) rolling the pastry, and (*c*) baking in the oven, can be cut out by using an electric iron, which has Mrs. Beeton beaten. Take a noggin of flour, a jugful of water, enough salt to cover a sixpence, six brace of eggs and no asparagus, and paste these into a mixture with the iron. When the mess (sorry), mass is mixed, do not roll it out; just iron out the creases. Now switch on the current and continue the movement until the pastry changes colour.

* * *

OTHER USES.—When not used for any of the above duties the iron will be found useful for ironing clothes.

Points of View.

Cheap power rightly used means high service and high prosperity.—*Mr. Henry Ford.*

* * *

Careful provision is made in the [Electricity] Bill that the benefit of cheap generation shall be passed on to the consumer.—*The Prime Minister.*

LIGHTING SERVICE.

New Bureau Opened in Manchester for North-Western District.

A REPRESENTATIVE gathering of the electrical industry in the North-Western area met at 4, Fountain Street, Manchester, last Tuesday, for the opening of the new Electric Lighting Service Demonstration Bureau for the North-Western Province.

The audience were first of all invited into a typical badly lighted room, and in the semi-darkness Mr. P. P. Wheelwright introduced the Lord Mayor of Manchester. After Mr. Wheelwright's opening remarks the Lord Mayor was invited to "switch on," and the hitherto darkened room was immediately lighted up according to the latest E.L.M.A. principles.

After a pleasing speech from the Lord Mayor, who emphasised the public importance of better lighting, a vote of thanks was proposed by Mr. Farthing, of the G.E.C., Manchester, and seconded by Mr. H. Dickinson. The work of the committee, which is composed of three representatives from the supply authorities (Messrs. Wheelwright (Blackburn), Lamb (Manchester) and Dickinson (Liverpool), three wholesalers (Messrs. Davies, O'Brien and Smith), two contractors (Messrs. Shaw and Hazel) and two representatives of the manufacturers (Messrs. Farthing and Pryor), was suitably referred to by Ald. Walker, who proposed a vote of thanks, which was seconded by Mr. C. W. Sully. Mr. H. C. Lamb responded on behalf of the Committee and the proceedings then terminated, to be followed later by a special demonstration of the new equipment by Mr. W. E. Bush.

As much as possible of the Savoy Street equipment has been reproduced at Manchester, and special arrangements have been made for the demonstration of the latest forms of household, shop and poster lighting, as well as for the display of industrial fittings.

TRADE PUBLICATIONS.

Details of Catalogues and Dealer-Helps Issued by Manufacturers.

We have received from the Bastian Meter Co., Ltd., 58, Haymarket, London, S.W.1, leaflet 13/35 on Bastian storage geysers for household purposes, leaflet 14/44 on geysers for dual purposes—e.g., for bathroom and kitchen—leaflet 14/42 and 43 on geysers for use on ships, and in hotels, hospitals, etc.; leaflet 13/40 and 41 on quartzite heating elements; leaflet 13/38 and 39 on Rex fires; leaflet 13/33 and 34, on electric cooking apparatus, and a small folder in reference to the "Little Wonder" grill oven and the "New Imp" fire.

Evershed and Vignoles, Ltd., Acton Lane Works, Chiswick, have issued a new portable instrument catalogue (No. P.117f.). The matter in the book has been entirely rearranged to simplify reference. The electrical indicating instruments described are of the permanent magnet moving coil, the moving iron and the dynamometer types, and details are given of the processes by which the several types are actuated. Ammeters, voltmeters and wattmeters of various patterns and current and pressure transformers are illustrated, and particulars are given of their construction, capacity, etc. Evershed's electrical tachometer is described in leaflet P.156, which can be obtained by our readers on application. This tachometer has been used for a number of years for various purposes, from checking the speed of paper machines to testing aeroplane engines.

The latest edition (B/376) of the Electric Construction Co.'s book on "Modern Electrical Plant" is well printed and profusely illustrated, and extends to 80 pages. It contains particulars and illustrations of synchronous and synchronous-induction motors which give leading power-factor enabling the consumer to reap a financial advantage when his supply of electricity is charged for on a kVA basis, various types of a.c. and d.c. generators, switchgear, etc., views of the shops at the company's Wolverhampton works, and useful notes, formulæ, etc., for the calculation of consumption of motors, the power required to drive generators, cable drop, the current-carrying capacity of cables, fusing temperatures of wires, etc. The company has also issued booklet B 626, on rotary converters, and sheet S 762, a specification of E.C.C. continuous current electro magnets. Applications for these publications should be sent to the head office, Ingersoll House, 9, Kingsway, London, W.C.2.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given.

ASHFORD URBAN DISTRICT COUNCIL.—Motor generator, 30 kW, 400 V, three-phase, 50 periods, to 220 V d.c. Specifications, etc., from Mr. H. Wilson, electrical engineer, Ashford, Kent.

LLANSILIN PARISH COUNCIL.—Laying of mains, cables, etc., and lighting the village. Particulars from Mr. T. Jones, Clerk to the Council, Glanyrafon, Llansilin, near Oswestry.

DURHAM COUNTY COUNCIL, October 16th.—Electrical works in connection with the conversion of Earl's House School and other buildings into a tuberculosis hospital. Plans and specifications can be seen at the offices of M. and T. R. Milburn, 19, Fawcett Street, Sunderland; deposit £2 2s.

CARLISLE CORPORATION, October 18th.—Lagging steam piping at new electricity station. Specifications from Mr. C. W. Salt, city electrical engineer; deposit 10s. 6d.

DUBLIN COMMISSIONERS, October 18th.—Magazine flame arc lamps. Specification from the City Electrical Engineer, Fleet Street, Dublin.

DUBLIN BOROUGH COMMISSIONERS, October 18th.—Supply and erection of four water-tube boilers, with stokers, economisers, feed pumps and accessories, for the Electric Supply Department. Specification from the City Electrical Engineer, Fleet Street, Dublin; deposit £5 5s.

DUBLIN BOROUGH COMMISSIONERS, October 18th.—Supply and installation of a complete 5 000 kW generating set (including steam turbo-alternator and exciter, condensing plant, etc.), at the Pigeon House generating station. Specification, etc., from the City Electrical Engineer, Fleet Street, Dublin; deposit £3 3s.

EDINBURGH CORPORATION, October 18th.—Two motor-driven circulating water pumps, drainage pump valves and pipework for Portobello generating station. Specification from Mr. E. Seddon, Electricity Department, Dewar Place, Edinburgh; deposit £1 1s.

SALFORD CORPORATION, October 18th.—Supply of paper insulated, lead covered cable. Particulars from the Borough Electrical Engineer.

GLASGOW PARISH COUNCIL, October 19th.—Six months' supply of electric fittings. Form of tender (No. 62) from M. A. Reynard, inspector and clerk, 266, George Street, Glasgow, C.1.

WEST RIDING EDUCATION COMMITTEE, October 19th.—Electric light installation at Shellow New School, Owston. Specification from the Education Department, County Hall, Wakefield.

INDIA STORE DEPARTMENT, October 20th.—Supply of sub-station plant for Ridge Institute, Jubbulpore, including transformers, condensers, cables and ironclad draw-out truck type h.t. switchgear. Specification (5s.) from the Director-General, Belvedere Road, Lambeth, London, S.E.1.

ROCHDALE CORPORATION, October 20th.—Electric light and power installations to 128 houses on Albert Royds Street housing estate. Particulars from the Borough Surveyor, Town Hall, Rochdale.

ROCHDALE GUARDIANS, October 20th.—New electrical machinery and apparatus at the Poor Law Institution and Infirmary, Birch Hall, Dearnley, Littleborough. Specifications from Mr. I. Clegg, Union Offices, Townhead, Rochdale; deposit £2 2s.

CARLISLE GUARDIANS, October 21st.—Chloride 54-cell battery, 110 V, 120 Ah, 5 kW dynamo of British manufacture, with slide rails and pulley; and slate base switchboard, with all necessary instruments and switches.

DUNDEE CORPORATION, October 22nd.—Supply of 4-core, 3-core and 2-core h.t. paper insulated lead covered and double steel tape armoured cable, for working pressure up to 660 V. Specification, etc., from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

IRISH FREE STATE COMMISSIONERS OF PUBLIC WORKS, October 22nd.—Extension of electric lighting installation at Ordnance Survey Office, Phœnix Park, Dublin. Specification from Mr. J. J. Healy, Secretary, Office of Public Works, Dublin; deposit £1.

STAFFORDSHIRE COUNTY EDUCATION COMMITTEE, October 23rd.—Electric wiring of Wolstanton Boys' New Secondary School. Specifications from Cramp and Frith, 33, Brazennose Street, Manchester; deposit £5 5s.

BARRY URBAN DISTRICT COUNCIL, October 25th.—Underground mains, sub-station, transformers and meters. Specification, etc., from Mr. T. Franklin, Gas and Water Offices, Barry, Glam, or from A. H. Seabrook and Partners, 146, Bishopsgate, London, E.C.2; deposit £3 3s.

BURY INFIRMARY, October 25th.—Equipment of new electro-massage and X-ray departments. Plans can be seen at the Infirmary or at the offices of Mr. A. C. M. Lillie, architect, Brownedge, Bamber Bridge, Preston.

ON CIRCLES.

SQUARING circles is difficult, and so is the drawing of circles—to some of us. But forming an Electrical Circle is easy, and it will help along the Better Home Lighting Campaign in your district. If there is no Circle near at hand, form one yourself and co-opt any local electrical men as members. In one area there are TWENTY-TWO Circles! To see if your guess is correct, look on page 452.

EDINBURGH EDUCATION AUTHORITY, October 25th.—Electrician's work in connection with additions to Hermitage Park School, Leith. Schedules from Mr. T. Aikman Swan, 7, St. Colne Street, Edinburgh.

STIRLING CORPORATION, October 25th.—Electrical work in connection with the erection of 20 houses at Burnside. Specifications from the Burgh Engineer; deposit £1.

BLACKROCK AND KINGSTOWN DRAINAGE BOARD, October 26th.—Supply and fixing of electrically-driven pumping plant at the Eden Road pumping station, Dun Laoghaire. Specifications from Kaye Parry, Ross and Hendy, 48, Kildare Street, Dublin.

ILFORD URBAN DISTRICT COUNCIL, October 26th.—Supply and erection of one transformer kiosk, including transformer and switchgear, etc.; one switch kiosh, including switchgear, and l.t. (660 V) paper insulated cables. Specifications, etc., after October 8th, from Mr. Arthur H. Shaw, Electricity Works, Ilford.

RATHMINES AND RATHGAR URBAN DISTRICT COUNCIL, October 27th.—Supply of cable. Specification can be obtained at the Electricity Works.

TYNE IMPROVEMENT COMMISSIONERS, October 29th.—One 3-ton and one 5-ton portal electric, travelling, level luffing cranes, to be erected at Albert Edward Dock, North Shields. Specification from Mr. A. Blacklock, Tyne Improvement Commission Offices, Bewick Street, Newcastle-on-Tyne; deposit £1 1s.

METROPOLITAN ASYLUMS BOARD, November 3rd.—(1) Automatic telephones and fire alarms; and (2) alterations to electric lighting installation at North-Eastern Fever Hospital, St. Anne's Road, Tottenham. Specifications from the Board's Office, Victoria Embankment, E.C.4; deposit £1 in respect of each work.

EASTBOURNE CORPORATION, November 5th.—Supply and erection of one water-tube boiler, economiser, feed heaters, two steel chimneys with induced draught, pipework, etc. Specifications from Mr. J. K. Brydges, Electricity Works, Eastbourne; deposit £1.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

SYDNEY CITY COUNCIL.—One three-phase oil-immersed induction voltage regulator.

INDIAN STORES DEPARTMENT (ENGINEERING BRANCH), SIMLA, October 16th.—Supply of four electrically-driven

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horizontal centrifugal or turbine pumping sets, with transformers. (Order No. N/4 870.) (Reference A.X. 3 590.)

NEW PLYMOUTH (N.Z.) HARBOUR BOARD, October 16th.—Supply, delivery and erection of 30 cwt. portal electric horizontal luffing jib crane, fittings and accessories. (Reference A.X. 3 458.)

SYDNEY COUNCIL, October 18th.—Two 100 ton electrically-operated overhead travelling cranes. (Contract 1 033.) (Reference A.X. 3 467.)

CHRISTCHURCH (N.Z.) DRAINAGE BOARD, October 19th.—Supply and erection of three sets of electrical centrifugal pumping plants. (Contract 26 329.) (Reference A.X. 3 215.*)

CAPE TOWN MUNICIPALITY, October 20th.—Motors and starting switchgear, for Brankenfel Quarry. (Reference B.X. 2 902.)

EIGHTY MILES AN HOUR.

EIGHTY miles an hour is the speed at which one of the district officers of the Better Home Lighting Campaign travels on a motor-cycle to further the objects of the Campaign. While it is not necessary for all of us to exceed the speed limit on motor-cycles, we can all try to equal this effort in our own particular sphere of Campaign activity. Some useful hints on "speeding" are given on pages 452, 453 and 466.

VICTORIAN RAILWAY COMMISSIONERS, October 20th.—Supply and delivery of rail motor equipment. (Contract No. 39 614.) (Reference A.X. 3 449.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Telephone plugs and sleeves. (Schedule C.120.) (Reference B.X. 2 799.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Lamps, lamp caps, and lamp sockets. (Schedule C.124.) (Reference B.X. 2 800.)

DIRECTOR-GENERAL OF EGYPTIAN MUNICIPALITIES AND LOCAL COMMISSIONERS, November 1st.—Supply of about 30 000 electric lamps. Tenders to the Director-General, Savoy House, Cairo.

SYDNEY ELECTRICITY DEPARTMENT, November 1st.—Supply, delivery, erection, setting to work, testing and maintenance at Bunnerong power station of boiler feed pumps. (Reference A.X. 3 470.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Supply of 110 000 V transformers for Waikaremoana power scheme (section 17). (Reference B.X. 2 744.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Indoor control gear and switchgear for Waikaremoana electric power development (section 14). (Reference B.X. 2 675.)

CAPE TOWN MUNICIPALITY, November 3rd.—Two automatically-controlled, electrically-driven sewage pumps, etc. (Reference A.X. 3 617.)

VICTORIAN RAILWAY COMMISSIONERS, November 3rd.—Supply of 77 miles of seven-strand h.d. copper cable.

VICTORIA RAILWAY COMMISSIONERS, November 3rd, Pole changing transformer (contract 39 822). (Reference B.X. 2 915.) Pole transformers (contract 39 823). (Reference B.X. 2 914.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 4th.—Supply of primary battery material. (Reference B.X. 2 900.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 4th—Supply of one electrically-operated 40-ton Goliath crane. (Reference A.X. 3 657.*)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, November 8th.—Diaphragms, cords, etc. (Reference B.X. 2 860.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone transformers. (Reference B.X. 2 797.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone protective apparatus. (Reference B.X. 840.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, November 10th.—Supply and erection of steam turbine-driven centrifugal boiler-feed pump. (Contract No. 770.) (Reference A.X. 3 534.) Supply and erection of motor-driven centrifugal boiler-feed pump. (Contract No. 771.) (Reference A.X. 3 536.)

SYDNEY CITY COUNCIL, November 15th.—Supply of 33 000 V cable and pilot cable. Specification (No. 1 047) from the Constructional Engineer, Electricity Department, Town Hall, Sydney.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 16th.—Supply of timing clocks for indicating the duration of telephone trunk line calls. (Reference B.X. 2 827.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 23rd.—Lightning arresters and transformers. (Reference B.X. 2 792.)

PORT ELIZABETH MUNICIPALITY, November 25th.—Supply and erection of duplicate electrically-driven automatic float controlled centrifugal sewage pumps, etc. (contract 24, Mill Park). (Reference A.X. 3 680.*)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 26th.—Primary battery material.

SYDNEY CITY COUNCIL, November 29th.—Three-phase oil-immersed induction voltage regulator. (Reference B.X. 2 936)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 30th.—Supply of 110 kW transformers. (Reference B.X. 2 874.)

SOUTHLAND ELECTRIC POWER BOARD, INVERCARGILL, N.Z., December 1st.—Supply of a 3 000 H.P. horizontal Francis turbine and 2 350 kW generator. (Reference B.X. 2 822.)

VICTORIAN RAILWAY COMMISSIONERS, December 1st.—Rotary converter or rectifier set, with switching equipment for its automatic operation.

STATE ELECTRICITY WORKS, MONTEVIDEO, December 6th.—Diesel-electric generating sets.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 7th.—Three-phase induction regulator for Waikato electric power scheme (section 206). (Reference B.X. 2 935.)

NEW ZEALAND GOVERNMENT RAILWAYS, DECEMBER 10th.—Electric motors. (Reference B.X. 2 861.)

VICTORIAN ELECTRICITY COMMISSION, December 15th.—Water tube boiler, with superheater, economiser, etc., for Yallourn power scheme. Specification (No. 28/82), from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.2; deposit £3 3s.

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 1st.—Supply and erection at site of Seru pumping and power station, of four Diesel engine alternator groups, three pumps and accessories. Specification (10s. 6d.) from Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 4th.—Supply of switchgear and transformers for Waikaremoana electric power scheme. (Reference B.X. 2 872.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 1st.—Storage battery and booster for Waikaremoana Electric Power Board (section 28). (Reference B.X. 2 937.)

Tenders Accepted.

MAIDENHEAD HOSPITAL.—Maidenhead Radio Co., wireless installation.

LIVERPOOL CORPORATION.—Titan Trackwork Co., Ltd., new tramway junction.

CHESTER GUARDIANS.—Commercial Electric Co., electrical fittings for six months.

TICEHURST GUARDIANS.—Wallis, Ltd., electric light installation at the Institution.

CROYDON GUARDIANS.—Baxter and Caunter, Ltd., electrical fittings and appliances, for six months.

CHESTERFIELD CORPORATION.—Reed and Kenning, Ltd., fourteen trolley vehicle bodies, £6 337 2s.

CAMBORNE URBAN DISTRICT COUNCIL.—Urban Electric Supply Co., Ltd., public lighting at Beacon Fields.

HIGH WYCOMBE EDUCATION COMMITTEE.—H. Milner, electric light installation at Green Street Schools, £78.

DONCASTER CORPORATION.—British Thomson-Houston Co., Ltd., 6 000 kW turbo-alternator and condensing plant, £20 570; Enfield Cable Works Co., Ltd., low-pressure cables.

SHANKLIN URBAN DISTRICT COUNCIL.—Isle of Wight Electric Light and Power Co., electric light installation at the public offices, the Surveyor's office and the public conveniences at the Town Hall, £49 13s. Other tenders:—H. W. Keeping, £61 10s.; E. E. Matthews, £62.

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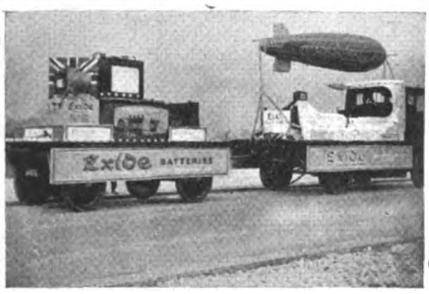
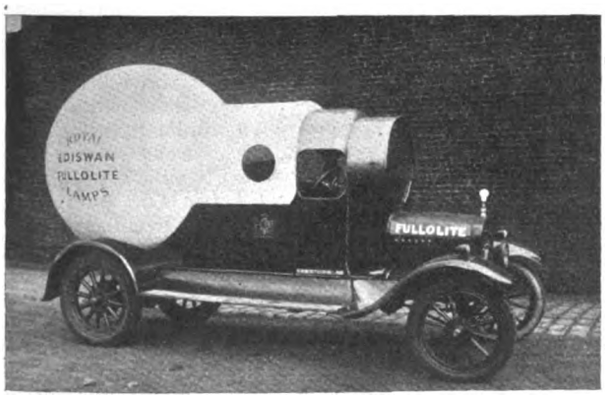
MANCHESTER'S CIVIC WEEK



ELECTRICAL firms' vehicles participating in the Manchester Pageant of Industries and illustrated on this page included those of the Chloride Electrical Storage Co., Ltd., W. T. Glover and Co., Ltd., the Edison Swan Electric Co., Ltd., and the Metropolitan-Vickers Electrical Co., Ltd. The floodlighting effects are reproduced by special permission of the Manchester Corporation Electricity Department.



MANCHESTER'S Civic Week celebrations were a great success and many thousands of the public gained useful knowledge of the industrial activities of the community of which they form part. The big electrical firms rose handsomely to the occasion, and, as will be seen from the pictures on this page, were well represented in the Pageant of Industries. Above the Ediswan car is a picture of Ferranti transformers traversing Manchester streets bearing placards: "Made in Lancashire for Use in India." A brief account of the part played by the electrical industry is given on page 464.

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ELECTRICITY SUPPLY.

Southend Ratepayers to Consider New £649,000 Power Station Scheme—£475,000 Dublin Extension Programme—Cost of Hackney Demonstration Halls.

LYTHAM St. Annes T.C. has borrowed £2 211 to buy more electrical converting plant.

Aldershot Electricity Department made a gross profit of £7 700 and a net profit of £2 517 for the past year.

The agreement for the supply of electricity by the North Wales Power Co. to Prestatyn U.D.C. has been sealed.

The Duke of York will inaugurate the Urban District Council's electricity supply system at Ashford (Kent) on October 20th.

> *"SIX MONTHS' HARD LABOUR."*
>
> *THIS was the sentence passed at a Midlands police court last week on a large number of electrical traders. Further details are given on page* 452.

Wigton U.D.C. has decided to support the application of Carlisle Corporation for an Order to supply electricity in the town.

Maidenhead T.C. has received sanction to loans of £8 540 for e.h.t. mains, and £2 960 for transformers, kiosks, and switchgear.

The transformer station at Padiham is rapidly approaching completion. A supply of electricity will be available by the close of the year.

Hazel Grove and Bramhall U.D.C. has applied to the Electricity Commissioners for a loan of £5 000 for extensions of mains and services.

Tamworth R.D.C. has consented to the application of the Pooley Hall Colliery Co., Ltd., for a Special Order to supply electricity in the district.

Manchester Lighting Committee has decided to light electrically a number of secondary and first class roads in the southern suburbs of the city.

It is understood that Barrow Electricity Supply Sub-Committee has opened negotiations with Vickers, Ltd., for a supply of electricity to the Corporation by the company.

A meeting of ratepayers of Peacehaven and Piddinghoe (Sussex) has rejected a resolution to oppose the application of the Peacehaven Electric Light and Power Co. for a Special Order.

Cardiff Finance Council has sanctioned the borrowing by the Electricity Committee of £10 000 for the extension of the undertaking during the next two and a half years, and £10 000 for the erection of sub-stations.

Altrincham Electricity Supply, Ltd., and Manchester Corporation have informed Bucklow R.D.C. that they are applying for Special Orders to extend their areas of supply so as to include parts of the Council's district.

Tunbridge Wells Loan.

Tunbridge Wells T.C. has received sanction to a loan of £16 847 for electricity purposes. Of this sum £14 400 is to be expended on works and distributing mains and £2 447 on sub-station equipment and switchgear.

Carleton P.C. has been informed that there will be a supply of electricity from Blackpool before next autumn. Consequently, the Council has decided to obtain estimates for the electric lighting of the streets immediately supplies are available.

Teignmouth U.D.C. was informed recently that the Teignmouth Electric Light Co. had asked the Board of Trade for permission to lay a 3 in. cable across the river Teign from Teignmouth to Shaldon. The council decided not to oppose the application.

Southend Corporation considered, last week, the recommendation of the Electric Lighting Committee to erect and equip a new generating station at South Fambridge, at a cost of £649 000. It was decided to submit certain details to the Ratepayers' Association.

The supply of electricity in Callington (Cornwall) by the Callington and District Electric Supply Co. has been commenced. On the occasion of the opening, the chairman of the company, Mr. John Spear, said the scheme had met with wonderful support, 215 houses having already adopted electric lighting.

The Nottinghamshire and Derbyshire Electric Power Co. has asked for the consent of Newark R.D.C. to the company's application for a Special Order to supply electricity in the Council's district. The Council has decided to approve the application, provided the maximum charge for energy does not exceed 8d. per kWh.

Maidstone T.C. has fixed the following tariff for supplies to all-electric houses: 8s. per annum for each 30 W lamp and ¾d. per kWh in the winter quarters and ½d. in the summer quarters. A stand-by supply of 750 kW is to be given to the Holborough Cement Co., the company to pay £100 on each occasion when the supply is used, with an addition of 1d. per kWh.

Fylde Board of Guardians, after considering the installation of electricity at the Institution, has decided that the firms who quoted for an installation in 1920 shall be asked to give fresh estimates based on current prices for (1) providing fittings and wiring of the Institution, a supply of electricity to be obtained from outside sources, and (2) providing electric plant, fittings and wiring.

Walton-le-Dale Council's new lighting scheme was officially inaugurated by Mr. W. de Rome, J.P., on October 6th. He switched on the first five of 50 lamps which Lancashire Electric Power Co. is converting from gas to electricity on the Council's behalf. There are 300 gas lamps in the district, and the conversion of the whole of these will save about £200 a year, apart from economy in wages.

The work of driving the 370 reinforced concrete piles comprised in the erection of Oldham Corporation's new electric power station in Slack's Valley, Chadderton, is being actively carried on. The plant to be installed in the station is to be of an aggregate capacity of 100 000 kW, and it will be employed chiefly in generating energy for mills, the Greenhill station being retained for domestic supplies.

Middlesbrough Inquiry.

Col. T. C. Ekin, chief inspector for the Electricity Commissioners, opened an inquiry at Middlesbrough on Tuesday into Middlesbrough Corporation's application for sanction to borrow £142 000 for the purchase of electricity generating plant. The Corporation now takes a bulk supply from the Cleveland and Durham Power Electric Co., but the agreement with the company terminates in November, 1927.

Dublin City Commissioners have under consideration a proposal to apply to the Ministry of Industry and Commerce for sanction to a loan of £475 000 for electricity extension works between 1926 and 1929. Amongst the items covered by this amount are £104 400 for cables to bring a supply of electricity from the Shannon power system to Dublin, if and when it is available, and £22 000 for the proposed new sales department.

It is reported that the exportation of the energy to be generated by the National Hydro-Electric Co. by the water power of the Carillon Falls on the Ottawa river is to be prohibited, and the output is to be divided between the Provinces of Quebec and Ontario. The power supplied to the latter will be distributed by the Ontario Hydro-Electric System. The National Hydro-Electric Co. is expected to spend $40 000 000 on the scheme.

Glasgow Housing Committee proposes to introduce electricity for domestic purposes in the new re-housing schemes for depossessed slum-dwellers at Duke Street and Govanhill. There are 180 houses at Duke Street and 228 at Govanhill, of two and three apartments. If the proposal is approved it is intended to instal penny-in-the-slot meters for which 4d. or 6d. will be charged weekly, and the charge for current will be at the rate of 1d. per kWh.

Hackney (London) Finance Committee reports that the actual expenditure on the new electricity demonstration hall and offices amounts to £47 533 (excluding £4 400 for the site), or £5 253 more than the estimates already approved, and leaving a balance of £22 533 which has not been sanctioned by the Electricity Commissioners. It is recommended that application be made to the Commissioners for sanction to the borrowing of the last mentioned amount.

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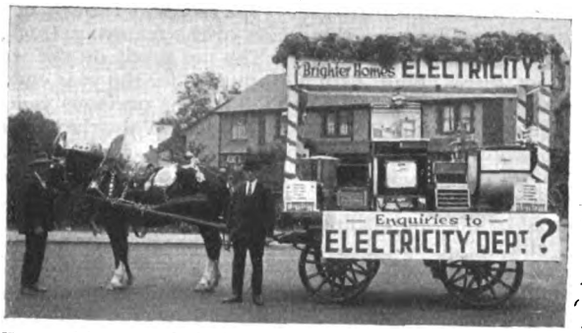
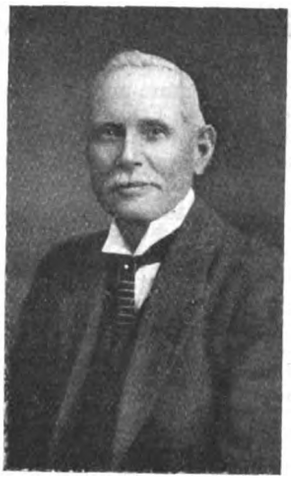
NEWS IN PICTURES

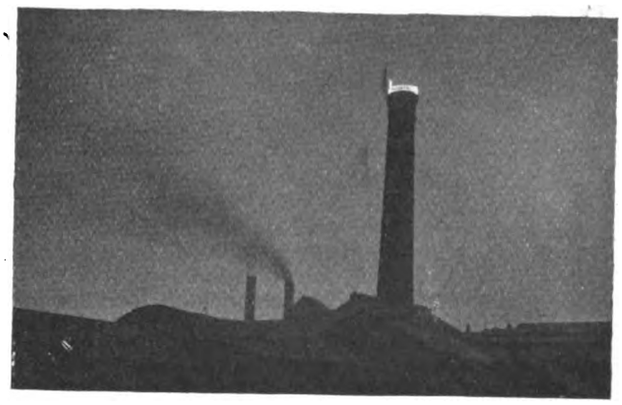
Mr. Eric Dunstan, whose voice is well known to London radio broadcast listeners, has been appointed general manager of the Indian Broadcasting Co., in which capacity he will have the big task of organising broadcasting entertainments to appeal to 345 000 000 people.



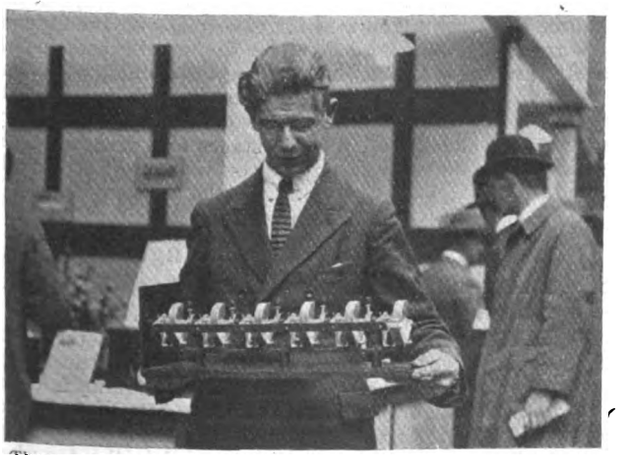
From this perambulating electrical exhibition staged by Mr. J. Boyce, the Morecambe borough electrical engineer, in connection with the Morecambe Carnival, electrical talks were given in the streets, and propaganda literature was distributed. The exhibit was awarded a silver cup and prize in the Trades Procession, and was also in two other carnival processions. Already several inquiries have come from distant towns from people who saw the exhibit in Morecambe.



Mr. William Mackintosh, who succeeds Mr. R. A. Ure as president of the Electrical Contractors' Association of Scotland, of the Central Board of which he has been a member for many years, is a director and general manager of William Douglas and Co., Ltd.



These two pictures, reproduced by courtesy of Mr. F. V. L. Mathias, Warrington's borough electrical and tramways engineer, illustrate some of the activities of the Electricity Department during the recent Civic, Local Shopping and Empire Week at Warrington. Large numbers of people visited the Department's stand at the local trades exhibition. Advantage was taken of the fact that steeplejacks were repairing the 160 ft. high chimney shaft at the electricity works to illuminate the chimney top in the manner shown in the picture on the right above. By night this effect was clearly seen a very great distance away.



There were about fifty exhibitors at the Birmingham and Midlands Wireless Exhibition, and, as stated by an ELECTRICIAN correspondent in a review of the exhibits (p. 462), the trend towards simplicity in tuning was a noticeable feature of the majority of the sets exhibited. The illustration shows the driving of groups of condensers from one shaft as shown by a Birmingham firm.

In this group of leading British and German industrialists taken at Col. Wilfrid Ashley's house last week-end, Sir Hugo Hirst, chairman and managing director of the General Electric Co., Ltd., is seen seated on the right of the front row. It is understood that European industrial problems were discussed with a view to international co-operation, but no official report was issued.

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WIRELESS NEWS.

Radio Apparatus Shown at a Birmingham Exhibition.

THE Birmingham and Midlands Wireless Exhibition, which opened last Friday and closes to-morrow (Saturday), emphasises, as did the national exhibition at Olympia, the considerable progress which the industry is making in the direction of simplifying receivers. There were about fifty exhibitors, and a large proportion of them showed sets in which simplicity in tuning was a conspicuous feature. The interest displayed in this was another indication of the growing disposition on the part of listeners to regard the wireless receiver purely as a musical instrument, and the number of requests for demonstrations was proof of the diminishing readiness to accept manufacturers' claims alone. Some beautifully finished receivers were on view, some of which were too late for exhibition at Olympia. The sets by S. A. Lamplugh, Ltd., Wilkins and Wright, Ltd., Cleartron Radio, Ltd., and the Omniaphone Radio Co., were prominent, by reason of their simplicity, amongst the exhibits by local manufacturers.

In the manufacture of small parts for the wireless industry, both at home and abroad, Birmingham now plays an important part, and these items naturally were noticeable on many stands. From inquiries made amongst some of the exhibitors (writes an ELECTRICIAN representative) it is evident that in this section of the industry increasing competition is being met with from abroad, especially Germany and Switzerland, and prices in many cases have had to be keenly cut in consequence.

THEY ALL PLEADED GUILTY.

"WHO did?" and "what to?" are natural questions to ask. They were electrical men, and they pleaded guilty to being enthusiastic about the Better Home Lighting Campaign. Are YOU "guilty" or "not guilty"?

A number of new loud speakers were shown, and models in the form of lamp shades, rose bowls, and miniature chandeliers awakened considerable interest. Particularly popular was the stand on which the new "Hedgeland" pictorial loud speakers were displayed.

An outstanding exhibit was that of the new duplex telephony apparatus, comprising transmitter and receiver, which was used recently in tests between the G.W. Rly. Co.'s boat "Reindeer" and a shore station on the south coast. In these tests duplex telephony was established up to distances of 70 miles without the use of either aerial or earth. The inventor, Mr. Derek S. B. Shannon, of Sutton Coldfield, Birmingham, claims that with his receiver, utilising only two valves and no aerial or earth connection, results are obtainable equal to those of a seven or eight valve super-heterodyne set. It is probable that more will be heard of his circuit in the near future.

The exhibition was promoted by the "Birmingham Weekly Post" and organised by Provincial Exhibitions, Ltd.

I.E.E. Wireless Section Committee.

The new committee of the Wireless Section of the Institution of Electrical Engineers for 1926-27 comprises: Prof. C. L. Fortescue (Chairman), Dr. W. H. Eccles (ex-officio); the Chairman, I.E.E. Papers Committee (ex-officio); Major B. Binyon; Mr. P. R. Coursey; Capt. P. P. Eckersley; Lieut.-Col. A. C. Fuller (nominated by the War Office); Mr. F. Gill (nominated by the Council, I.E.E.); Dr. R. V. Hansford; Major G. Harrison (nominated by the Admiralty); Capt. N. Lea; Lieut.-Col. A. G. Lee (nominated by the Post Office); Lieut.-Col. H. P. T. Lefroy (nominated by the Air Ministry); Prof. E. Mallett; Mr. S. R. Mullard; Mr. C. F. Phillips; Col. T. F. Purves (representative of the I.E.E. General Purposes Committee); Capt. H. J. Round; Mr. E. H. Shaughnessy; Mr. G. Shearing; and Commdr. J. A. Slee.

Mr. Ormsby-Gore, Under-Secretary of State for the Colonies, reporting on his recent visit to West Africa, thinks it would be worth while to investigate whether a relaying station could be established at Accra or Jakoradi to distribute the Daventry programmes.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

WALTHAMSTOW U.D.C. has applied to the Ministry of Transport for a loan of £45 600 for reconstructing a portion of the tramway track.

The net profit on the working of the Aberdeen Corporation tramways for the year ended May 31st, 1926, was £760, against £438 for the previous year.

On the Wolverhampton tramways, trolley vehicles and motor 'buses last year there was a gross profit of £58 597 and a net profit of £23 768.

Glasgow Tramways Committee recommends the Corporation to apply to the Ministry of Transport for authority to increase the maximum speed of the tramcars.

On the first complete year's working of Keighley Corporation's railless trolley omnibus undertaking there was a net deficit of £2 622. The total revenue of the trolley vehicles for the year was £20 410, compared with £20 453 on the tramcars during the last complete year of their existence.

Liverpool Tramways Committee has under consideration a scheme of extensions involving the construction of a tunnel under Everton Hill. The financial aspect of the enterprise is now engaging attention. The Tramways Committee has instructed the Tramways Manager to consider and report on the advisability of substituting light metal for the heavy wood used in car construction.

Trolley 'Bus Extensions.

Conisborough U.D.C. has granted permission to the Mexborough and Swinton Tramways Co. to operate a trolley 'bus route from the existing terminus at Dale House, Conisborough, along Dale Road, Castle Hill, Castle Street, Church Street, Old Road, Welfare Avenue, Denaby Avenue, The Crescent, and Cadeby Avenue. This is an extension of the Mexborough and Swinton trackless tramway which the company has been contemplating for some time.

Clough, Smith and Co., who are supplying to West Hartlepool Corporation twelve trolley 'buses for the Hartlepool route, have been unable to deliver them in accordance with contract, owing to the coal strike, but they are expected in December. Some of the Garrett trolley 'buses for the Seaton Carew route are also expected to be delivered in December, and trolley 'buses should be running on the whole of the Corporation's tramway routes on January 1st.

The electrification of the Paris-Orleans Railway has now been completed, and electric trains ran over the whole route (about 75 miles) for the first time on October 6th. The system will be extended to Vierzon, about 50 miles further south, by about the end of this year. The section between Toulouse and Brive is also being electrified, and the big power station which is being equipped at Eguzon and which was fully described in a recent issue of THE ELECTRICIAN, will supply energy for the purposes of the railway.

Glasgow Tramways Committee has rejected a proposal that the three-farthings token fare for two stages on the Corporation's tramways be restored. The Committee unanimously agreed to remit to the sub-committee on traffic and revenue to consider and report as to the advisability of instituting the following revised scale of fares:—Two stages for a half-penny, four stages for one penny, and six stages for three-halfpence; the maximum twopenny fare to be continued. At present the lowest fare is 1d. (for two stages) and the highest 2d.

Electricity in Mining.

Further Applications Discussed at Meeting of South Wales Branch of the A.M.E.E.

AT the first general meeting of the session of the South Wales Branch of the Association of Mining Electrical Engineers held at Cardiff, Mr. Dawson Thomas (branch chairman), in his inaugural address, advocated a joining up of the power stations of the largest collieries for the maintenance of a good service. He looked forward to the day when by electrical development collieries now idle would be working.

A gold medal won by Mr. E. W. Davies and the first prize for a paper won by Mr. S. T. Richards were presented by Mr. David Hannah, who made some remarks on the progress of electricity in South Wales collieries during the last fifty years. There was, he said, one problem that awaited the attention of engineers, and that was the application of electricity to work at the coal face.

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COMPANY NEWS.

Appreciation in Price of London Electricity Supply Companies' Shares, Due to Bonus Share Distributions—Midland Counties Co.'s New Issue.

THE feature of the past week in the electrical share markets has been the rise in prices of London electricity supply companies' shares. Last year's London Electricity Act provides for the regulation of dividends, and in anticipation of this it is expected that reserves will be capitalised and share bonuses distributed. The Kensington and Knightsbridge announced last week an issue of bonus shares. As a consequence the £5 shares have jumped in value from £14 to £17. Although there has been some reaction, all the London ordinary shares show substantial advances, Charing Cross from 44s. 4½d. to 48s. 9d., County of London 58s. 1½d. to 63s. 9d., Metropolitan 36s. 10½d. to 40s. 7½d., St. James's 16⅞ to 18½, and Westminster 45s. to 48s. 9d.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
	Electricity Supply.				
10	Brompton & Kensington Ord. ..	31/3	31/3	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	90	90	100	67
15	Charing Cross Elec. Ord. (£1) ..	48/9	44/4½	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	42/6	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	50/7½	49/4½	52/6	20/3
6	,, ,, 6% C.P. ..	23/-	23/-	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	63/9	58/1½	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	17	14	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	35/-	32/-	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	40/7½	36/10½	41/6	8/-
4½	,, ,, 4½% C.P. ..	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	22/6	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord. (£5) ..	18½	16⅞	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	48/9	45/-	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
	,, ,, 6% C.P. ..	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	140½	140½	123	24
6	,, ,, 6% Pf. Stk. ..	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69	69	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	78½	78½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	50½	50½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	78½	78½	89	65
4	Lon. Un. Trams. 1st Deb. ..	44½	44½	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	64½	64½	101½	49
5	,, ,, 5% Deb. ..	66½*	66½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	60½	61½	84½	19
3½	,, 3½ Pf. Stk.	63½	63½	88½	40½
3½	,, 3½% Deb.	69½	69½	92½	51
3½	Met. Dis. Ord. Rly. Stk. ..	52½	53	58	12⅞
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb. ..	68	68	73½	48½
—	Underground Elec. Rlys. Ord.(£10)	4	4	5⅝	21/3
5	Yorks. (W.R.) Trams. Ord. ..	11/6	11/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	70/-	70/-	62/-	26/6
6	,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	22/6	22/6	23/4	19/7
7	,, ,, ,, 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	26/10½	26/10½	29/-	10/-
‡15	Callender's Cable Ord.	66/3	67/6	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref.	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)	12/9	12/9	28/9½	1/1
7½	,, ,, 1st Pref. ..	22/6	22/6	26/-	5/-
10	Elec. Construction Ord. ..	31/10½	31/10½	30/4	6/7
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	16/3	15/6	29/3	7/3
6	,, ,, 6% C.P. ..	18/-	17/6*	21/3	10/6
—	Ericsson Telephones 7% Pref.	21/3	21/10½	21/-	12/7
6	Ferranti 6% Pref.	18/9	19/4½	18/6	16/9
7	,, 7% 2nd Pref. ..	18/-	18/-	19/-	13/9
5	,, 1st Mort. Deb. Stock	91½	91½	96½	80½
7½	General Elec. Ord.	30/3	30/3	59/-	13/6
20	W. T. Henley's Ord.	82/6	82/6	86/6	23/3
17½	Johnson & Phillips Ord. ..	66/3	66/3	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	25/7½	25/7½	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	47/6	47/6	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	30/-	30/-	36/6	12/3
‖10	Telegraph Const. Ord. (£12) ..	30/-	30/-	56/2/6	19
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	74½	74	87½	60
10	Eastern Ord. Stk.	190½	190½	213½	113/2/6
3½	,, 3½% Pref. Stk. ..	66½	66½	84/17/6	49
4	,, 4% Deb.	79½	79½	103½	60
10	Eastern Extension Ord. (£10) ..	19½	19½	21½	10/12/6
4	,, ,, 4% Deb. ..	78½	78½	97½	60
‖10	Gt. Northern Telegraph (£10) ..	27½	27½	42/12/6	19
—	Indo-European (£25)	47½	47½	59½	25
7½	Marconi's Wireless T. Ord. ..	13/9	14/4½	9/16/3	20/9
10	,, Int. Mar.	21/3	20/-	5/11/3	14/11
4	Western Tel. Ord. (£10) ..	18½	18½	23	11/6/3
	,, ,, 4% Deb. Stk. ..	78½	78½	10	60/2/6

* Ex dividend.
‡ Plus share bonus. ¶ Plus 3p.c. in respect of 1921. ‖ Including bonus.

BABCOCK AND WILCOX, LTD.—Intm. div. on ord. shs., 5 p.c., tax free.

CALLENDERS' CABLE AND CONSTRUCTION CO., LTD.—Intm. div. 5 p.c., less tax, on ord. shs., payable November 2nd.

MONTE VIDEO TELEPHONE CO., LTD.—Fin. div. for year ended July 31st, 5 p.c., making 8 p.c., tax free, for year.

HANKOW LIGHT AND POWER CO., LTD.—Fin. div. on ord. shs., 15 p.c. and div. on def. shs. 3 000 p.c. for year ended March 31st.

CALCUTTA ELECTRIC SUPPLY CORPORATION, LTD.—Intm. div. on ord. shs. 5 p.c., actual, less tax, at 2s. in £, payable November 15th.

SIR W. G. ARMSTRONG, WHITWORTH AND CO., LTD.—It is not proposed to pay div. due this month on the £1 000 000 4 p.c. 1st pref. capital.

ANGLO-AMERICAN TELEGRAPH CO., LTD.—Intm. divs. for quarter ended September 30th, 15s. p.c. on ord. stk., and £1 10s. p.c. on pfd. stk., less tax.

CUBA SUBMARINE TELEGRAPH CO., LTD.—Intm. divs. at the rate of 10 p.c. p.a., less tax, on pref. shs. and at rate of 5 p.c. p.a., tax free, on ord. shs., payable October 21st.

MIDLAND COUNTIES ELECTRIC SUPPLY CO., LTD.—On Wednesday offers were invited for remainder of unissued capital, consisting of 250 000 6 p.c. cum. pref. shs. of £1 at par, and 250 000 ord. shs. of £1 at par.

MONTREAL TRAMWAYS CO.—Directors have authorised issue of $1 000 000 par value of common shs. at $125 p. sh. to shareholders on record at October 15th, at rate of one sh. for each sh. held on that date. Subscriptions can be received by Aldred and Co., Ltd., 24-28, Lombard Street, London, E.C.3.

KENSINGTON AND KNIGHTSBRIDGE ELECTRIC LIGHTING CO., LTD.—Directors propose to capitalise £189 000 free reserves, and make distribution of bonus shs. For each £5 ord. sh., holders will receive 9 new £1 ord. shs., and £5 shs. will be converted into £1 shs., so that each existing £5 sh. will be superseded by 14 £1 shs.

CENTRAL ARGENTINE RAILWAY CO.—Directors state, in regard to policy of extending electrification in suburban section around Buenos Aires, that authorities ask for other works which they think of public advantage to be simultaneously undertaken, so that there may be further delay before arrangements are completed.

WESTERN ELECTRIC DISTRIBUTING CORPORATION, LTD.—Report for year ended June last states that in September last an issue of additional 21 825 6 per cent. cum. pref. shs. and 34 777 ord. shs. was made. Latter were issued at premium of 5/6 p. sh. which has been placed to reserve. £6 000 is being written off reserve fund. Net profit is £11 371, plus £445 brought in. Balance div. 7 p.c. on ord. shs. makes 10 p.c., less tax, on new shs. for year. £917 is written off preliminary exes. and exes. of increase of cap., £1 001 is placed to res.

New Companies.

ROSS-SHIRE ELECTRIC SUPPLY CO., LTD.—Cap., £60 000. To acquire the undertaking of the Strathpeffer and Dingwall Electric Co., Ltd. (in liquidation). Reg. office: 4, Tulloch Street, Dingwall. (Public company.)

LOTHIANS DYNAMO AND MOTOR CO., LTD.—Cap., £2 500. Manufacturers of dynamos, motors and other electrical machines and machinery, electricians, etc. Reg. office: 54, South Bridge Street, Bathgate, West Lothian.

WOODSTOCK POWER SYNDICATE, LTD.—Cap., £3 000. To manufacture and supply gas for heating, power and lighting and to adopt an agreement with the Woodstock Electric Light Co., Ltd. Reg. office: Abbey House, Westminster, London, S.W.1.

BRIGGS, PRECIOUS AND BUCKLEY, LTD.—Cap., £600. To acquire business now carried on by H. Briggs, A. Precious, B. Buckley and A. Moon at Lockyer Avenue, Burnley, as "Briggs, Precious and Buckley," and to trade as contractors, electricians, etc.

TELEPHONES AND ACCESSORIES, LTD.—Cap., £3 000. Manufacturers of and dealers in telephones and telephone, telegraph and wireless appliances and accessories, etc. Solicitors: Cruesemann and Rouse, 40/42, King William Street, London, E.C.4.

READ RADIO, LTD.—Cap., £1 000. Manufacturers, assemblers, erectors, installers and repairers of wireless, telegraphic, telephonic, and television apparatus, valves, instruments, etc. Solicitors: Cohen and Cohen, 112, Salisbury House, London, E.C.2.

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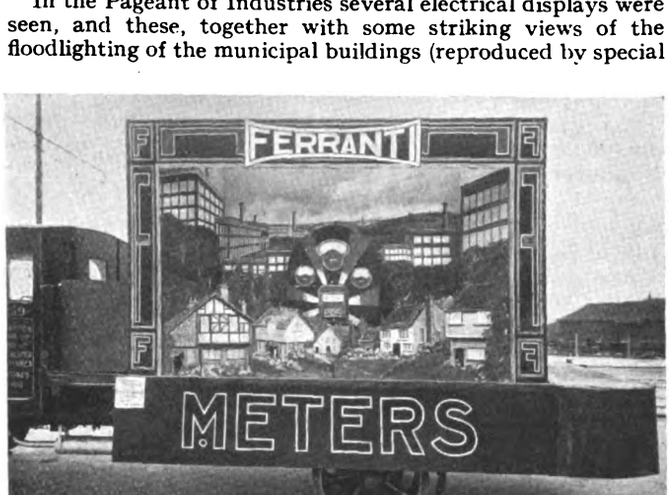
CIVIC WEEK.

Electrical Firms' Prominent Part in Manchester Celebrations.

LAST week Manchester celebrated its Civic Week on a grand scale and the public was given a unique opportunity of gaining knowledge of the activities of the community, and the electrical manufacturing firms of the district were well to the fore in providing interesting sights.

In the Pageant of Industries several electrical displays were seen, and these, together with some striking views of the floodlighting of the municipal buildings (reproduced by special



One of the Ferranti vehicles in the Civic Week procession.

permission of the Manchester Corporation Electricity Department) are illustrated on page 459.

One of the most popular resorts was the Trafford Park works of the Metropolitan-Vickers Electrical Co., Ltd., which were visited by hundreds daily. There they were shown very large motors side by side with fractional horse-power motors, and a 35 000 kW turbo-alternator was seen undergoing preliminary tests. Considerable interest was displayed in a turbo-generator rated at 43 750 kVA and running at 1 500 revs. per min., the largest so far built in this country, and another, rated at 15 675 kVA, running at 3 600 revs. per min., which at present establishes a world record for output at this speed. A uniform route was followed through the various departments and special guides were provided. The company's well-known water tower appeared in miniature on the Metropolitan-Vickers decorated lorry illustrated on page 459.

The Chloride Electrical Storage Co., Ltd., entered a G.V. electric vehicle and trailer. On the former was staged a tableau representing Amundsen's flight to the Pole and the trailer was built up with illuminated pictorial panels depicting Chloride batteries for power stations on one side and for house lighting on the other side; the whole being surmounted by a larger model motor car starter battery illuminated from inside. For night illumination 300 electric lamps were used.

In addition to their representation in the procession, Ferranti, Ltd., appropriately transported through Manchester during the Civic Week celebrations two power transformers, each weighing 25 tons, which are part of a contract for 12 transformers to deal with 186 000 kVA at 120 000 V, for the Tata Power Co.'s new Bhira (India) power station.

W. T. Glover and Co., Ltd., the B.T.-H. Co., Mather and Platt, Ltd., Matthews and Yates, and the Edison Swan Electric Co., Ltd., were also represented by vehicles representing their manufactures. A number of searchlights were supplied by the London Electric Firm for floodlighting purposes.

As the week advanced (writes an ELECTRICIAN correspondent) the nightly illuminations improved considerably, and amongst the buildings which excited comment were the Town Hall, the Art Gallery, the Ship Canal Building, the Calico Printers' Association and the Refuge Assurance Co.

"Last week," our correspondent adds, "I was able to report that no fewer than 450 permits had been applied for by the public for the purpose of visiting the Barton power station in Civic Week. I have just been advised that during the whole period 2 446 applications were dealt with, and that this number was divided as follows:—Barton station, 1 783; Stuart Street station, 521; sub-stations, 142."

BUSINESS ITEMS.

Changes of Address, Representatives, and other Developments.

RADIO Instruments, Ltd., have reduced the price of their multi-ratio transformer to 25s.

The Huddersfield Radio Co. have opened additional premises at 9, King's Head Arcade, Cloth Hall Street, Huddersfield.

The Lichfield Agricultural Co., Market Street, Lichfield, has opened new showroom premises for its electrical department.

On October 30th the British Electrical and Allied Industries Research Association will remove to new offices at 36 and 38, Kingsway, London, W.C.2. The telephone number will be Holborn 0171.

Walker, Crosweller and Co., 54-58, Queen Elizabeth Street, London, S.E.1, have been appointed sole British representatives of Lewis M. Ellison, of Chicago, manufacturer of inclined draught gauges for boiler and other power plants.

Lighting Trades, Ltd., of Wandsworth, London, has acquired the undertaking of J. and W. B. Smith, Ltd., of Farringdon Road, London. The business at the Farringdon Road premises will be continued, and will be carried on under the old name, at any rate, for the present.

The new premises of the Birmingham branch of the British Thomson-Houston Co., Ltd., are now completed, and the first window display was devoted to the Better Home Lighting Campaign. The premises are in Snow Hill, and include extensive stores, a trade counter and a suite of showrooms. A demonstration shop window has been provided, and various business houses in the City will be invited to dress this from time to time. The window is fitted with up-to-date lighting equipment for white and coloured lighting.

Metal and Chemical Prices.

TUESDAY, October 12th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£64 0 0	—	10s. 0d.
Electro Wirebars	,,	£66 5 0	—	10s. 0d.
H.C. Wire, basis	per lb.	9 3/16d.	—	1/16d.
Sheet	,,	9 11/16d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 0 5/16d.	—	1s. 0 1/16d.
Brass 60/40—				
Rod, basis	per lb.	7 1/4d.	—	—
Sheet, basis	,,	9 3/4d.	—	—
Wire, basis	,,	10 1/4d.	—	1/4d.
Pig Iron—				
Cleveland Warrants	per ton	£5 17 6	12s. 6d.	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 0 0	—	—
Lead Pig—				
English	,,	£31 15 0	—	£1 0 0
Foreign or Colonial	,,	£30 10 0	—	17s. 6d.
Tin—				
Ingot	,,	£315 10 0	—	£2 10 0
Wire, basis	per lb.	3s. 11 1/2d.	—	1/2d.
Aluminium Ingots	per ton	£112 0 0	—	—
Spelter	,,	£34 2 6	—	10s. 0d.
Mercury	per bottle	£16 10 0	10s. 0d.	—

Sulphur (Flowers)—Ton £11 10 0 *Sodium Chlorate*—Per lb. 2 1/2d.
,, (Roll-Brimstone)—,, £10 5 0 *Sulphuric Acid* (Pyrites, 168°)
Copper Sulphate— ,, £25 to £25 10s. per ton, £6 15 0
Boric Acid (Crystals) ,, £37 *Sodium Bichromate*—Per lb. 3 1/2d.
Rubber—Para fine, 1s. 8 1/4d.; plantation 1st latex, 1s. 8 3/4d.

The metal prices are supplied by British Insulated Cables, Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

The Lead Market.

IN their lead market report dated October 9th, James Forster and Co. state that the first four days of the week again saw a sagging market, prices falling away 10s. per ton, but on October 8th the fall was accentuated, the tone being flat and values 10s. per ton lower.

Consumption is not active and demand is slow and it is now doubtful whether there will be any revival this year. Continental demand is quiet, while in America, under the influence of Wall Street, an easier tone has set in, the price there having been reduced to 8.50 cents per lb.

It seems probable that little change in present conditions will be witnessed in the near future, and that prices will fall still further before any permanent recovery takes place.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BAISTER, Mr. H., The Shambles, Alnwick, electrical contractor. £20 4s. August 18th.

SAVAGE, Mr. F. G. (trading as H. W. TYLER), 2, Station Buildings, Beckenham, electrical engineer. £11 2s. 5d. September 13th.

SOUTH WALES AND WEST OF ENGLAND WIRELESS TRAINING COLLEGE, LTD., Market Buildings, St. Mary Street, Cardiff. £15 1s. 10d. August 27th.

Receivership.

TRIBE (A. E.) AND CO., LTD. A. E. Tribe, of 18, London Street, Basingstoke, was appointed receiver on September 28th, 1926, under powers contained in debentures dated September 21st, 1926.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BOWER ELECTRIC (1926), LTD., London, W. Registered September 28th, £1 500 debentures; general charge.

REES (C. H.) AND CO., LTD., London, E.C., electrical supplies and glassware merchants.—Registered October 4, £2,500 debentures; general charge.

Satisfactions.

"B. N. B." WIRELESS, LTD., Liverpool.—Satisfaction registered September 29th, £150, part of amount registered December 4th, 1923.

COLNE VALLEY ELECTRIC SUPPLY CO., LTD., London, E.C.—Satisfaction registered October 4th, £1,500, part of amount registered July 17th, 1925.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

NORWEST ELECTRICAL MANUFACTURING CO., LTD. Creditors met at Glasgow recently, when it was agreed that the company should be allowed to carry on for six months, during which period creditors would be paid only for new purchases, and report to them again not later than March 31st. In addition to trade creditors for over £300 and cash creditors for £940, there is a bank overdraft for nearly £800. The company's balance sheet as at March 31st showed a debit at profit and loss account amounting to over £1 930. Assets were valued on a break-up basis at £380, but as a going concern at £1 170. The company's solicitors explained to the meeting that the company's chief products were electrical appliances for use in collieries.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Companies Winding-up Voluntarily.

REACTONE, LTD.—F. W. Inns, accountant, 41, Cheapside, London, E.C.2, appointed liquidator, October 5th. Meeting of creditors, Cannon Street Hotel, Cannon Street, London, E.C.4, on Wednesday, October 20th, at 12 noon. Creditors' claims by November 10th.

WOODSTOCK ELECTRIC LIGHT CO., LTD. By special resolutions, September 3rd, confirmed October 4th. V. N. Tolley, Woodstock, appointed liquidator.

Notice of Intended Dividend.

TREND, James Anthony, 31, Chapel Street, Luton, Bedford, electrician. Last day for receiving proofs, October 19th. Trustee, T. Keens, 11, George Street West, Luton.

Bankruptcy Proceedings.

BOYD, George, New Road, Mousehill, Milford, Surrey, electrical engineer. The receiving order in this matter was made recently on debtor's own petition. The statement of affairs shows liabilities of £282, against assets of £31, or a deficiency of £251. Debtor attributes his failure to want of capital and bad trade owing to the coal strike. It appears that in July, 1925, with £12 capital he commenced business in his own name at Milford as an electrical engineer, doing chiefly repair work, but the business has not been successful. On September 14th last the Sheriff levied execution and on September 24th sold his stock and plant. Debtor also states that in August, 1926, he disposed of his Ford motor car for £10, the proceeds being used in payment of rent and for living expenses.

BRITTAIN, Percival Frederic (trading as Brittain's Electrical Motor Co.), East Down Works, Dermody Road, Lewisham, S.E., and 110, Cannon Street, E.C., electrical engineer. The adjourned statutory first meeting was held on Friday at Bankruptcy Buildings, Carey Street, W.C. The debtor, who denies that he is insolvent, attributes his present position to lack of ready capital through the industrial conditions. He roughly estimates his liabilities at between £2 000 and £3 000 and considers that his assets are of the value of between £17 000 and £18 000. Mr. S. S. Moore, who now appeared on debtor's behalf, stated that it had been hoped to form a company with a capital of £25 000 but in consequence of the time of the year it had been found impossible to proceed with such an arrangement. If, however, the meeting were further adjourned it was proposed to pay the debts in full and to apply to the court to rescind the receiving order. The meeting, however, passed a resolution for bankruptcy and appointed as joint trustees of the debtor's estate Mr. Osborne and Mr. J. Hodson, recommending that the bond to be given by them as security should be £5 000.

ELBA LIMITED, 1, Winchester Place, Acton, Middlesex, battery manufacturers. The winding-up order in this matter was made on a creditor's petition. The statement of affairs shows liabilities of £3 274, and assets estimated at £354, from which preferential claims of £67 have to be deducted, leaving an amount of £287, which is insufficient by £1 033 to meet the claim of the debenture holder, amounting to £1 320. The issued share capital of the company amounts to £1 353, so that there is a deficiency as regards the contributories of £4 626. The failure of the company is attributed to insufficient working capital, delay in receiving the final instalment of amount advanced by the debenture holder, keen competition, and bad trade. The deficiency account shows a gross profit from carrying on the business from the date of the formation of the company to date of appointment of receiver for debenture holder of £916, while against this the general expenses amount to £2 942, bad debts £45, stock written down £250, depreciation of trade fixtures £26, depreciation of plant and machinery £515, goodwill written off £385, and further loss arising out of purchase of assets £1 379. The company was formed in January, 1924, for the purpose of manufacturing batteries for electrical and wireless purposes. The nominal capital was originally £2 000, divided into 2 000 shares of £1 each. On October 27th, 1924, a resolution was passed increasing the capital of the company to £2 100 by the creation of 4 000 deferred shares of 6d. each, which were allotted and paid for in cash. The business acquired by the company was originally commenced at Farringdon Road, E.C., and in May, 1921, was transferred to a limited company. On January 1st, 1923, the business was removed to 1, Winchester Place, Acton, and shortly afterwards a debenture holder for £1 350 appointed a receiver who carried on the business until January 29th, 1924. Apparently the Receiver sold all the assets of the company (except the book debts), subject to a charge to the bank for about £800 to Elba, Ltd., then formed to take it over, for £1 250, which was satisfied by the allotment to the debenture holder of 1 250 fully paid £1 shares in the new company. It is now stated, however, that in order to preserve the credit and goodwill of the business the present company found it necessary to make a number of payments to the creditors of the first company, and that the payment off of the bank and the payments to these creditors make up the sum of £1 379 shown in the deficiency account as part of the company's losses. The company had the usual borrowing powers and on December 5th, 1924, £1 320 was borrowed at 10 per cent. per annum upon debentures covering all the assets of the company.

PARKES, Stanley, trading as H. and S. PARKES, Brewery Buildings, Wistaston Road, Crewe, electric battery manufacturer. The public examination of this debtor was held on October 7th, the statement of affairs showing liabilities expected to rank of £434 and a deficiency of £417. Debtor commenced business two years ago as a knitwear manufacturer, and in October, 1925, entered into a verbal agreement with another to carry on business in partnership as manufacturers of electric batteries. He paid about £60 in preliminary expenses, including £20 deposit on the purchase of a motor car, which was returned to the dealers five weeks later. In December, 1925, they obtained on credit 450 transmission poles, invoiced at £90 and these were sold a few days later for £33 15s. In June judgment was given against him for the cost of the poles, and in consequence thereof and pressure by other creditors, he filed his petition. The examination was adjourned for the production of a wages book and to enable the Official Receiver to make further enquiries respecting the sale of the transmission poles.

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"Wiring the Homes of Britain."—VII.

(*Concluded from page* 452.)

the campaign for their own purposes are invited to broadcast their discoveries through THE ELECTRICIAN, so that others may share the benefits of their ingenuity.

The opening of the E.L.M.A. Service Bureau and the great interest taken in Civic Week have tended to delay the development of the Campaign in the city of Manchester itself, but early this week more active developments were noticeable, and the Corporation showrooms have installed an excellent window display. Mr. R. C. Hawkins told a representative of THE ELECTRICIAN that the North-Western area has now distributed 100 000 competition booklets, and one firm alone has taken over 10 000.

No definite arrangements have yet been made in regard to electric demonstration houses in the district, but an active committee is superintending the matter at headquarters in Manchester, and Circles are being formed all over the area. Liverpool has now a Committee of its own and Southport is expected to follow suit, whilst a meeting will be held in Blackburn Town Hall on October 19th at 3 p.m. Chester, Llandudno, Blackpool, Preston, Burnley and Lancaster are already getting matters under weigh.

No definite arrangements in regard to local advertising have been advised to headquarters, but as everyone has been tied to Manchester in Civic Week it is possible that some quiet work is being done in the wide area covered.

A Point to Watch.

One matter which occurred to a friend of the writer's in Manchester this week is worthy of mention. When he applied for a competition booklet no effort whatever was made to take his name and address. True, this was the case of an assistant carelessly dealing with customers, but it should act as a warning to those who let business pass and imperil their chances of reaping the utmost value from the campaign.

In the shade of St. George's Hall, Liverpool, there has just been built a reproduction of a Corporation subsidy all-electric house, in which have been fitted as many electrical comforts as can be conveniently installed in a dwelling of that size. The electrical equipment of the house (seen in the picture on page 452) has been installed by the Corporation Electricity Department. The dwelling will open to the public to-morrow (Saturday), the first day of Liverpool Civic Week, and during the next few days it will be visited by tens of thousands of people. The Corporation conveys to visitors the information that advice and estimates for installing electrical apparatus may be obtained from any of the city electrical contractors.

In the Liverpool district the campaign is slowly but surely gathering impetus, and in conversation with Mr. Hazell, of Lindsay and Co., chairman of the Liverpool Branch of the Electrical Contractors' Association, THE ELECTRICIAN'S representative was assured that the initial response to the advertising matter which had been put out had been very satisfactory. On Wednesday evening a meeting of Liverpool and district electrical contractors and others was to be held to discuss the campaign, which is likely to be considerably helped forward by the Civic Week displays.

Rotherham Traders Delighted.

Conspicuous success has attended the opening of the Campaign in Rotherham, writes an ELECTRICIAN correspondent. Rotherham already has about 5 000 consumers of electricity, which number is increasing at the rate of 1 000 per annum, but electrical traders are determined to show the rest of the public that "the better way is the electric way." The competition booklets are disappearing quickly, and at the present rate new supplies will have to be obtained. Mr. A. Lilleker, of Lilleker Bros., Doncaster Gate, told THE ELECTRICIAN representative that the public were eagerly demanding the booklets, and up to Monday his firm had given away nearly 200. Other traders reported similar results, and expressed their delight with the success of the scheme so far.

Inquiries made of the leading electrical contractors in Brighton by an ELECTRICIAN representative seem to show that whilst there have been many applications for competition books there has so far been no great rush of business. This, of course, is only to be expected, as interest must first be aroused before business can be done. Page and Miles, Ltd., have distributed a fair number of booklets and E. Fellingham has also distributed quite a number. The Home Life Exhibition at the Dome, to which reference was made in an earlier report, has an attractive exhibit staged by Messrs. H. J. Galliers, comprising a model of the first television transmitter made, and also a model of a television wireless receiver.

Inquiries made by the Plymouth representative of THE ELECTRICIAN on Monday elicited the view, which was quite generally expressed, that a larger poster than the one supplied by the E.D.A. (which is 24 in. by 9 in.) is necessary for effective window display. Messrs. Heath said that they had already disposed of 100 competition booklets, and they were looking forward to receiving a supply of larger posters so that the advertising spaces in their showrooms and windows could be more adequately utilised, the result of which would be to increase the appeal the scheme is making to the public.

Mr. W. Hodge indicated that he had had a fair demand for the booklets, having disposed of 60 to date, but was in urgent need of further illustrated and printed matter, especially large posters for display purposes.

Axworthy and Co. reported that they had made full use of the advertising matter received, and were now waiting for supplies of competition booklets.

Asked whether it was intended to equip an electric demonstration house in Plymouth, Messrs. Axworthy said they would be prepared to wire it if suitable premises could be rented for six months, but the exigencies of the housing situation in Plymouth prevented any such place being obtained.

Corse and Co. seconded what Mr. Hodge had said in regard to the demand for competition booklets and expressed the view that the coal crisis was providing a splendid opportunity for electrical development. They strongly held that bigger posters were a necessity from the retailer's standpoint.

On Wednesday the total number of competition booklets disposed of was 700,000.

Patent Record.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

244 591 STANDARD TELEPHONES AND CABLES, LTD. (formerly WESTERN ELECTRIC CO., LTD.). Electromagnetic relays. (30/12/24.)

244 592 A. MILLEDGE. Telephone head-set. (30/12/24.)

244 596 A. CAMPBELL. Inductances and auxiliary apparatus for electrical measurements. (3/1/25.)

244 604 E. E. ROOKE. Crystal detectors for wireless reception. (22/1/25.)

244 607 STANDARD TELEPHONES AND CABLES, LTD. (formerly WESTERN ELECTRIC CO., LTD.). Method of indicating frequency changes in alternating electric currents. (24/2/25.)

228 937 BRITISH THOMSON-HOUSTON CO., LTD. Self-excited induction motors. (9/2/24.)

229 348 MASCHINENFABRIK OERLIKON. Electric drive for transmission gear operated high-tension electric switch apparatus. (14/2/24.)

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Friday, October 15th (To-day).

BIRMINGHAM ELECTRIC CLUB.—Grand Hotel, Colmore Row, Birmingham. Lecture on "Radio" by Mr. J. Entwistle. 7 *p.m.*

ELECTRICAL TRADES COMMERCIAL TRAVELLERS' ASSOCIATION.—Old Colony Club, Aldwych House, Strand, London. Bohemian Concert. 7.30 *p.m.*

ELECTRICAL DEVELOPMENT ASSOCIATION.—The Royal Society of Arts, John Street, Adelphi, London. First E.D.A. Conference: "Wiring the Homes of Britain." Speaker, Mr. V. W. Dale. 7.30 *p.m.*

Wednesday, October 20th.

NATIONAL ASSOCIATION OF SUPERVISING ELECTRICIANS.—Visit to Barking Power Station.

INSTITUTION OF FUEL ECONOMY ENGINEERS.—Connaught Rooms, Great Queen Street, London. Luncheon. Address by the Rt. Hon. Sir Robert Horne. 1 *p.m.*

ELECTRICAL ASSOCIATION FOR WOMEN.—Visit to London Electric Wire Co. and Smith's, Ltd. 3 *p.m.*

UNIVERSITY OF LONDON.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Lecture I by Prof. J. A. Fleming on "Electric Insulation and Conduction." 5.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (SOUTH MIDLAND CENTRE).—Grand Hotel, Birmingham. Inaugural address by Col. J. F. Lister. 7 *p.m.*

SOCIETY OF TECHNICAL ENGINEERS.—102, Belgrave Road, London. Address on the work of the Society by the President of the London Central Branch, Mr. C. T. Inman. 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH MIDLAND CENTRE—SHEFFIELD SUB CENTRE).—Royal Victoria Hotel, Sheffield. Chairman's address by Mr. G. H. Nelson, followed by smoking concert.

Thursday, October 21st.

INSTITUTION OF ELECTRICAL ENGINEERS.—Savoy Place, Victoria Embankment, London. Ordinary meeting. Inaugural address by the President, Dr. W. H. Eccles, F.R.S.

ELECTRICAL CONTRACTORS' ASSOCIATION (LIVERPOOL BRANCH).—Ordinary meeting. 6 *p.m.*

METER ENGINEERS' TECHNICAL ASSOCIATION.—E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Paper by Mr. W. Casson on "The Testing of Large Capacity Meters in situ." 7 *p.m.*

Friday, October 22nd.

UNIVERSITY OF LONDON.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Lecture II. by Prof. J. A. Fleming on "Ferromagnetism." 5.30 *p.m.*

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THE ELECTRICIAN

ESTABLISHED 1861.

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The Electrician.

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PROPAGANDA.

REPLYING to a politician, one of a class who on occasions say curious things, Sir J. J. THOMSON remarked that he was surprised to find anyone in these modern times presuming to doubt the value of research. If we in our turn were to say that at present the electrical industry did not yet understand the value of propaganda we should probably be accused of a similar state of ignorance and of not a little ungraciousness, considering what has been happening during the last fortnight. We admit, however, that things have very much changed for the better during the past few years. There are still, of course, those who contend that it is unwise to push electricity for domestic purposes, until the perfect equipment has been involved; and those who believe, contrary to experience, that to reduce the price of electricity used for those purposes is to toboggan down the slippery slope into Carey Street. But these false prophets are ever decreasing in number and less notice is taken of their lamentations than was the case a few years, even a few months, ago.

That this much has been gained is not a little due to the activities of the British Electrical Development Association, among which special attention may be directed this week to the Conferences which have taken place at intervals during the winter for the past six years. At first, as will be remembered, these gatherings were known as Salesmanship Conferences, the idea being that they should be made specially attractive to those engaged in selling electricity and electrical apparatus and that their subject matter should be crystallised round what may be called "sales talk." The idea was not a failure, neither was it a complete success. The reasons for this neutral result are interesting and are mainly psychological. At many of the earlier meetings attention was too exclusively directed to the outward manifestations of salesmanship and even the outward equipment of the salesman. At one of these gatherings it was stated that among the most important factors in successful salesmanship was the possession and use of a clothes brush. At others a good deal of time was occupied with the giving of advice on the approach, hooking and subsequent landing of the "prospect"—we had almost written fish. Again, we admit that all this was not without its uses, but it soon became clear that a broader outlook was necessary and that what was mainly required was a careful examination and interchange of information on methods that had been successful elsewhere; and that with this must be bound up not only technical details of equipment that had to be sold, but the generation of enthusiasm about the "electrical idea."

At the moment the whole electrical industry is concerned with the campaign for Wiring the Homes of Britain. Much hard work, ingenuity and enthusiasm is being displayed, but the most satisfactory feature is that all sections of the industry are co-operating to make the campaign a success. A year ago, it is not too much to say, such co-operation would have been difficult to obtain. Six years ago it would have been impossible. This necessary and very gratifying change of heart is, we feel, not a little due to the E.D.A. Conferences. If it is also more than a little due to the efforts of THE ELECTRICIAN and the other electrical journals, we are too modest to mention it.

This being so, it is appropriate, if it had not been for other reasons inevitable, that the first E.D.A. Conference of this winter's series, which was held on Friday last, should have been devoted to a review of the results of the campaign to date. Mr. V. W. DALE in his opening remarks described the results as gratifying. We agree with him. We also agree with him that more might yet be done, especially in London. What can be done by propaganda is shown by the fact that three years ago less than 4 000 electric cookers were in use, while now some 70 000 are connected to the public mains. Mr. DALE said that as yet there had been over 300 editorial references to the campaign, representing about 3 000 in. of newspaper space. That is good as a start and as a start only. Everyone interested in this problem of developing the use of electricity for all purposes throughout the country is at this juncture invited to read Mr. RUDYARD KIPLING'S story entitled "The Village that Voted the Earth was Flat" and to draw his own conclusions. We want electricity to be news, like Hughley, the village in the story, and there is every indication that if the campaign goes on as it has begun it will not be long before the desirable end is attained.

We have not allowed our readers to remain in ignorance of the development of the campaign in all parts of the country, and this week we again give full reports from all centres. These, read in conjunction with the inside information supplied by Mr. DALE, leave us in no doubt of the complete solidarity of all branches of the industry on this question and of the determination that the efforts that are being

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made shall be successful. In a word, as Mr. DALE truly remarked, E.D.A. has taught the electrical industry how to fight. It may be added in no spirit of pessimism that this is a fight to which there will be no finish. It is early days to sit down and count successes. But of this there can be no doubt. The position next year will be better than it is now. More people will be using electricity. It will still, however, be necessary to ensure that the year after the rate of progress shall be accelerated, if only because it will appear that the greater the actual consumption of electricity the greater the potentialities for its further use.

There are many excellent reasons for devoting the present campaign mainly to rubbing in the benefits of using electricity for lighting purposes. Lighting is the thin end of the wedge, but it must not be forgotten that the thick end is the part that really counts. The potential consumer must not be allowed to think for a moment that electric lighting is the whole story, but he must be encouraged to use electricity for other purposes. That will require encouragement, patience and education. Our greatest industry is the domestic industry, and it is entirely conducted in the home under the supervision of innumerable "little masters." To interest those little masters must therefore be one of the main objects of the campaign. As it is, every electric shopkeeper has a chance to attract potential consumers into his shop at the rate of a penny a time. If he cannot make a profitable return on that outlay he had better go in for writing free verse. It is also possible with a little ingenuity to ensure that every intending competitor shall visit the shop twice. This has already been done in some cases. It means double the opportunity of obtaining profitable business. It means more, for it provides a chance for making friends with the consumer and that that is worth doing cannot possibly be doubted.

That the campaign is going well is certain. That it is going better in some parts of the country than in others is an equally patent fact. The efforts of those concerned must be directed to altering this. They will find a stimulation to do so in the news from the various centres, which we publish each week, in Mr. DALE'S Paper in the discussion which followed it, and above all in a realisation that this is a magnificent way of stimulating the progress of an industry, whose prosperity is our main concern. A complaint is often made that it is difficult to get a Britisher to adopt a new idea. It is forgotten, however, that it is equally difficult to get him to abandon an old idea. As Sir ERNEST BENN has pointed out, this means that while a customer may be difficult to get he is often as difficult to lose.

Current Topics.

A Minor Weir Report.

To a large extent the report of the Advisory Committee on Domestic Supplies of Electricity and Methods of Charge does for distribution what the Weir Report did for generation and transmission: Outlines the problems remaining for solution and indicates the way in which they can best be solved. The terms of reference were wide enough and the Committee have not been unduly hampered by strict attention to them. The result is a document which, though it contains a great deal of ancient history, should, if acted upon, pave the way to real development. The object of the Commissioners in appointing this Committee, we are told in a foreword, has been to see whether such an investigation, as the Committee has made, might not result in practical proposals which would lead to an increased consumption of electricity for domestic purposes. And though we are told that the various conclusions and recommendations of the Committee have not been fully considered, they may be summed up in the word: Freedom. The Committee see, in fact, that if an increased consumption of electricity for domestic purposes is to be achieved in full measure shackles must be unloosed. Great development there has been, but it has often been achieved with an inefficient expenditure of energy and time. For instance, the procedure with regard to obtaining consent to the use of overhead lines and the consequent wayleaves should be simplified, the expense caused by the extra-legal position of the POSTMASTER-GENERAL, where his own lines are concerned might be saved, permission to lop trees should be easier to obtain, and even the technical requirements require modification. There should be more standardisation both of procedure and apparatus.

Full Trading Powers

AN interesting section of the report is devoted to the burning question of tariffs. For bulk supplies to distributors the *form* of the tariff is important in order that the distributor in his turn may make his charges attractive to the consumer. On the domestic side simplicity is essential, and the same adjective of course applies to the two-part tariff. Of this there are many types in use, but the Committee regard none of them as perfect, and only the floor area tariff really escapes censure. We heartily approve the suggestion that meter rents should be included in the fixed charge. More controversial is the suggestion that all undertakings should have full trading powers, though the plea for closer working between the various interests concerned in this matter will not, we hope, fall on deaf ears. Showrooms are also considered essential, and any doubt as to their legality should be definitely removed, as should also be expenditure on local educational publicity. The Committee follow the Weir report in considering that a change is necessary in the procedure connected with the purchase of distribution undertakings, and they also make a number of interesting recommendations with regard to working capital, surplus revenue, rate-aid and assessment. The possession of ample coal fields, the presence of the gas industry and legislative restrictions have all conspired to prevent a long view being taken in organising the electricity supply of the country. The adoption of most of these recommendations would clear the obstacles that still exist out of the path of development. Mr. J. W. BEAUCHAMP and his colleagues are to be congratulated on their work.

Kelvin, Parsons, Marconi.

ON Tuesday next the Kelvin medal for 1926 will be presented to the Hon. Sir CHARLES A. PARSONS, and following that ceremony the James Forrest lecture will be delivered by Mr. G. MARCONI, who will take "Radio Communications" as his subject. Thus the two extremes of electrical engineering will be brought together and the audience may well reflect on the differences and similarities between the large powers with which Sir CHARLES deals and the much smaller one with which Mr. MARCONI has done such useful work. The history of the former's contributions to electrical development are well known to readers of THE ELECTRICIAN. It is not too much to say that the modern generating station would have been impossible but for his inventions, and whatever the future may bring, either in the way of better steam utilisation or of its discarding in favour of some other form of heat agent, the progress of the last twenty years will always be bound up with his name. It is both just and fitting that his name and that of KELVIN should be associated by the award of this medal, considering how much the latter master did to increase our knowledge of the phenomena of thermodynamics. Mr. MARCONI will doubtless have a good deal to say about his recent work on the employment of short waves, some of which we deal with on another page of this issue. In turn this inevitably recalls the name of KELVIN. More or less apocryphal stories are told of his disbelief in that new means of communication. But once again his theoretical work laid foundations upon which others have successfully built.

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The N.J.I.C. Re-established.

It will be remembered that after the general strike the negotiating machinery set up to deal with conditions in the electricity supply industry broke down, and that there had been a good deal of friction in the machine for some time before that stupid demonstration took place. Nevertheless, the more sober-minded members of the industry have always been cognisant of the good work that this body could do, and like Mr. Ostler have wondered why so excellent a system as the Whitley scheme has not been more widely adopted. We are therefore relieved to have the official announcement that the National Joint Industrial Council for the electricity supply industry met in London on October 15th to receive a recommendation from its negotiating committee, which has been considering the conditions that arose as the outcome of the general strike in May. The committee's recommendation was unanimously adopted, and as a result the National Council has resumed its functions and has asked its 13 district councils to follow suit as quickly as possible. We hope that this will be possible at the earliest moment, and that before long these useful bodies will be playing their part in carrying on their most necessary work.

I.E.E. Business.

The opening meeting of the 1926-27 session of the Institution of Electrical Engineers took place yesterday, when, in accordance with custom, the new president, Dr. W. H. Eccles, F.R.S., delivered his presidential address. This, as might be expected, dealt with radio matters, and combined with Mr. Marconi's James Forrest lecture will provide us with useful and up-to-date knowledge of the progress that is being made in that art. The session possesses good auguries for success. The Papers are more interesting than usual, and with one exception will direct our attention to the practical aspects of the distribution of electricity for all kinds of purposes. That exception, we hasten to add, is Mr. G. F. O'Dell's Paper on "An Outline of the Trunking Aspect of Automatic Telephones," so that, though not concerned with power supply, it will deal with what is an equally important subject to electrical engineers and the community generally. The other Papers that have so far been announced include "The Designs of City Distribution Systems and the Problem of Standardisation," by Messrs. J. R. Beard and T. G. N. Haldane; "The Application of Electricity to Agriculture," by Dr. A. Ekstrom (at this meeting appropriate Swedish and American films will be exhibited); "Notes on the 60 000 V Underground Network of the Union d'Electricité," by Col. E. Mercier, and "Electrical Equipment of Track on the Underground Railway," by Mr. A. R. Cooper. These all offer an opportunity for good and informative discussions which will, we hope, be seized.

Smoke Abatement.

The Smoke Abatement Bill now before Parliament and the excellent work of the Smoke Abatement Society have stimulated what may conveniently be called the *advocati diaboli* to a good deal of energy. For while they agree that the measure is desirable in that it is designed to remove the cause of much disease, dirt, waste, gloom and deterioration, it will impose a burden on industry too grievous to be borne at the present time. It seems to be forgotten, however, that black smoke is in itself a sign of waste, and that though to be obliged to take steps to prevent it may mean expenditure at a time when it is desirable that every penny should be saved, that expenditure will lead to savings of a degree which are worth obtaining. On one point, however, we do heartily agree with the critics, the exclusion of private dwelling-houses from the scope of the clause. The open fire, wherever it is found, is a prime offender in the creation of smoke, and to reduce its baleful effects should be the first duty of those concerned. To effect this legislation by itself will do no good. But legislation combined with propaganda can be of the greatest possible use. No one wishes the householder to spend more than he can afford in the attainment of an ideal, but it may well be doubted whether in the end he would find it more expensive to use modern rather than out-of-date methods. Even as it is, more care might be taken in the use of raw coal so as to prevent the emission of foul black smoke in very large quantities—a process which Sir Robert Horne has rightly pointed out is wasteful both of our money and our resources. The occupants of a new building with which we are acquainted are great sufferers in this respect, and if the local authority had power to bring a certain amount of pressure their discomfort could well be avoided without any real harm being done to anybody.

Restrictions upon European Trade.

An important statement, entitled "A Plea for the Removal of Restrictions upon European Trade," the signatories to which include bankers and business men in Great Britain and other European countries and in the United States, has been sent us for publication. This document draws attention to the extent to which tariff barriers, licences and prohibitions have been allowed to interfere with international trade since the war. On the other hand, it states, at no time has freedom been so necessary. New trade frontiers have, in fact, been erected and old markets have disappeared. Experience shows that the results have been unfortunate for all concerned. New local industries have been started without economic justification and railway rates dictated by political considerations have made transport difficult and costly. Prices have risen and production has diminished, and too many States are imperilling their welfare by treating all trading as a form of war. There can be no recovery, the statement continues, until politicians realise that trade is not war but a process of exchange, and that restricted imports also mean restricted exports. Happily there are signs that opinion in all countries is awaking to the danger ahead. Nevertheless, the signatories desire to place on record their conviction that the establishment of economic freedom is the best way of restoring the credit and commerce of the world. The French and Italian representatives sign the document with certain reservations, and its reception in Germany and the United States is reported to be cold. Nevertheless, we regard it as an announcement of first-class importance, possibly the biggest thing which has been done for trade since the Armistice.

Removing Artificial Barriers.

The statement is of first-class importance both on account of the weight that attaches to its signatures and for the remarkable sanity of its text. But the bankers, from the nature of their business, see the effect of present restrictions on credit, currency and exchange. Our connection with a large publishing enterprise, such as that of which The Electrician is a part, results in a day-by-day association with the difficulties of individual industries. This association has convinced us that there can be no real revival of trade in Europe until the artificial barriers set up as a result of the seething passions of war are done away with. So convinced was he of the truth of this that ten years ago our Chairman founded the "European Commercial" and published it in Vienna, distributing through this medium as widely as possible propaganda directed towards the breaking down of restrictions on trade, and the rebuilding of practical, profitable business relationships between the various countries of Europe. It is, therefore, with peculiar gratification that we realise that the prolonged effort made in this direction has not been without direct result; to-day the best-known bankers and men of business throughout Europe, after reviewing the problem with the greatest impartiality, are pleading for the abolition of restrictions which interfere with trade and prevent it from flowing in its natural channels.

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ELECTRICITY SUPPLY AND THE CONSUMER.

The "Orthodox" and the "Converse" Schools—Saving by To-day's Methods in Lieu of Weir Committee Proposals £14 300 000 per annum.

By J. RUTHERFORD BLAIKIE.

IN the former articles* a plea was put forward for a closer study of existing statistics and the need of more. It is now proposed to consider the use of statistics as practised by the two schools, which for the moment we will call the "orthodox" and the "converse." The Weir Report represents the views

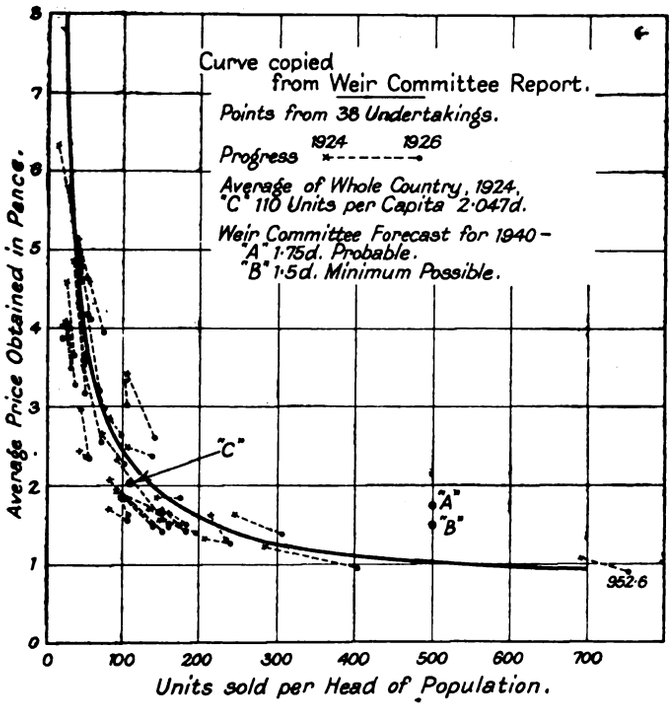

Fig. 1.

of the "converse" school and in a matter of great national importance it is hoped that the present article will call forth an adequate expression of opinion from the "orthodox" school. At the outset it may be said that neither party can prove the other to be wrong, and as usually happens in such cases, perhaps a few friendly gibes passing between the two schools will be taken in good part.

In the Weir Committee's Report, the "converse" school puts in a curve†, prepared from actual data, to show how the consumption per head of population increases as the price falls. It also very definitely asserts that to-day's methods, in the best circumstances, cannot produce the unit at a lower rate than 1·5d., and probably not below 1·75d. But apparently this school has not sufficient confidence in its professed convictions to say: therefore we do not think it possible for the consumption per head to go beyond 220 kWh, per capita or probably not beyond 170 kWh per capita, as shown by the curve. On the contrary, elaborate calculations are put in to show that in 1940, or when the average of 500 kWh per capita is expected, that there will be a saving of £44 556 000 per annum, as a possible, or £66 832 000 as a probable, in consumers' bills if the Weir proposals are substituted for to-day's methods.

From an inspection of the same curve, which is based on actual results, the "orthodox" school will claim that the price is likely to fall to 1·05d. per kWh, when the output reaches 500 per capita, in which case there will be no saving at all, and possibly a reversal of the situation as the actual data contains a profit or surplus for the undertakers and the "converse" school calculations do not appear to include any profit or even meter rents, etc.

Let us now closely examine the curve and apply any checks that may be available, and finally form an estimate, by other means of the probable price by to-day's methods when the 500 mark is reached.

The curve itself appears to be that of a straight line law which fits the plotted points well enough, though at the elbow (about 150 kWh per head) the majority of the points are well below the line.

It seems probable that there are minor factors at work, such as a gradual though not uniform increase in load factor and possibly a small decrease in the price of coal, which may tend to reduce the price more rapidly near the elbow and less rapidly beyond, than the curve shows. But so far as capital charges are concerned, which are eventually a large proportion of the total cost, we may expect a true straight line law as shown in the second article as the law of diminishing costs.

As a first check we can plot the point from the data in the Weir Report for the whole country, viz., 110 kWh per head at the cost of 2·047d.

This point is marked "C" in Fig. 1. It is found to be about 11 per cent. below the curve, which is satisfactory. Points "A" and "B" are the estimates of the "converse" school and appear to be hopelessly out of position to the eye of the "orthodox" school.

As a further test, the progress of 38 undertakings from 1924 to 1926 are shown alongside the curve which appear to give a general confirmation. It is interesting to note the number of cases where the progress line runs parallel to the curve in its different parts or angles. In other cases we find a greater drop in price than is to be expected, more or less balanced by cases where the drop is less than the curve suggests.

These 38 undertakings (Table 1), are quite accidental and not in any way selected. They are all the undertakings where the results of 1926 working have appeared in the "Electrical Times" up to September 2nd, 1926. It will be noticed that they cover the country fairly well and are of all sizes. Every case shows an increase in output and a decrease in price. It is suggested that these progress lines support the curve very well.

TABLE 1.

	1924.		1926.	
	KWh sold for Private Supply per head of Population.	Average Price Obtained Private Supply.	KWh sold for Private Supply per head of Population.	Average Price Obtained Private Supply.
		d.		d.
Hampstead ..	105·2	3·41	142·1	2·60
Poplar	160·3	1·65	184·3	1·51
Barnes	105·3	2·48	138·0	2·36
Barrow	91·0	2·32	160·9	1·48
Birmingham ..	149·5	1·57	196·3	1·40
Bolton	205·0	1·31	240·9	1·28
Burton	245·0	1·62	308·0	1·39
Canterbury ..	51·5	4·17	68·8	3·19
Carlisle	144·1	1·85	174·1	1·84
Chesterfield ..	83·1	1·70	107·5	1·56
Clacton	26·7	5·80	40·7	4·60
Colchester ..	36·0	4·88	48·5	3·63
Coventry	282·5	1·21	403·1	0·95
Crewe	23·0	4·08	31·0	3·50
Douglas	12·9	6·31	40·3	4·84
Dover	39·1	5·11	52·7	4·63
Harwich	—	—	20·1	3·87
Ipswich	73·6	2·67	102·8	2·28
Kirkcaldy	94·8	1·91	157·1	1·65
Kingston	52·7	4·62	75·9	3·96
Lancaster	25·2	4·59	36·9	3·64
Leeds	152·1	1·70	178·9	1·49
Leek	83·4	2·85	99·3	2·65
Leigh	82·7	2·08	154·9	1·42
Manchester ..	214·5	1·63	234·4	1·32
Nottingham ..	52·7	3·69	71·3	2·99
Portsmouth ..	27·0	4·03	37·8	3·27
Scunthorpe ..	—	—	22·8	4·02
Southport	101·6	3·31	107·8	3·04
Stockton	45·2	2·43	53·1	2·35
Stoke-on-Trent ..	47·1	2·99	59·7	2·32
Stretford ..	697·4	1·09	952·6	0·92
Sunderland ..	99·1	1·86	109·5	1·62
Tunbridge Wells ..	49·3	3·59	72·7	2·57
Walsall	107·7	1·83	141·4	1·50
Worthing	34·9	4·81	58·5	4·12
Yarmouth	44·5	4·20	53·0	3·16
York	134·8	1·71	184·1	1·42

*ELECTRICIAN, February 26th and April 16th, 1926.

†ELECTRICIAN, March 5th, 1926.

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TABLE 2.
SUMMARY OF 38 UNDERTAKINGS, 1926 RESULTS, "ELECTRICAL TIMES," SEPTEMBER 2ND.

Year ending.	Millions kWh. sold.	Average price obtained.	Load factor.
1924	812·65	1·64d.	23 per cent.
1926	1 067·84	1·43d.	24 ,, ,,

Output increase 31 per cent.
Price decrease 12·3 per cent.
Load factor increase 1 per cent.

If this group maintained the same rate of progress the price would be under 1d. in 1934, the output more than quadrupled and the load factor at 28 per cent.

In estimating the probable cost when 500 kWh per capita is reached, for the purpose of testing the curve, the cost, to the consumer, is divided under four heads :—

1. Capital charges, i.e., interest and redemption, 8 per cent.
2. Coal.
3. Management, labour, rents, rates and taxes, repairs, maintenance and small stores.
4. Hire of meters, etc., and undertaker's profits or surplus.

1. Capital Charges.

The first step is to decide the load factor, as with a predetermined output the load factor will determine the amount of plant required. After plotting a large number of cases, consumption per capita against load factor, actual data, it is found that the points arrange themselves roughly into a wedge form, the thin end, at about 50 kWh per capita, ranges from about 15 to 22 per cent. At about 230 kWh per head, where there are numerous practical cases the load factor is from 22 to 32 per cent. Beyond this the points are very scattered but the lowest limit indicated for 500 kWh per head is 31 per cent. and the highest 44 per cent., with a mean of 37 per cent. There are also numerous outside points all on the high side of the wedge. For the present purpose 32 per cent. has been taken as a safe figure. The "converse" school has decided on 30 per cent.

All statistics used are taken from the Weir Report.

21 385 000 000 kWh sold (representing 500 kWh per head of population) at 32 per cent. load factor will require a capacity of 7 600 000 kW of plant. With 68 per cent. spare the total plant required will be 12 760 000 kW. Of this amount 3 096 000 kW is existing so that the new plant required will be 9 664 000 kW.

Applying the law of diminishing costs, described in the second article* we have :—

	£
9 664 000 kW at £34 per kW	328 500 000
Add existing capital expended	161 750 000
Total capital, plant and mains	£490 250 000

With this amount, the cost per kWh demanded will be £64·6, as against £87·6, the cost per kW demanded in 1924.

This figure of £64·6 per kW demanded seems to be ample as there are quite a number of undertakings of all sizes below this rate at the present date, see Table 3.

TABLE 3.

	Year.	M.D.	Cost per kW. M.D. £
1. Manchester	1926	136 194	63·25
2. Birmingham ..	1925	102 354	55
3. Sheffield	1925	72 356	55·7
4. London Electric ..	1925	45 600	60·5
5. Coventry	1926	26 700	32·9
6. Rotherham	1925	25 000	55·4
7. Hull	1925	22 100	63
8. Oldham	1925	22 043	48·9
9. West Ham	1925	21 900	48·8
10. Wolverhampton ..	1925	16 898	53·5
11. Dundee	1925	16 597	55·5
12. Stalybridge	1925	15 300	32·8
13. Halifax	1925	12 540	61
14. Huddersfield	1925	11 564	49
15. Luton	1925	8 754	41·2
16. Darlington	1925	8 020	43·6
17. Accrington	1925	7 400	53·6
18. Warrington	1925	7 300	61·75
19. Keighley	1925	6 000	57·2
20. Barnsley	1925	5 200	51·5
21. Maidstone	1925	5 135	57·75
22. Rawtenstall	1925	4 700	56·25
23. Falkirk	1925	2 380	61·5

*ELECTRICIAN, April 16th, 1926.

The relative costs for capital charges for 1924 and 1940 will be as under :—

	1924	1940 (About).
Units sold per head of population	110	500·
Capital cost per kW maximum demand	£87·6	£64·6
8 per cent. interest and redemption	1680d.	1230d.
Units per kW at 24.9 per cent. L.F.	2180 at 32 per cent. L.F.	2800
Cost per unit sold	·771d.	·443d.

2. Coal.

The curve is of course based on the price of coal per ton in 1924. It is possible that the average rate of all undertakings, say up to 100 kW per head, is higher than the average rate of those above 100 kWh, but we have no statistics on this point so no allowance can be made. We have no information as to the average cost of coal per ton in 1924.

From the Electricity Commissioners' Returns, it is found that the average price in 1921–22 was 35s., and 1922–23, 20s. 5d. per ton. By finding a suitable factor to bring local observations to these amounts it is possible to make a guess at the average for the country in 1923–24, which I estimate at 21s. per ton.

The consumption per kWh sold may be expected to decrease very considerably as more efficient plant is added to the existing plant. This will be especially the case with the steam raising plant.

Again referring to the Electricity Commissioners' Returns, we find very marked progress in fuel economy, the total average consumption being as under :—

1920–21.	1921–22.	1922–23.
3·4 lb.	3·2 lb.	2·8 lb.

per kWh generated.

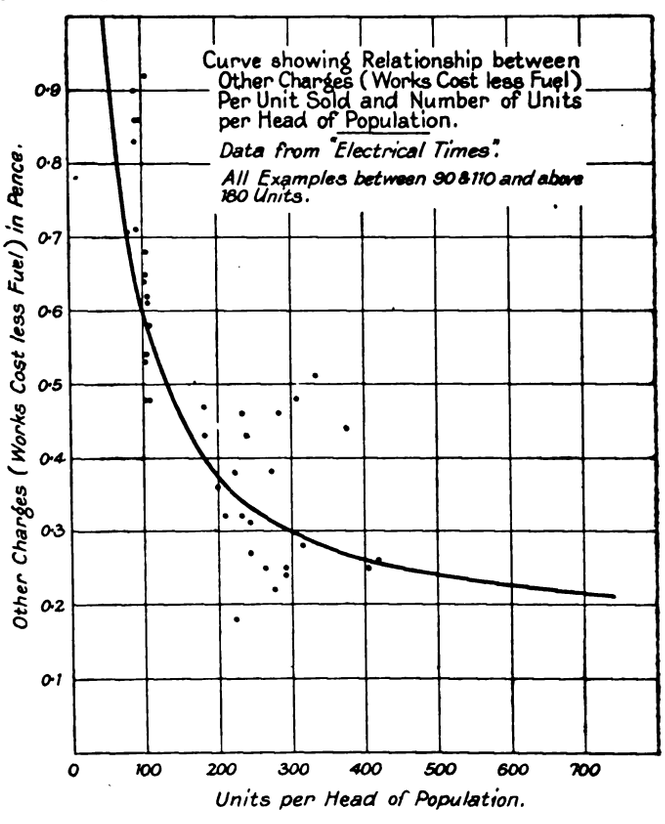

Fig. 2.

Also in 1922–23 there were three undertakings generating at under 2 lb., and twenty-three at or under 2·5 lb. per kWh.

In the absence of positive information it is proposed to take 1923–24 at 2·7 lb., and 1940 at 1·8 lb. per kWh generated, and for the purpose of checking the curve, both amounts at 21s. per ton.

	1923–24. Per kWh sold.	1940. Per kWh sold.
2·7 lb., plus 20 per cent.	3·25 lb.	
1·8 lb., plus 20 per cent.		2·16 lb.
At 21s. per ton per kWh sold ..	0·336d.	0·244d.

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A MINOR WEIR REPORT.

The Advisory Committee's Views on Obstacles to Development—Methods of Charging Criticised—The Importance of the Distribution Side—The Trading Powers Problem.

THE Advisory Committee which was appointed by the Electricity Commissioners in April, 1925, to consider what steps are being taken by authorised undertakers to encourage the use of electricity for domestic purposes, what further steps should be taken to bring about an increased consumption for these purposes, what methods of charging should be standardised and what further legislative powers are necessary, have concluded their deliberations and their report has been issued by the Stationery Office at the price of 1s. The Committee was made up of representatives of the Electrical Development Association and of the bodies representing the electricity supply interests. Mr. J. W. Beauchamp was chairman and Mr. C. E. Allen secretary. Mr. W. W. Lackie attended on behalf of the Commissioners. The Committee circulated a questionnaire and after the replies to this had been analysed a number of witnesses were examined.

Electricity in the Home.

The first part of the report is occupied with some general observations on electricity in the home, the value of the domestic load to the supply undertaking, the social aspects of new housing estates, the importance of distribution work, commercial education, and the price of current, wiring and apparatus. Attention is called to the fact that while the general consumption per house ranges from 100 to 300 kWh for lighting, it reaches from 1 000 to 3 000 kWh when electricity is used for cooking, heating and labour-saving devices.

From the social point of view, every endeavour should be made to overcome the initial difficulties connected with the provision of wiring installations adequate for all the domestic uses of electricity in both old and new houses, and whether an immediate electricity supply is available or not, all new houses should be wired.

The Committee feel that it is almost impossible to overemphasise the importance of the distribution side, and those in actual control of it should therefore be given full scope for the exercise of their initiative. The importancee of the need for constant co-operative study of supply economics and commercial conditions, should be realised by increasing the number of assistants, whose work brings them into touch with the public. It is essential that the price charged for current to the domestic consumer should be as low as practicable, as the high prices obtaining for electric wiring apparatus, and in some areas for electricity, are the chief deterrents to a wider use of electric power in the home. It is useless to expatiate on the merits of " other uses," unless the charges for supply and the cost of the necessary apparatus are within the purchasing power of the householder.

Need for More Freedom.

Under the heading of generation the Committee state that the evidence given confirms the high " diversity factor " of the general domestic load. As regards transmission and distribution, authorised undertakings are hampered by the necessity of obtaining the consent of the Minister of Transport in every case when they wish to use overhead lines, and before this consent is given the local authority is afforded an opportunity of being heard. This procedure often involves delay. It is recommended therefore, that the Minister of Transport should be enabled to grant general powers, on compliance with certain basic specifications, and so free the undertaking from the necessity of securing particular consents in relation to specified routes and positions. It is also suggested that the procedure for obtaining wayleaves for low tension lines should be simplified and improved, and that all undertakers should be given special powers to break up streets not repairable by the local authority, while as regards Post Office lines the " second comer " should pay for the alterations to the works of the " first comer." It is also suggested that there should be relaxation in the present requirements of the Postmaster-General.

The regulations relating to overhead lines for low and medium pressure distribution require simplification on lines which would enable contractors using local material and certain standard fittings to erect lines which would need no more special inspection than does a wiring installation. Delay and expense is now caused in obtaining extensions to the area of supply and this and the procedure with regard to the obtaining of fringe orders requires modification.

As regards bulk supply to distributors, it is essential that the form of tariff for the supply should be such as to make it possible for the distributor to obtain the diversified load upon which the financial success of a bulk supply depends. In some cases, the unit rate is too high and the maximum demand rate too low, or the distributor is prevented in some other way from re-selling at sufficient low rates to secure certain classes of business. As regards the metering and sale of electricity for domestic purposes, simplicity is essential. The energy should be usable for any purpose in any room and on any circuit, without time restrictions, and waste should not unduly penalise nor parsimonious use result in any great saving to the consumer.

This dictum leads up to the discussion of the various multipart tariffs which are in vogue, none of which the Committee regards as ideal, the following briefly is considered to be the most suitable for general domestic use. A fixed tariff payable weekly, monthly or quarterly per square foot of regularly lighted floor area, or per " active " room, plus a unit charge for all purposes, through one meter.

The simpler forms of multipart tariff can, however, be adapted to any domestic premises, and their general use is the first essential to the wide use of electricity in the home. It is suggested, therefore, that the Commissioners should urge all authorities to offer an alternative two-part tarift for the supply of electricity for all domestic purposes, including meter rental. This course was strongly approved by representatives of the Electrical Contractors' Association and other witnesses. The Committee also recommend that all undertakers should have statutory authority to make tariffs which not only include a charge in respect of the electricity supply, but also a charge for the hire or hire-purchase of the installation and apparatus, service cable and other works.

The Minimum Quarterly Charge.

It is considered that the minimum quarterly charge, about which at times there has been a good deal of controversy, should be retained, while, on the other hand, greater uniformity is needed in regard to meter rents and other similar charges. There is much to be said for including the meter rental in the fixed charge, but these ancillary costs should always be kept low.

With regard to the exercise of trading powers, approximately 57 per cent. of the statutory electricity supply undertakings of the country have power to offer their consumers complete trading services. The remaining 44 per cent. have hiring powers, and in addition, all but 30 have selling powers, but must not execute wiring or supply fittings except through a contractor. Although the desire on the part of local authority undertakers for full trading powers is apparently unanimous, it does not appear that many of them would exercise them in full. Owing to the extremely rapid rate at which electrical appliances are being developed it is important that suppliers of electricity should be unfettered in their relations with the consumers and the Committee therefore submit that full trading powers should be granted to those local authority undertakers who do not at present possess them. Contractors generally admit that they are not in a position to let out apparatus on hire-purchase terms and every undertaker should therefore be encouraged to make hire systems and hire-purchase systems available both for the wiring installation and for domestic purposes. The Committee are of opinion that it is desirable and quite possible for the interests principally concerned to evolve a co-operative method of working which would be beneficial to the public and yet safeguard the interests of private traders. Attention is called to the need for demonstration facilities. These needs can be satisfied by showrooms under the control of the electricity undertakers. Company undertakers are, however, in doubt as to whether the showroom is legally part of the undertaking which is liable to be purchased by the local authority, and some local authorities have expressed doubt as to the legality of establishing showrooms without special authorisation. All doubt on this point should be removed by general legislation.

Great improvements have been effected in installation

(*Concluded on page* 476.)

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SUBMARINE CABLE SEA EARTHS.

Methods of Using the Compensation Box—Advantages and Disadvantages Shown by Test Results.

By A. FRASER.

IN duplex balancing, on Heurtley connections, it has been usual to compensate for the sea earth cable, used as earth on the artificial line capacity, by inserting a box of artificial line in front of the cable and with its capacity side joined to the junction of its resistance side and the cable. This sea earth

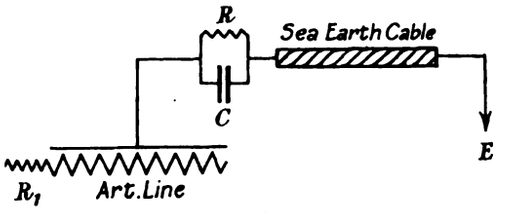

Fig. 1.

compensation box has resistance and a small capacity reactance, but no inductance.

The sea earth cable has both capacity and inductance, and as no definite information has been available on the resultant effects, of the capacity and inductance, an attempt was made to obtain tests on the actual cables.

Tests were taken on two sea earth cables Nos. 1 and 2. With the No. 1 sea earth, length 21·948 nautical miles, it was impossible to get any really accurate figures on account of various disturbances, but the results obtained show that there is a capacityr eactance, though this is apparently very small at frequencies below 50 cycles per sec. On the No. 2 sea earth, length 12·5 nautical miles, it was possible to obtain accurate readings, and the tests show that the inductance of this sea earth is a very appreciable factor, varying from 0·0218 henries at 105·3 cycles to 0·0626 henries at 4·8 cycles. It is evident that the sea earth compensation artificial line, used in front of the cable, cannot accurately compensate for the sea earth cable and that plain resistance is more satisfactory.

The data obtained from the tests show that there may possibly be some critical length of sea earth cable, of any particular core ratio, at which the capacity reactance and inductance will neutralise each other at the signalling frequencies used, and this point seems worthy of very careful investigation. When using sea earth cable in the artificial line capacity side, and if this sea earth has an appreciable inductance, it must be necessary to accurately balance it to obtain the best duplex balance. This might be done by inserting small inductances in the sea earth compensation box, or better still have the box designed and manufactured actually to represent the laid sea earth in all its characteristics, as far as

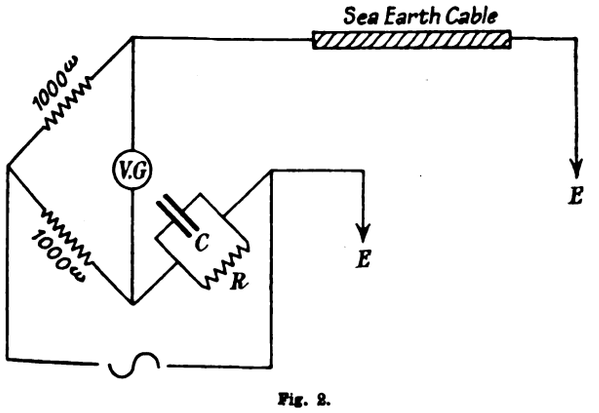

Fig. 2.

possible. A compromise adjustment which might be advantageously used to compensate for the sea earth cable inductance could perhaps be obtained by inserting a resistance shunting a condenser between the sea earth cable and the artificial line capacity as shown in Fig. 1.

The values of R and C could be adjusted to neutralise the inductance of the earth cable at the signalling frequencies used; it would not do so at all frequencies, but it is a compromise which seems well worth trying. If C were made large, say 40 or 60 microfarads, R could be kept comparatively small, its value depending on the length and core ratio of the cable. Then this arrangement could be compensated for by using plain resistance in front of the cable.

The following are the particulars and results of the tests taken on the No. 1 and No. 2 sea earth cables:

TESTS OF NO. 1 SEA EARTH CABLE BY A.C. METHOD.

Total length	=21·948 n.m.
Core	$=\frac{180}{160}$ B.T.
Core ratio	=18
C.R.	=147·58 Ω

Preliminary tests showed that the capacity effect was greater than the inductance effect.

Efforts were made to balance the cable by using a condenser in series with a resistance, but no really satisfactory results were obtained except that at 100 cycles; using even bridge ratio arms, balance was obtained with 72 microfarads in series with 166·8 Ω.

At lower frequencies very large capacities were required to obtain balance, and considering the liability of error due to capacity to earth, this method was not considered accurate, and the parallel condenser method was therefore adopted, the connections being as shown in Fig. 2.

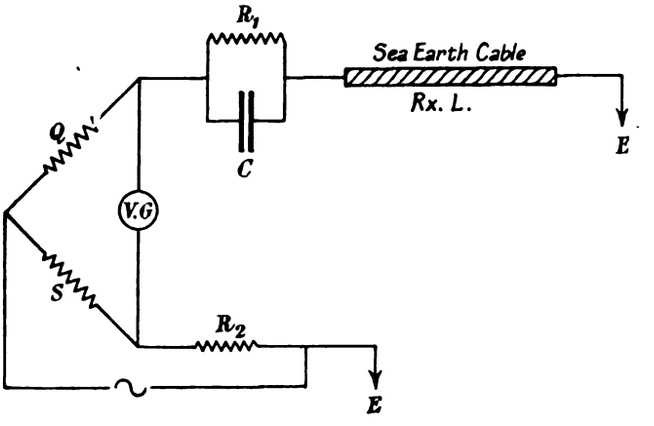

Fig. 3.

Balance was obtained by adjusting C and R.

Fairly close balances were obtained at frequencies of from 105·3 to 64·8 cycles, but accurate results at lower frequencies were quite unobtainable, though attempts were made on several occasions to obtain some useful data; the disturbances from the cable itself were very troublesome.

The value of the condenser decreased with decrease in frequency, and at 40 cycles the best balance was obtained with no capacity.

The following are the results obtained:

Frequency.	Volts.	Value of R. Ohms.	Value of C. Microfarads.
105·3	25	169·5	1·11
96·3	25	168·8	0·98
86·1	25	167·6	0·80
74·6	25	166·4	0·62
64·8	25	164·4	0·36
53·2	25	162·0	0·04 (approx.)
41·3	25	158·0	0·00 (approx.)

TESTS OF NO. 2 SEA EARTH CABLE.

Total length	=12·5 n.m.
Core	$=\frac{220}{180}$ B.T.
Core ratio	=15·7
C.R.	=67·24

Pirani's bridge method used as in Fig. 3.

As $Q=S$, inductance of cable is given by formula

$$L=CR_1(R_2-Rx)$$

As the leads used from the bridge to the cable were ·22ω, Rx was taken for purpose of calculation as 67·24 ± ·22 Ω = 67·46 Ω.

C was made 20 mfd. and kept at that value. Balance was obtained by adjusting R_1 and R_2.

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CANADIAN BEAM SERVICE TESTED.

Commercial Operation to Start on Monday—Successful Trials—Details of the Bodmin and Bridgwater Stations.

ON Wednesday morning Mr. Marconi made known the interesting piece of information that the sending beam station erected at Bodmin and the receiving beam station erected at Bridgwater for transmission to and reception from Canada respectively, have been submitted to seven days' working trial and, after making due allowance for the period during which an abnormal electrical storm was experienced, it had been found that the stations were capable of sending and receiving at the same time, to and from the Canadian station, one hundred words of five letters each per minute during a daily average of eighteen hours working. He added that the tests have shown that the beam system can give a signal strength 100 times that obtainable with non-directional transmitting and receiving aerials using the same power. In other words, 20 kW supplied to the transmitting aerial will give the same results at the receiving end as 200 000 kW under the older system. Interference from atmospherics is also less, and though fading is sometimes experienced, it can be overcome in practice by temporarily using an alternative wave. The Post Office specifications required that a service of 500 letters per min. each way should be given, but during the test 1 250 letters per min. were transmitted in each direction, equal to 2 500 letters per min. over the whole circuit.

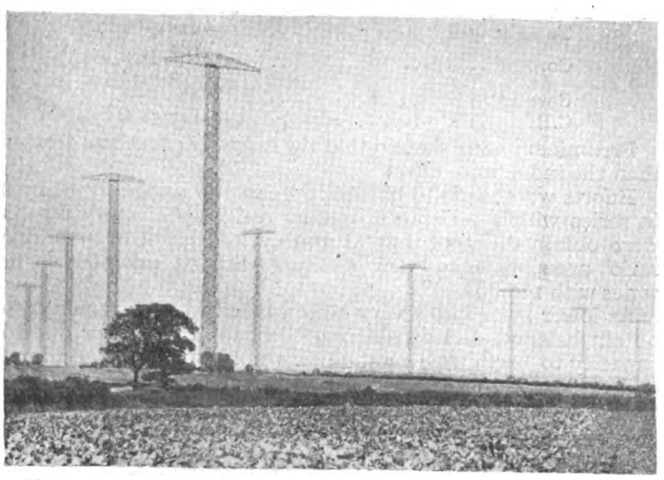

Fig. 1.—View of the Aerial System at the Bridgwater Receiving Station which is to be opened on Monday for radio communication between this country and Canada. The Marconi Short Wave System will be used. Five of the masts are for receiving from Canada, the remainder are for the South African service, which it is hoped to inaugurate shortly.

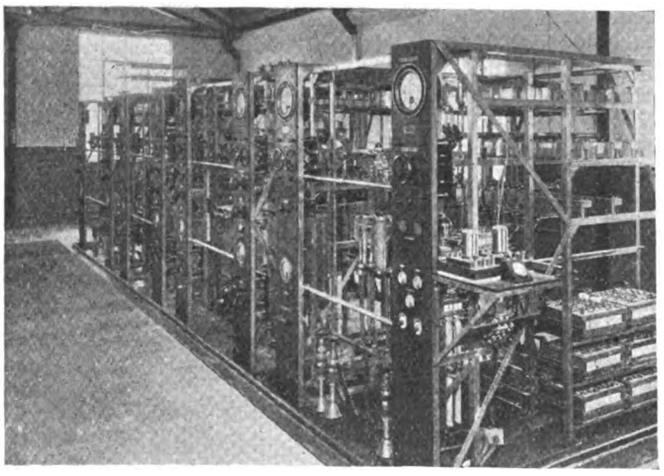

Fig. 2.—A view inside the Bodmin Beam Transmitting Station, which is to be used for the Canadian Service. The panels reading from right to left deal with the following services :—No. 1, Absorber and Signalling Panel ; No. 2, No. 3 Magnifier and No. 2 Magnifier for the Higher Wave Band ; No. 3, No. 3 Magnifier and No. 2 Magnifier for the Lower Wave Band; No. 4, No. 1 Magnifier, which is common to both Higher and Lower Wave Bands. In the front of the picture, attached to the absorber panel, are the signalling relays through which current for the line is transferred to the transmitter. Either of these relays can be used at will.

It is not surprising, therefore, that Mr. Marconi should have stated that his complete faith in the beam system has been justified by these results, or that he should pay a well-merited tribute to the work of Mr. C. S. Franklin and Mr. R. N. Vyvyan for their energy and ingenuity in making them possible.

The Bodmin station, two views of which we give herewith, is 460 ft. above sea level. The generating plant consists of three 165 H.P. oil engines driving 92 kW generators, which deliver direct current at 440 V. There are also three "main power" alternators each of 50 kVA capacity, which supply single phase current at 1 000 V and 300 cycles. These machines provide the main h.t. power at 8 000 to 10 000 V to the valve anodes via step-up transformers, rectifying valves and smoothing devices. Three "drive-power" alternators, each of 1·2 kVA capacity, generate single-phase current at 220 V and 500 cycles. These supply power at 2 000 V to the anodes of the valves in the master-oscillator panels of the transmitters through transformers and valve rectifying and smoothing apparatus. Two "rectifier filament" alternators with an output of 20 kVA supply single-phase current at 500 V and 300 cycles for heating the filaments of the main and rectifying valves at 11 to 12 V through step-down transformers. Two "magnifier filament" generators have an output of 18 kW at 24 V and supply the filaments of all the oscillator valves of both transmitters and also charge the batteries which supply the current for heating the filaments of the master oscillator valves. All these machines are driven by direct-current motors supplied from the oil engine sets.

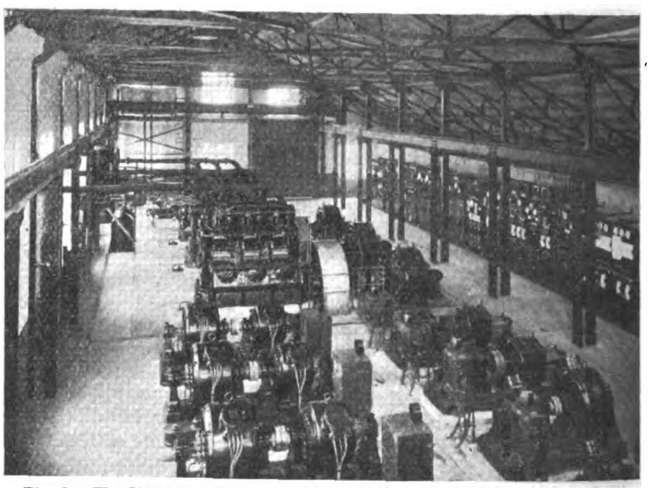

Fig. 3.—The Machinery Hall at the Bodmin Beam Station. The three generators in foreground supply power to the transmitting valve. The generator on the right supplies power for the filaments of the rectifying valves in the main and drive rectifying units. Immediately behind this generator are two d.c. machines, which supply current for lighting the valves in the transmitting panels. On the extreme right are the station switchboards controlling the output of dynamos and generator sets.

Two sets of valve rectifiers are used to provide h.t. d.c. anode supplies for each of the valve transmitters. There are one main rectifier and one drive rectifier in each set. Each main rectifier carries a bank of 16 MR7a valves, a filament voltmeter and other apparatus, while the drive rectifier is a self-contained unit based on two MR7a valves. Stability of wavelength is obtained by screening the master oscillator from the rest of the circuits, its oscillatory circuit being coupled to another oscillatory circuit known as No. 3 magnifier, which has partly an amplifying and partly a stabilising effect. The transmitter is operated through an A.T.M. relay. Keying is effected by keeping the power load constant by throwing it on to the main magnifiers while "marking," and on to a circuit consisting of absorbing valves while "spacing." A complete system of control for all the apparatus is provided. The earthing system required special design and construction. There are 12 earth plates to each aerial coupling box, while each transmitter has an independent earth.

Our other illustration shows the mast system at the Bridgwater receiving station, of which some details will be given in our next issue.

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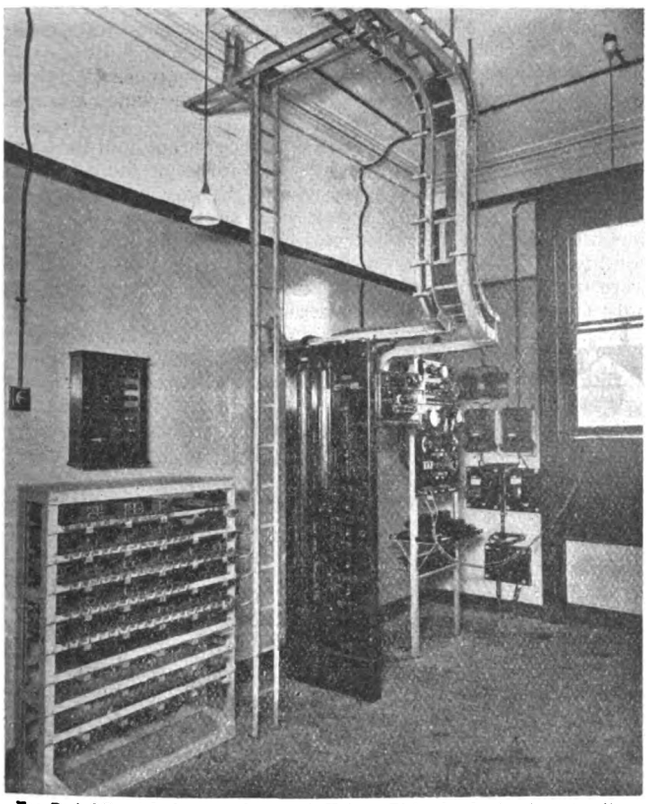
TELEPHONE PROGESS.

Opening of a New Telephone Exchange at Birkenhead.

A NEW manual telephone exchange at Upton, Birkenhead, in the Liverpool Telephone Area, was cut into service by the Post Office on Saturday, October 9th. The equipment, which is of the No. 10 C.B. type, is housed at "Inglefield," Church Road, Upton, and was manufactured and installed for the British Post Office by Automatic Telephone Manufacturing Co.

The decision to instal manual equipment in this instance was due to the fact that the main Liverpool area has not yet been converted to automatic working, although a comprehensive scheme which will enable this to be accomplished is in course of preparation by the Post Office Engineering Department.

The switchroom equipment at the new Upton Exchange comprises six two-panel switchboards sections and a cable-turning section, affording accommodation for six operators in all.



New Post Office telephone exchange at Upton, Birkenhead, showing repeating coil and condenser rack, fuse board and power plant.

The equipment of the sections, from right to left, is as follows :—

One two-panel subscribers' section, equipped with twenty jack-ended junctions.

One two-panel subscribers' section equipped for sixty subscribers and twenty jack-ended junctions.

Three two-panel subscribers' sections, each equipped for one hundred and twenty subscribers.

One two-panel subscribers' section equipped for plugging-up circuits. There is also a one-position supervisor's desk.

The auxiliary equipment in the apparatus room comprises a main and intermediate distributing frame ; two-bay relay and meter rack ; special apparatus rack ; repeating coil and condenser rack ; test case ; fuse board, and fuse alarm mounting board.

The present equipment of the new Upton Telephone Exchange is approximately 300 subscribers, and its initiation in a growing district affords additional evidence of the progressive spirit which now animates the Post Office Telephone Department in its endeavour to overtake the arrears of telephone construction and development work with which it is faced, and which have been brought into prominence by the activities of the Telephone Development Association.

CORRESPONDENCE.

THE DETECTOR PROBLEM.

[To the Editor.]

SIR,—In THE ELECTRICIAN of the 15th inst. your correspondent, Mr. P. K. Turner, criticises my comparative treatment* of the three types of rectifier on the score of incompleteness. I am afraid that Mr. Turner wrote under the impression that the second article entitled "The Rectifier in Telephone Receivers" is the concluding one. For this, sir, you, as well as I, owe him an apology, for was it not the editorial pencil which deleted the "(To be concluded)" in my manuscript ?

The third and concluding article, to be published on the second Friday of November, begins thus : "There remains the question as to the relation between magnitude of rectified current and high-frequency amplitude. The relationship *ought* to be that of direct proportionality. What it *is* depends on the shape of the characteristic curve of the rectifier, the value of R, and the strength and modulation ratio of the incoming signal." It would therefore be premature now—and I hope it may be unnecessary later—for me to attempt to reconcile any apparent differences between Mr. P. K. Turner and myself on the subject of his second and third paragraphs.

In his fourth paragraph, however, Mr. Turner does raise a point which I thought I had disposed of. He speaks of the efficiency of rectification falling off (seriously in grid rectifiers, he suggests) with rise of acoustic frequency. This, surely, is a companion effect to that of sluggishness, and is referred to at the top of the second column of p. 412. The criticism in Mr. Turner's fourth paragraph seems to me to be met by the agreement with my conclusion which he expresses in his first.

—I am, etc., L. B. TURNER.

Cambridge, October 17th, 1926.

PULVERISED FUEL v. STOKER FIRING

[To the Editor.]

SIR,—The ELECTRICIAN of September 24th contains a short résumé of a report by Mr. Seddon, of Edinburgh, on his visit to powdered fuel plants in this country and on the Continent.

Mr. Seddon admits that steam can be raised more efficiently and more economically with pulverised fuel fired boilers than with stoker fired boilers, but he is not satisfied that the plant available for drying and pulverising has reached such an advanced state as to be reliable for central station work.

Mr. Seddon has chosen a rather unfortunate time to visit pulverised coal fired stations as, owing to the coal strike, these have been working under conditions which are altogether abnormal. Pulverised fuel plant is now consuming coal containing 25 per cent. of moisture and 45 per cent. of ash, a lower grade of coal than was legislated for in any plant known to the writer. Even under these adverse conditions, however, the fact remains that where pulverised fuel fired boilers and stoker fired boilers are operating side by side, the former have had to bear the brunt of the strike as far as maintaining station load is concerned. That pulverised fuel firing has amply justified itself under these conditions is shown by the fact that in one large electric generating station partially equipped with pulverised coal firing, an efficiency of 60 per cent. has been maintained with coal having a calorific value of only 4 500 B.Th.U's per lb. and an ash content of over 25 per cent. The pulverising and drying equipment is dealing with this fuel in a satisfactory manner, with the exception that the output is slightly reduced and the moisture content of the pulverised product not as low as might be desired. Pulverised fuel engineers have certainly had to learn a good deal about the drying and pulverising of low grade fuels, but there is no question that development has now reached a stage where the stoppage of a boiler due to breakdown of the drying and pulverising plant is only a remote possibility.

Mr. Seddon also condemns pulverised coal on the score of dust and noise. With normal grades of coal, pulverising plant is neither noisy nor dirty.

Taking everything into account it would seem to be unfortunate that stoker fired boilers have been recommended for Portobello, particularly as there is every possibility that a combination of pulverised coal firing and low temperature carbonisation will in the near future provide the best means of producing cheap electrical energy from low grade fuels and colliery waste.—I am, etc., E. G. RITCHIE, .DSc.

London, W.4.

[We have abbreviated Dr. Ritchie's letter a little.—ED.]

* "Notes on Wireless Matters," September 10th and October 8th.

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Electricity Supply and the Consumer.

(*Concluded from page* 471.)

3. Management, Labour, Rates, etc.

This figure can best be estimated by means of a curve similar to that in the Weir Report dealing with these items against kWh per head of population. Such a curve, in an abbreviated form, has been made Fig. 2. This curve indicates :—

110 kWh per head	0·57d.
500 kWh per head	0·24d.

A surplus of some description is required for building up a reserve or renewals fund quite apart from a legitimate trading profit, duly recognised in the Electric Lighting Acts, and limited to 5 per cent. on the total capital, after paying interest and redemption.

It is more or less an arbitrary figure up to 5 per cent., and I believe usually amounts to about 3½ per cent. in practice, 3½ per cent. is taken for these estimates.

1923–24.		1940.	
3½ per cent. on £87·6 per kWh sold	0·339d.	3½ per cent. on £64·6 per kWh sold ..	0·192d.

SUMMARY, TO-DAY'S METHODS.

	1923–24.	1940.
KWh sold per capita	110	500
Capital charges..	0·771d.	0·443d.
Coal at 21s. per ton	0·336d.	0·244d.
Management, labour, etc.	0·570d.	0·240d.
Meter rents, undertaker's profits	0·339d.	0·192d.
Total cost to consumer	2·046d.	1·119d.

This analysis gives a result that almost exactly coincides with the actual cost in 1923–24. For 1940 or 500 kWh per capita, the result is about 6 per cent. higher than that indicated by the curve, viz., 1·05d.

Taken with the other tests applied, I submit that there is ample justification for accepting the indication of the curve.

In conclusion, it is interesting to compare the estimate of To-day's Methods for 1940 with that of the "converse" school embodied in the Weir Report. It is very difficult to get at the figures in the same form that has been used above. All we know is that the cost is estimated at 1·0d. without any allocation for undertaker's profits or surplus. Also, there does not appear to be any sum charged to capital for the cost of changing over non-standard undertakings. However, it is interesting to compare the different items, and the following attempt has been made to produce them in the same form.

1940 OR 500 KWH PER HEAD OF POPULATION.

	"Orthodox" school.	"Converse" school.
Total capital	£490 250 000	£561 250 000
Cost per kW demand	£64·6	£69·2
8 per cent. on capital per kWh sold	0·443d.	0·507d.
Coal at 16s. per ton	0·186d.	0·164d.
Management, labour, etc. ..	0·240d.	0·329d.
Converse school total	0·869d.	1·00d.
Undertaker's profit, 3½ per cent.	0·192d.	0·222d.
Total cost to consumer ..	1·061d.	1·222d.

The "converse" school, therefore, shows 0·161d. in excess of to-day's methods, so that the saving to the consumer per annum in 1940 effected by rejecting the Weir Committee proposals would be, say, £14 300 000.

A Minor Weir Report.

(*Concluded from page* 472).

material and in methods of erection, but the first cost of the work often prevents the introduction of electricity in the home, or results in the provision of inadequate installations. Easy-payment systems can therefore well be applied to installation work. The development of this business must undoubtedly depend on the energy capacity of all parties concerned, and the very good work that has been done by the Electrical Contractors' Association and the National Register should in every way be encouraged. Recent years have seen a most desirable change in the reluctance which once existed to employ any form of publicity for making the use of electricity and its correct use made known to the public. Certain local authorities, however, still have some doubt as to the propriety of spending money on publicity work. Any doubts as to the legality of this expenditure should be removed. The Advisory Committee concur generally in the recommendations of Lord Weir's Committee on the procedure to be followed in the purchase of a company undertaking by a local authority. They are also of opinion that statutory authority should be given to local authority undertakers to borrow for the provision of working capital, and that the practice of paying for works out of surplus revenue should be encouraged.

On the other hand, the application of surpluses to the relief of the rates should be discontinued, or strictly limited.

The assessment of electricity supply undertakings for local rating requires immediate amendment. The Committee recommend that they should be assessed on the profits of the undertaking with a rebate of such sum as would represent 75 per cent. of that payable on account of the general district rate, in respect of underground cables and works.

Submarine Cable Sea Earths.

(*Concluded from page* 473.)

This method of testing was adopted as previous attempts to take measurements of this sea earth showed that the inductance predominated over the capacity.

Much trouble was experienced in getting good tests, owing to the disturbances coming in from the cable.

These disturbances consisted of a fairly steady earth current, occasional sharp kicks and also a disturbance which appeared to be due to an external a.c.

This latter disturbance was in evidence throughout the tests; it would come in for periods of 15 minutes or more and was quite regular and steady. It was in no way connected with the local a.c. machine, which was shut down entirely on several occasions for observation and verification of local conditions. The balances obtained at 105·3 and 86·1 cycles were quite good and reliable. At 64·8, 53·2, 41·3, and 31·2, only fair balances were obtained.

At 21·3, 15·7, 10·4 and 4·8 cycles excellent balances were got, R_1 being observable to ·01ω; these balances were obtained during the rare periods when the cable was comparatively free from disturbances.

The results obtained are given on the following table:

Frequency.	Volts.	R_1 Ohms.	R_2 Ohms.	Calculated Value of L. Henries.
105·3	30	31·35	102·3	0·0218
86·1	30	31·7	102·48	0·0222
64·8	30	32·8	103·4	0·0236
53·2	30	33·6	204·0	0·0245
41·3	30	34·3	104·3	0·0253
31·2	37	36·8	106·6	0·0288
21·3	40	40·96	110·24	0·0350
*15·7	40	44·405	113·19	0·0406
10·4	43	49·84	117·88	0·0502
4·8	43	56·09	123·30	0·0626

* A test was also taken at 15·7 cycles using 20 V, which was considered to halve approximately the current in the cable.

This gave a result $R_1 = 44·30$ Ω, $R_2 = 113·08$ Ω, making the value for L 0·0404 henries, showing apparently that there is not a great variation in the inductance with variations in current strengths.

I.E.E. Wiring Regulations.

For the last two years the Wiring Rules Committee of the Institution of Electrical Engineers have been considering very carefully the comments and criticisms which were made as a result of the issue, in July, 1924, of the Eighth Edition of the Wiring Regulations, and the Council have recently adopted a recommendation of the Committee that a revised edition of the Regulations be published as early as possible next year, embodying a number of alterations with a view to: (1) Bringing the regulations up to date; (2) removing certain difficulties which have arisen in practice in complying with the regulations; (3) amending the wording of some of the regulations so as to render their meaning clearer.

A few amendments, particularly the revised current-carrying capacities of flexible cords and cables, are, however, considered by the Committee to be of such importance as to warrant their immediate publication, and the Council have therefore issued a revised alterations and additions pamphlet which also includes the alterations issued in July, 1925.

Copies of the pamphlet can be obtained free of charge on application to the Secretary.

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NEWS IN BRIEF.

Automatic Telephones for Brussels Railway Stations—Call Offices in London Tube Stations—National Joint Industrial Council resumes its Functions.

JALALABAD, Afghanistan, is to have a power station.

Improved lighting on the sea front is proposed at Hove.

Burnley Chamber of Trade has postponed its shopping exhibition until the spring.

A telephone repeater station is to be erected at Tavistock, and tenders have been invited for the work.

The Russian Soviet Commissariat of Posts and Telegraphs is increasing the internal telegraph rates by 40 per cent.

Automatic telephones are to be installed in Brussels post offices and railway stations. At the outset these will number about 50.

An automatic telephone exchange is being considered for Santo Domingo, the oldest settlement of white men in the New World.

At a special service to celebrate the installation of electric light in Sheffield church, the vicar preached from the text, "I am the light of the World."

Blackburn and Lancaster telephone districts have been amalgamated, and the area is now known as the North-Western Telephone District.

Glasgow Corporation has accepted a tender, for the erection of a sub-station for the Electricity Department and an electric pumping station for the Water Department.

The French Government has decided to substitute automatic telephones for the present telephone system in Paris, which is said to be notorious for its inefficiency.

A scientific officer is required at the Royal Aircraft Establishment, South Farnborough, Hants, primarily for research in connection with electrical ignition appliances.

St. Helen's Cable Co., Slough, football club has defeated Denham Juniors on the latter's ground by 4–2 in the preliminary round of the Berks and Bucks Junior Cup.

It is reported that Tasmania is doubling her hydro-electric power works, at a cost of £200 000, to provide power for new industries, including several with English capital.

An additional relief telephone exchange to be called "Exhibition" is to be opened in the district of London now served by the Sloane, Kensington and Western exchanges.

The Sunderland telephone exchange will shortly be removed to new premises, which, like the Ryhope, Hylton and Whitburn exchanges, will be equipped with automatic apparatus.

A new monkey house to be built at the London Zoo will be fitted throughout with electrically-heated floors, and ultra-violet ray lamps to provide artificial sunlight during the winter.

Amongst the inventions shown at the Exhibition of Inventions at the Central Hall, Westminster, is an electric lock, invented by Mr. E. Dwyer. It is controllable from a distance and is said to be unpickable.

Heriot's (F.P.) Rugby Club has been practising by artificial light, and has obtained from the governors of George Heriot's Trust authority to erect electric lamps at the football ground at Goldenacre, the cost to be borne by the club.

"The Relative Fields and Merits of Gas and Electricity" will be discussed by the Efficiency Club at Vernon House, Park Place, St. James's Street, London, on November 19th, at 8 p.m. Mrs. M. L. Matthews will preside, and speakers will include Miss C. Haslett and Mr. F. W. Goodenough. Admission will be free, without tickets.

The revenue of the Toronto Electric Commissioners for 1925 was $8 827 372, compared with $726 763 in 1912 (the first year of the Commissioners' operations) and the electricity sold was 512 784 492 kWh, compared with 35 176 548 kWh. Meters in use have increased from 13 858 to 143 648 and the connections have risen from 46 296 kW to 534 182 kW.

At a meeting of Heywood T.C. last week Mr. D. Schofield suggested that members of the Council should not be allowed to trade with the Corporation. He raised the question because the Health Committee had recommended the purchase of a crane from James Berry, Ltd., of which firm Ald. James Berry is a member. No vote was taken on the subject at last week's meeting, but the Mayor said if a member is working for nothing on the Council he did not see why he should not have the same opportunity of tendering as anybody else.

The Great Northern Telegraph Co. gives notice of interruption of the Hankow line.

The new automatic telephone equipment at Oxford is expected to be put into operation on December 4th.

Leeds City Tramways football team beat Bradford City Tramways by two goals to none in a match at Monk Bridge ground, Leeds, last week.

A BUSMAN'S HOLIDAY.

IF you cannot see the advantage of the "Wiring the Homes of Britain," take a "busman's holiday" and visit the Newcastle area, which has about 24 Electrical Circles and has just opened its SECOND demonstration electric house. One electrical firm there has already given away over 5 000 competition books. Newcastle is SO bracing!

The West Midlands Joint Electricity Authority requires a financial assistant and a secretarial assistant. Particulars from Mr. H. F. Carpenter, Secretary and Treasurer, Phœnix Buildings, Dudley Road, Wolverhampton.

As a start towards the unification of electricity supply in Japan it is proposed to form a semi-Government company with a capital of 250 million yen. The company will construct a 300-mile long transmission line between Fukushima and Osaka.

For inadvertently leaving two lights burning in his show window Mr. Harry Moss, registered contractor, of Bradford, was fined 5s. at Bradford City Court last Friday. Another contractor was fined £5 for having window advertising signs illuminated.

Arrangements have been made by the Post Office to instal underground telephone call-offices at interchange Tube stations, where the passenger traffic from one route to another is heavy. Call-boxes are being erected at Leicester Square and Oxford Circus Stations.

The National Joint Industrial Council for the Electricity Supply Industry has resumed its functions and asked its 13 district councils similarly to resume as quickly as possible. After the general strike the whole of the negotiating machinery set up to deal with conditions in the industry ceased to operate.

The annual dinner of the Newcastle-on-Tyne Branch of the Electrical Contractors' Association will be held on December 9th, and the Newcastle E.T.B.I. Ball is fixed for the following evening. Mr. H. J. Miles, the E.C.A. president, and Mr. L. C. Penwill, the Association's general secretary, will attend both functions.

It is announced by the Institute of Patentees, organisers of the International Exhibition of Inventions at the Central Hall, Westminster, that the judges have decided that the Grey-Wilson Memorial Gold Medal shall be held over until next year as, in their opinion, no invention is of sufficiently outstanding merit.

The Deputy Mayor of Torquay (Mr. E. H. Serman) opened at Newton Abbot on Monday an electrical exhibition organised by Torquay T.C. He said that since the Torquay Council took over the Newton Abbot electric lighting in May, 1924, the consumption in the area had been more than doubled and the price of current had been halved.

The opening meeting of the Illuminating Engineering Society will be held at the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, London, W.C., at 6.30 p.m., on October 26th, when reports on progress during the vacation and developments in electric lamps and lighting appliances will be presented and some interesting novelties will be shown and described.

Sir A. Whitten Brown, in his presidential address to the western district sub-branch of the Association of Mining Electrical Engineers at Swansea, last Saturday, said there was one thing in which the progress he would like to see had not been made; that was in regard to electric winders. He desired to remove the atmosphere of suspicion that existed, and said that could only be achieved by frankness.

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"WIRING THE HOMES OF BRITAIN."—VIII.

Need for More Circles in London Area—General Progress Satisfactory—What Individuals are Doing for the Campaign.

APPROPRIATELY the first of this season's London E.D.A. Conferences was devoted to a report on the progress of the Wiring the Homes of Britain Campaign by Mr. V. W. Dale. Mr. H. J. Miles, president of the Electrical Contractors' Association was in the chair and the lecture hall of the Royal Society of Arts was filled "to capacity."

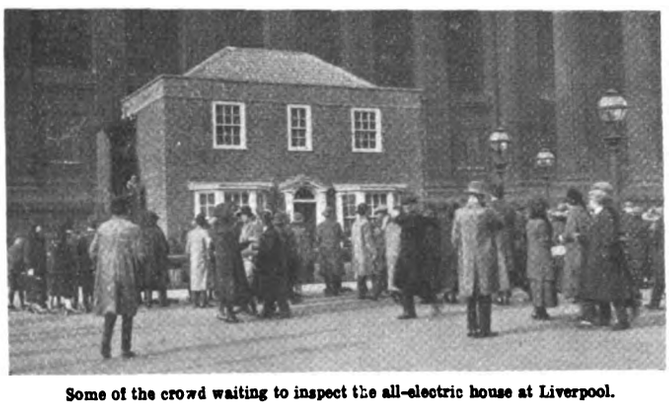
A reproduction of the poster stamp which every electrical letter should bear.

The campaign, said Mr. Dale, was the beginning of a new regime for the electrical industry, and it also ushered in a new and better era in the lives and homes of hundreds of thousands of British people. Electricity could cut the labour of the housewife in half, and domestic electrification propaganda, though commercial in its means, was more than half-way towards the spiritual in effect.

Mr. Dale indicated how the earlier work of the E.D.A. had led up to the present campaign, jointly produced by the E.D.A. and the E.L.M.A., and earnestly appealed to everyone in the industry to read and learn all about the campaign. Unless this was done, individuals could not possibly give to the campaign that disciplined assistance which was absolutely essential to its success.

Sales of competition books were progressing favourably, and up to Wednesday nearly 708 000 had been sold. Of this number electrical contractors had bought nearly 490 000 and supply undertakings had taken about 219 000. In addition there had been sold 406 555 copies of the six special E.D.A. pamphlets (Nos. 1 010 to 1 015); 976 000 poster stamps; 9 850 window bills and nearly 100 stereos of the competition advertisement for use in local newspapers. Many more copies of the competition book would have to be sold and he hoped that a grand total of 5 000 000 copies would be distributed before the end of the campaign. The public should be able to get a competition book at any place where they could ordinarily obtain electrical service or goods.

Contractors, said Mr. Dale, could now feel that something really tangible was being done to help them, as £30 000 was being spent to drive people into their shops and showrooms. The cost to the electrical shopkeeper was less than a penny a time, i.e., the cost of the competition book. There were many traders who would and did gladly spend twenty times that amount to get potential customers over their doorsteps.



Some of the crowd waiting to inspect the all-electric house at Liverpool.

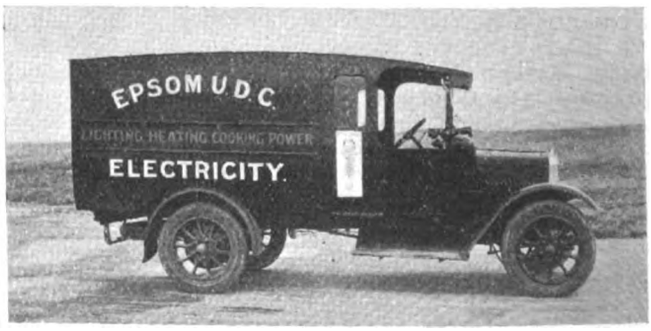
Next in importance to the work of getting the competition books widely distributed, was the setting up of the Electrical Circles. Already there were 43 of these Circles actually at work, and within a few days it was hoped to have at least 100 in being. This, however, was not enough; before another month passed there should be quite 500 Circles. So far the London and Home Counties area was behind other areas in this important sphere of campaign activity and had only four Circles at work. These were at Croydon, Epsom, Hackney, and Bournemouth. Even if there was not the remotest possibility of running a local demonstration electric house, an Electrical Circle was still necessary. Anyone in the area who was willing to take a part in forming a Circle should get in touch with Mr. Ball, the district officer, who would assist in getting the organisation going.

Some interesting examples were given showing how different individuals and firms had helped to further the campaign. Several of these have already been referred to in THE ELECTRICIAN.

In one case a comparatively small contractor in a South Coast town had a shop in a side street. He persuaded a draper friend to lend him a main street window for a campaign display in which was included a notice to the effect that the competition books could be obtained at the electrical shop.

One supply engineer had guaranteed to contribute to the local Circle fund £1 for every similar amount put up by local electrical contractors. The contractors in a Midland town had raised £150 for Circle activities and the supply engineer was asking his electricity Committee to add a similar amount. Some of the Circles were raising as much as £500 for local propaganda work.

Several supply undertakings and contractors had offered additional prizes to the winners of the first, second and third prizes in the competition if they supplied the prizewinners' booklets, and a manufacturer's branch manager had offered a prize to the salesman on his staff who sells the greatest number of competition books to electrical retailers.



This Epsom van has campaign posters posted on its sides, and the driver distributes competition booklets.

Now that the campaign was running, Mr. Dale continued, it was vital that every electrical shop and showroom assistant should be able to give correct instruction to the public. Newcastle had conceived an ingenious method for getting the booklet applicant into the showroom twice. That idea was excellent and should be emulated. The second visit made the prospect a better prospect. He would go further and attempt to return the visitor's compliment and get a representative into the applicant's house to demonstrate on the spot exactly how the various rooms should be lighted. Many people would be receptive to the idea of a personal visit as giving them a better chance to win a prize.

While the principal object of the campaign was to get wire into unwired homes, the immense possibilities in the field of improvements in existing installations must not be overlooked. A study of the competition book would show that one of its chief aims is to awaken public consciousness of the obsolete character of existing lighting equipment. New connections alone would not reflect the total results of this campaign. Every unwired house in Great Britain was a first-class potential. The industry was not going to remain satisfied to have its service in one house out of every ten while our American cousins enjoyed a saturation factor of 60 per cent. He hoped that this was only the beginning of a bigger movement, and he believed that a campaign had been started which it would not be possible to stop merely by the cessation of advertising. Once people were made to realise the vast

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difference the simple addition of a few more lamps made in their homes, appreciation for electricity would grow by leaps and bounds, and the switch habit for heating, cooking and power would inevitably develop with greater rapidity.

The reaction of this campaign, said Mr. Dale, would be an immensely increased demand not only for electrical energy, but also for conduits, cables, fuses, switches, meters, distribution boards, tubing, wires, plugs, lamps, fittings, as well as generators, transformers, recording instruments, and vast quantities of material to convey the electrical energy from the central station to consumers' premises.

No one need be ashamed of being associated with this campaign, when so shrewd and competent an authority as Sir Ernest Benn had said that " We electrical people might well be lighting a lamp which will radiate far further than might be imagined. Not only will this campaign do much for the electrical industry, but it will do a very great deal more for the comfort and well being of the mass of the people. The campaign sets an example in the way of perfection of human organisation, which will be very useful to the rest of the world."

In the discussion which followed Mr. C. W. Sully emphasised the point that this was the first national campaign that had been backed by all sections of the electrical industry. Therefore it was surely worth all the invididual support that could be given to it. In spite of the great efforts made to interest the trade in the campaign, there were indications that the public was not getting all the information it desired with regard to it. The campaign needed something more than the initial push it had received to enable it to come fully before the public and for that purpose he hoped there would be a rapid extension of the Electrical Circles. Particularly was that so in London and the Home Counties Area, because there was the largest population there and consequently there was the need for the largest number of Circles. The public was demanding the competition book and we must see that they get it.

Competition Booklet encourages demand for Goods.

Mr. H. F. Simon said he was purchasing large quantities of competition books for his own business as an electrical contractor. He believed it would be possible to get builders and decorators to display posters relating to the campaign. He wished to impress upon all contractors the value of the campaign as a business getter. There had been case after case in his own business in which people who had come in for the competition booklet had bought something, even if it were only a lamp or two, whilst in one case he had succeeded in getting quite a large order for commercial reflectors and other up-to-date lighting apparatus from the manager of a large printing works. This same customer had also asked for a quotation for other things, and this could be traced directly to the competition book. Although his place of business was in a side street off Cannon Street, he had had people come in for the booklet as the result of displaying posters with regard to the competition.

Mr. Ellersdale said there was still much room for the E.D.A. to act as an educational as well as a development organisation because he knew of one electricity supply company which had refused to connect heating circuits at the moment. The excuse was the shortage of coal, but the gas company immediately came along and the whole place in question was now gas-heated.

Mr. W. E. Bush said the number of lamps sold in this country was ridiculously small compared with other countries. In 11 years the world had gone ahead 180 per cent. in the sale of lamps but the increase for Great Britain was only 23 per cent. and it was the lowest rate of progress of any country. The number of lamps sold in any country was an index of the rate of development of the lighting industry in that country and if Great Britain was so far behind, it was not good enough. That was why the E.L.M.A. had joined the E.D.A. in this campaign. At the same time, if the lamp makers could sell more lamps it meant that others would sell more switches and cables and so on, there would be more wiring contracts and, what was more important, they would be putting in that entering wedge for other types of electrical apparatus than lamps which must be sold before the homes of the country could be regarded as having reached saturation point. It had been suggested that the campaign should be stopped because of the coal strike, but he regarded that as a completely wrong policy. The electrical industry could not be expected to put up the shutters because of a strike here and there. As to Electrical Circles, there were at present 50 such centres where the supply engineers and contractors were sitting down week by week discussing the problem of how to develop. That in itself was an achievement, but in another few weeks there would be 100. The electric house was a very important aspect of the campaign. Already there were three in operation and another dozen were well on the way. This was the cheapest form of propaganda because the house was obtained for nothing, the furniture could be obtained for nothing and the decorations could be obtained for nothing. All the industry had to do was to provide the electrical equipment and start it. It helped the builder to sell the house and the furniture people to sell furniture and it also assisted various other industries.

Good Progress in Newcastle District.

Mr. J. Edgar gave some details of the remarkable progress of the campaign in the Newcastle area and in connection with the scheme generally he urged supply engineers seriously to consider some form of assisted wiring. When he described his own scheme before the Association last year he was criticised to some extent because he had only made provision for lighting, and one small plug, so that an iron or a similar piece of apparatus could be used. The wisdom of that policy was really confirmed by the campaign now started. The success of his own scheme was demonstrated by the fact that whereas at the end of March in South Shields there were 3 434 domestic houses connected to the mains, since that date owing to the assisted wiring scheme an additional 10 000 houses had been added. That, at any rate, was one step towards wiring the homes of Britain.

Mr. E. J. Riley said that although the number of booklets purchased so far was satisfactory, it must be recognised that their ultimate destination was the public, and every step must be taken to see that the booklets reached the public. In one large showroom in London the applications had been very few during the past week and therefore it was necessary for showroom staffs and others to draw the attention of as many people as possible to the booklet and to distribute them. As an indication of the competition still to be faced from gas, he mentioned the case of the electric lighting of a new arterial road in connection with which it had been stated in the local paper that the gas company had no idea the electrical supply authority was quoting for the work, otherwise their price would have been entirely different.

Special Progress Reports.

That remarks at the London meeting on the comparative slackness of campaign endeavour in the London and Home Counties area are unfortunately too true was confirmed by a representative of THE ELECTRICIAN this week. With the splendid example of the Newcastle area in particular, far more should be done to develop the campaign in this, the most densely populated area in the country. There are, of course, several notable exceptions, but every electrical firm and individual had been talking and working on the campaign. Actually there are still some contractors and supply undertakings in the London district who do not appear even to have heard that a national campaign was in progress. Reference has already been made in these columns to the splendid work that is being done at Croydon, Epsom and Hackney, but every one of the satellite towns comprising Greater London must make similar efforts. An ELECTRICIAN representative who called at a number of London electrical shops and showrooms found that people had deposited their coupons for competition books, while inquiries were made as to where the booklets could be obtained from. As we have stated repeatedly, no member of the public who asks for a competition book should ever be " sent empty away."

To glance at the other side of the London picture, it is encouraging to note the energetic way in which the electrical people of Croydon are campaigning in co-operation with Mr. A. C. Cramb, the borough electrical engineer. Banners drawing attention to the competition are being slung across the street from the municipal electricity showrooms and advertisements have appeared in the local newspapers.

At Epsom, where Mr. H. W. Watts, the Council's electrical engineer, was among the first in London to form an Electrical Circle, vigorous steps are being taken to exploit the campaign in co-operation with the local electrical contractors, and the establishment of a demonstration electric house is regarded as imminent when once the Council's sanction is obtained for the small expenditure necessary. As Mr. Watts

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is unable to make a proper campaign display in the electricity offices, he has pasted the campaign window bills on a motor van (illustrated on page ooo). This has attracted a good deal of attention, and as the driver carries a supply of competition books for distribution, the effort is proving very useful.

South Midlands Enthusiasm for the Scheme.

In no locality in the South Midlands area has there been any lack of enthusiasm in response to the preliminary meetings of the campaign, and (an ELECTRICIAN representative writes) it is gathering force rapidly, finding fresh adherents at every turn, and gaining in directive enterprise in a way which promises well for ultimate success. Things are beginning to hum in Birmingham. The first demonstration house is to be opened next Monday. It is at Erdington, and is a six-roomed dwelling, fully equipped for lighting and heating. A second demonstration house will be opened a few days later, at Bournville. A third, a fourth, and probably others, will be opened in the suburban districts before many more days have elapsed.

New circles have been formed at Leicester, Wolverhampton, and Walsall. The Leicester traders are letting no grass grow beneath their feet. The preliminary meeting, attended by representatives of the municipal electricity undertaking, and all sections of the trade, was addressed by the District Officer, Mr. Cooper, after which the only difficulty lay in restraining the number of traders who wished to speak in terms of eulogy about the scheme. The meeting was fortunate in having the active support of Mr. J. Orringe, the well-known Leicester contractor, and Mr. T. R. Smith, the municipal electrical engineer. Mr. Orringe was appointed chairman of a committee of seven, and three days later a meeting to consider ways and means was held. A further general meeting was held on Monday last, and arrangements for a thorough-going prosecution of the campaign are now well in hand.

At Wolverhampton the committee, of which Mr. E. Morgan, of the Electricity Department, is chairman, is planning to carry the campaign into all the outlying districts, and similar plans are being devised at Walsall, where Mr. H. A. Howie, the engineer and manager of the Electricity Department, is chairman of the Circle Committee.

The Stoke-on-Trent Circle is making excellent progress and at Tamworth the engineer reports that the competition booklets are "going like hot cakes."

The Shropshire, Worcestershire and Staffordshire Electric Power Co., is pushing the campaign vigorously in the town and rural areas which it serves, and meetings have been held this week at Dudley, Worcester, and Evesham.

Another big centre where more could be done for the campaign is Liverpool, where trade interest is only being stimulated very slowly. An ELECTRICIAN correspondent states, however, that a real effort will be made in the immediate future to take the fullest possible advantage of the national effort by means of special window displays and in other ways. As the illustration on page 478 shows, the all-electric subsidy house on the St. George's Hall plateau in Liverpool is being visited by a large number of people.

Moderate Progress in North-Western Area.

Our Manchester correspondent reports that he has made extensive inquiries as to the progress of the campaign in the North-Western area and finds that matters are only moving slowly but that there is nevertheless a steady increase in the interest taken which is resulting in the establishment of District Committees in a number of Centres. Southport, Liverpool and Blackburn are the leading committees in the area, and further developments are expected in the next few weeks. A movement is on foot to extend for a fortnight the period of exhibition of the Liverpool All-Electric House. Two good window displays have been arranged in Liverpool, but there is only a very moderate attempt being made in the Manchester area to give prominence to the campaign. Our correspondent had a long conversation this week with the Manchester Corporation Sales Department and they confirmed the views he had obtained that interest was only being slowly awakened. It was agreed that the enterprise shown by Brown's in advertising under the E.L.M.A. advertisement in the "Manchester Guardian" on the lines depicted in last week's ELECTRICIAN, would have its reward, and it was hoped that other retailers would take the obvious advantage to be derived from inserting their advertisement under that of the competition and thus attracting competitors to their shops. The Corporation have had a good demand for booklets at the showrooms in St. Ann's Square.

At the Victoria Hall, Saltaire, the Shipley Electricity Department, has been holding an electrical exhibition, which has been supported by local contractors, including Messrs. Gordon Binns, William Harper, Lindley, and J. E. Kay and Co. Accompanying advertisements in the "Yorkshire Evening Argus" is an article dealing with the exhibition, and linking it up with the campaign. As far as the local advertisements were concerned, however, the only reference to the campaign was contained in an announcement: "See Lindley's exhibit. £2 000 Free Competition."

An Electric House at Hebden Bridge.

At Hebden Bridge the Electricity Department is opening new showrooms and offices early next month, and Mr. H. H. Sutcliffe, the electrical engineer, has arranged to link this event up with the campaign by fitting up the showrooms as an electric house for the opening week.

Reports from the Newcastle area show that this district is maintaining the lead of previous weeks. Another demonstration electric house has been opened at Gosforth, and in connection with this house valuable free Press publicity was obtained. The house was jointly arranged by the Newcastle-upon-Tyne Electric Supply Co., Ltd., and Robson and Sons, Ltd., the Newcastle house furnishers, and the opening ceremony was performed by Lieut.-Commander W. J. Kitto, chairman of Gosforth Housing Committee.

Mr. E. S. Evans reports that 17 out of 22 Electrical Circles proposed for the area have already been formed. By the end of last week the Newcastle Electric Supply Co. had distributed 5 000 competition booklets and had ordered further large supplies.

On Wednesday the total number of competition booklets disposed of was 750 000.

PACIFIC CABLES.

Reduction of Traffic Receipts—The New Cables from Bamfield to Fiji.

THE traffic receipts of the Pacific Cable Board during the year ended March 31st, 1926, were £453 596, a reduction of £81 417, due partly to the loss of part of the United States business owing to a new arrangement between one of the American landline companies and the Eastern group of companies, which resulted in the transmission via Europe of much traffic hitherto transferred to the Board, and partly due to reductions of tariff. The receipts exceeded the working expenses (including normal payment to £30 000 to reserve and renewals fund) by £149 771.

The awning deck of the o.s. "Colonia" showing paying-out gear.

After providing for the annuity payable to the National Debt Commissioners and the annuity of £2 082 payable to the reserve and renewal fund in respect of money borrowed for the Sydney-Auckland cable (1912), there was a surplus of £70 144, the whole of which has been transferred to the reserve and renewal fund.

Various circumstances have delayed the progress of the contracts for the construction and laying of a new cable between Bamfield and Fanning Island, and one between Fanning Island and Fiji. It is expected that both will be completed before the end of November. The contractors for the Bamfield-Fanning Island section, the Telegraph Construction and Maintenance Co., found it necessary to build a new cable steamer primarily for the purpose of transporting and laying the Board's cable. This cable is the longest uninterrupted stretch in the world (nearly 3 500 nautical miles). The capacity of the "Colonia" is not equal to the demands of the new cable, which, although the same length as that laid in 1902, is loaded with a continuous winding of a non-magnetic alloy which increases the girth and weight of the cable and necessitates a larger ship. The new cable steamer, the "Dominia," has a gross tonnage of 9 250 tons, and is the last word in efficiency as regards design, construction and equipment. The weight of the cable she will transport to the Pacific for laying will be approximately 8 500 tons.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

THE late Major John Francis Hall-Edwards, F.R.S., a pioneer in X-ray work, left estate of the gross value of £5 111, net personalty £4 964.

M. Verdan, of Strasburg, who has successfully adapted the Baudot apparatus for wireless purposes, has been awarded the Legion of Honour.

Worthing Town Council has appointed Mr. S. F. C. Liernander as tempo.ary draughtsman in the mains department at a salary of £250 a year.

It is reported that Mr. Alfred Lowenstein, the Belgian financier, who has enjoyed considerable notoriety in British financial circles of late, has been robbed at Biarritz of jewellery valued at 15 000 000 francs.

Mr. Howard D. Rogers, an electrical engineer, of Pangbourne, has been presented with a silver cigarette case by members of the Reading Police Force for going to the assistance of a constable who was in difficulty.

Sir Henry Hadow has consented to act as chairman of a joint committee which is being set up by the British Broadcasting Co. and the British Institute of Adult Education to inquire into the possibilities of further development of education by wireless.

Mr. Carl G. Schluederberg, whose work with the Westinghouse Electric and Manufacturing Co. has taken him to many of the principal countries of the world, including England, has been appointed general manager of the George Cutter Co., South Bend, Indiana.

Inverness Town Council has appointed Mr. C. A. Grut as manager and engineer of the Corporation's electricity undertaking. It was stated that during the time that Mr. Grut had acted as interim manager he had shown not only capacity but an exceptional knowledge and grasp of the whole undertaking. A minority took the view that, before any appointment was made, the post should be duly advertised.

Mr. G. Wilkinson, the Harrogate borough electrical engineer, has resigned. His services are, however, to be retained in a consultative capacity, by the Harrogate Corporation at a salary of 500 guineas per annum for three years from December 31st. It has been decided to grant Mr. Wilkinson a three years' supply of electricity for his home use free of cost, which, in no case, is to exceed the value of £40 per annum.

The coming of age of Miss Eva Moss, daughter of Mr. Harry Moss, registered contractor, of Bradford, was celebrated last week by a supper and dance in the Masonic Hall, Bradford, when about 100 guests, including Mr. C. E. Allsopp, of the Bradford Corporation Electricity Department, and Mr. H. Girdlestone, the E.D.A.—E.L.M.A. Campaign district officer for the North Midland Area, were present. Miss Moss is a valued member of the staff of Mr. Moss.

Obituary.

Death of Mr. George Chauvin, of Siemens Bros. and Co., Ltd.

WE regret to record the death, at Hove on October 12th, of Mr. G. Chauvin, aged eighty years. For a quarter of a century Mr. Chauvin was managing director of Siemens Brothers and Co., Ltd., and though in April, 1925, he resigned his post on account of advancing age, he retained his seat on the board of directors until a few months before his death.

Mr. Chauvin's first connection with Siemens Brothers dates from the year 1866, when he was appointed assistant to their engineer in charge of the construction of the Caucasian Section of the Indo-European telegraph line of India. He has thus been associated with the business ever since its early days, and has been more particularly interested in the submarine cable section.

When still a young man, he left Siemens to take up the position of European manager for the Direct United States Telegraph Co., and later on he was for many years the European representative of the Western Union Telegraph Co. On various occasions he has acted as a British delegate at the International Telegraph Conferences.

In 1899, he returned to Siemens Brothers and Co., Ltd., and was appointed managing director. During his term of office the company steadily grew to one of the largest electrical companies in the world, and the paid-up capital, including debenture stock, increased from £425 000 to £2 854 300. A portrait of Mr. Chauvin is on our picture page this week.

FORTY YEARS AGO.

Some Interesting Gleanings from "The Electrician," of October 22nd, 1886.

THIS week our backward glance through early issues of THE ELECTRICIAN brings us to the issue dated October 22nd, 1886. Do you remember that at that time :—

Experiments were being made by the Navy in the use of electric semaphores for night signalling.

* * *

Public electrical illuminations at Burnley were provided by a 5A Gülcher low tension dynamo driven by a 14 H.P. compound portable engine.

* * *

Volk's electric railway at Brighton was severely damaged by a storm.

* * *

Mr. Robert Dick, of Glasgow, introduced a new method of making carbon lamp filaments.

* * *

In advertising telephone instruments the New Telephone Co. guaranteed purchasers against claims by trade rivals for alleged infringements.

* * *

The directors of the Eastern Extension Australia and China Telegraph Co. announced that owing to decreased revenue the net profit for the half-year was *only* £97 480.

Electrical Trade Travellers.

London Concert Inaugurates Association's Second Year's Activities.

The Electrical Trades Commercial Travellers' Association held a bohemian concert last Friday at the Old Colony Club, Aldwych, London, W.C. A very enjoyable entertainment consisting of vocal, instrumental and conjuring items, was provided.

Mr. E. A. Joyce (Chairman of the Association), who presided, said this was the first social function of the session, and added that the Association had been in existence nearly two years, it had been so far financially strong, and the members should try to draw in colleagues and so make it even stronger and better. They had excellent officers, a wonderful secretary (Mr. Norris) and an energetic vice-chairman (Mr. Markes), and the Association had got through its second year in a better manner than many societies which had started in a much larger way. They had invested £10 in the new Travellers' Club, which was going to be in a central position in London, and many of their members had become founder members of the Club. The Association had all its members insured, and it had already subscribed 15 guineas to trade charities.

Work in Prospect.

Trade Possibilities for Electrical Installation Contractors.

CRANHAM (ESSEX).—Church Hall, Front Lane. Particulars, the Vicar.

ELLAND (YORKS).—Housing scheme. Particulars, the architect, Mr. Exley Fisher.—Working Men's Club Premises (£3 000). Particulars, the architect, Mr. Exley Fisher.

ELLESMERE.—College Memorial Chapel. Particulars, the architect, Sir Aston Webb.

ERITH.—Houses (10), Orchard Avenue and Upper Park Road, for Mr. A. H. Jennings.

FLEETWOOD.—Housing scheme (53). Particulars, the Surveyor.

HORNBY.—Wesleyan church. Particulars, the architect, Mr. Hartley B. Richardson, Darlington, or the contractor, Mr. Morrison Black, Darlington.

LIVERPOOL.—Re-housing scheme (482). Particulars, the City Surveyor.

LYTHAM (ST. ANNES.—Additional housing scheme (80). Particulars, the Borough Surveyor.

MAIDSTONE.—Garage and motor showrooms, King Street, for Eustace Watkins. Particulars, the architects, Ruck and Smith, Week Street.

MIDDLESBROUGH.—Additional 100 houses, Whinney Banks. Particulars, the Borough Surveyor.

NEWPORT.—Laboratory and clinic. Particulars, the county surveyor, Mr. S. R. Cocks, 4, St. Thomas Street, Ryde.

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CABLES IN U.S.A.

Capt. Dunsheath Compares British and American Cable Practice.

CAPT. P. DUNSHEATH, chief of the Research Department of W. T. Henley's Telegraph Works Co., Ltd., lectured at Australia House, London, last week on his recent American tour. He went to America as one of the delegates to the Convention of the International Electrotechnical Commission, and also spent some time visiting electrical works and making observations of American practice in cable making and laying. During his lecture, he also showed cinematograph pictures illustrating the development of prime movers and electrical machinery from their earliest stages.

Capt. P. Dunsheath, whose observations on American cable practice are related below.

The most interesting development in high voltage cable work in the United States, he said, was the installation of two systems to work at 132 000 V one in New York and one in Chicago. For these systems, which were now nearing completion, an entirely new principle had been adopted. The cable conductor was made with a hollow centre which was kept filled with a fluid oil during service. The single core cables were used for the three-phase transmission, each cable being lead covered, then lapped with a reinforcing tape and again lead covered. The New York Edison Co., working in conjunction with the United Electric Co., were laying about 11 miles of these cables from Hell Gate to the northern outskirts of New York. The cable was being drawn into concrete ducts, and at intervals along the length special barrier joints were inserted into which oil under pressure would be kept supplied. The Chicago installation was on very similar lines for a six mile run, in both cases having a conductor section of 600 000 circ. mils.

Capt. Dunsheath visited the Lynn Works of the General Electric Co., the Electrical Laboratories of the Harvard University and the Massachusetts Institute of Technology. In the latter, which is the largest engineering college in the country, he found an interesting research in progress on the endurance of cable papers. Some hundreds of short pieces of impregnated paper cable were being subjected to high temperatures over long periods, and at intervals samples were dissected, and the papers tested, to determine what deterioration had been caused by artificial ageing.

Co-operative Testing.

The New York Electrical Testing Laboratories worked on a co-operative basis and carried out testing work for the supply companies. Both here and in the Brooklyn Edison Co., the lecturer saw that the American cable user was giving the American cable maker a more strenuous time than the British users were home manufacturers. In New York tests which were being carried out he knew must be causing the maker a considerable amount of worry. He thought this system was wrong, and considered that the British way, at least the way in which his own company was working—in which the manufacturer, by an efficient research organisation, was doing all he could to improve the product—was better.

In his various discussions on the theoretical side of cable manufacture, Capt. Dunsheath found a wide divergence of opinion among American engineers in matters of detail. For instance, on the question of the various stress theories some were still inclined to favour the use of the maximum stress as determined by the logarithmic formula, while others had definitely come out in favour of average stress.

Both makers and users were very much alive to the development of that curious substance which was found in high voltage cables after a few months or years of service. They referred to it variously as "cheese" or "substance x." In some of the large laboratories, elaborate testing arrangements were now installed for testing compounds with a view to determining their liability to form this substance. It seemed to be definitely established that the cable compounds which gave the low values of dielectric loss were those which were unstable and formed this cheese most readily. On the question of the relative merits of manila and wood pulp paper, although American cable makers were unanimous in favour of manila for many years, most of them were now definitely of the opinion that wood pulp paper, if properly selected, produced the most satisfactory cable.

Apart from the 132 000 V cables referred to earlier, there were a number of installations at 44 and 66 kV. In New York, for instance, there was an 11 mile run of single core 500 000 circ. mil. section. This was run from Sterman Creek to New Rochelle. There were two sets of single core cables made by different makers; one set, with ½ in. dielectric, had been in satisfactory operation for about two years, but the other set, with a greater thickness, had failed so frequently that it had to be entirely replaced. In Philadelphia there was a run of three or four miles of 40 000 V cable, also single core, while in Cleveland, there was an eight mile run of 66 kV underground transmission, again of single core cables. The same size of conductor, 500 000 circ. mil. was also employed with about 1 in. dielectric. Several makers had supplied parts of this installation and the curious thing was that while some had had perfect operation on their cables and had had joint troubles, others had had no breakdowns on their joints, but frequent cable failures.

As regards the use of 33 000 V cables, American experience was rather a sad history. There were several hundred miles of 33 000 V cable laid in the United States, but only a small proportion of it was in operation at 33 000 V. In most cases it had been necessary to reduce the voltage in order to keep the cable working.

Electrical Wholesalers.

E.W.F. President on the Federation's Policy and Progress.

ADDRESSING members of the Electrical Wholesalers' Federation at Manchester last Friday, Mr. G. P. Dennis, the president of the Federation, emphasised that the Council was pursuing the definite policy of securing complete recognition of the electrical wholesale trade. Electrical wholesalers rendered a definite service to the trade, and on more economical terms than could be obtained in any other way. For the heavy stocks they carried and for the power they possessed to distribute supplies of electrical goods more cheaply than by any other medium they deserved the support of the whole of the electrical industry.

Wholesalers rightly complained that the rate of their preferential discount was too small, and the Federation, with its national status, was working hard to obtain an improvement in this direction.

Recent happenings had caused the various electrical interests to get together for the common good, and the *camaraderie* now existing between the E.W.F. and kindred trade associations was a very encouraging sign of the progress that had been made towards that complete co-operation of all branches of the industry that was so essential to real progress.

More constructive work had been accomplished by the E.W.F. since the beginning of this year than during the whole of its previous history, and their organisation deserved the support and confidence of all legitimate electrical wholesalers.

Mr. Dennis also mentioned that during the year the Council had met in conference various kindred organisations, and it was now the practice to bring the principal representatives of firms with whom the Federation was negotiating to the E.W.F. Council meetings for a full and free discussion.

No Council could win through without the confidence and wholehearted support of each member, and this they were entitled to have. The Federation stood firm for the interests of its members, which it had protected in every way possible. The Council had never doubted the integrity and honour of its members faithfully to discharge their obligations to the Federation, but if the occasion ever arose to deal with a defaulter on any of the principles governing their organisation they would not hesitate to take drastic steps to effect a remedy.

The Electrical Wholesalers' Federation, Mr. Dennis concluded, never had a brighter outlook. But the work ahead was of supreme importance and affected every genuine wholesaler in the country. Those firms who were not already members should apply for membership of the Federation, and thus play their part in the unification of the interests of every bona-fide wholesaler in the country.

The latest additions to the Paisley Museum include a telephone transmitter and two receivers, presented by Mr. James Reid, Glasgow (formerly of Paisley). The set, which was made by Mr. Reid, is said to have been the first telephone in operation in Scotland, having been used for communication between Greenhaugh and Standyford in 1878.

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IN LIGHTER VEIN.

Random Thoughts Inspired by Recent Industrial Mergers.

RECENT industrial amalgamations and discussions on the sales value of such famous names as Swan and Edgar, Robinson and Cleaver, and so on, have caused our tame humorist to take the following peep into the future.

* * *

The recent fusion of the interests of Edison and Swan and Swan and Edgar, he writes, has occasioned no surprise to those who move in the inner circle. It was more a call of blood, of deep calling deep. When the actual amalgamation took place, there was a feeling that such a company could not possibly sink with two Swans on the board, and the company was easily floated. Trouble first arose when the new sign went up, for despite the large frontage of the shop, the sign was too long The signwriter had left too much space between Swan and and and and Swan, but even when this was rectified, there was still not enough room, and a Cambridge mathematician was called in to reduce the name to the lowest common denominator. The method is shown below for the first time.

* * *

(1) Edison+Swan+Swan+Edgar;
(2) =Edison+2 Swan+Edgar
(3) =Ed(ison+gar)+2 Swan

Divide equation (2) by 2 for Excess Profits Tax and Death Duty, leaving :—

(4) Edi+Swan+Edgar, as Edgar refuses to be cut in half.

Differentiating, we now have Ediswan and Edgar, showing fully the complete mathematical formula for such problems.

* * *

By combining showrooms, it has been found that two sales are often effected where one would normally have taken place, and the combined advertisements have done wonderful work. An example is shown below.

Extra heavy quality frock, carried out in Empire Cloth with trimmings of Black Tape and Webbing, braided and armoured, double cotton covered, all selvedges soldered. Fully cut. Sale Price 19s. 11¾d. Box and postage extra.

Kettle to match, any voltage. Copper with beautiful Brass fittings and ebonite knobs. Flexible cord in Rose, Green, Saxe or Navy.

Two pint size—29s. 11¾d., post free.

Out-size—35s. 11¾d., post free.

* * *

BARGAINS IN BULBS.—We have a wonderful stock of bulbs, all shapes, sizes, voltages and colours including Parma, Mulberry, Burgundy, Cocoa, Grand Marnier, navy, Ginanit and Black (specially suitable for night lights). These bulbs are guaranteed rust-proof and free from blight. No preservatives used.

All one price—2s. 11¾d. each, post free.

If brass cap is fitted—1s. extra.

ALL COD.

* * *

The following snappy specimen of telephone propaganda is taken from "The Transmitter" :—

When Pop got kicked by Smith's old mule
I used the telephone;
When Mom fell over the piano stool
I used the telephone;
When Jack got lost in the snow,
When Maud eloped with Tillie's beau,
When a speed cop caught my brother Joe,
I used the telephone.
When little Ted stepped on a nail
I used the telephone;
When Smith got shot while hunting quail
I used the telephone;
When a burglar once I had to rout,
When Sis got sick from eating kraut,
When Uncle Eli had the gout,
I used the telephone.

E.C.A. MEDALS.

Medal Awards to Successful Apprentices in City and Guilds Examinations.

IT is announced that the gold, silver and bronze medals and money grants provided by the Electrical Contractors' Association for indentured apprentices (in the employ of E.C.A. firms) who achieve distinction in the City and Guilds of London Examinations have this year been awarded as follows :—

The gold medal and £20 to Mr. Allan Campbell (employed by Reynolds and Bradwell, Birmingham), highest marks in First Class Final; the silver medal and £20 to Mr. Charles Blackburn (with Troup, Curtis and Co., London), highest marks in Grade 1; and the bronze medal and £10 to Mr. Stanley Frederick Snow (apprenticed to Marryat and Place, Ltd., London), second highest marks in Grade 1.

An Electrical Combine.

Reported Plan to Form Franco-German Cartel for French Electrification Works.

ACCORDING to statements published in Paris from Berlin, a Franco-German electrical combine is being planned, the prime mover in which is said to be M. Loucheur. It is asserted (states a "Financial Times" correspondent) that the formation of this combine has been rendered necessary by the exigencies of French electrical industrialists in connection with the enormous payments in kind which have to be made next year to France by the German electrical industries as the outcome of reparation payments and of the Dawes arrangement.

These payments in kind are to be made use of for the general electrification of France which is now proceeding apace. A pooling arrangement is in contemplation under which all profits will be shared in stipulated proportions between the French and the German electrical firms.

It is thought to be possible that, subject to certain reservations, the British and Belgian electrical industries may join in the cartel, though there is no evidence of such a possibility at present forthcoming in this country.

Faraday House Fees.

New Scale of Charges for the Testing of Electrical Machinery, Instruments, etc.

A NEW scale of fees for tests has been issued by the Faraday House (London) Testing Laboratories. Particulars are given of charges for testing ammeters, voltmeters, wattmeters ampere-hour meters, watt hour meters, etc., photometric tests, insulation resistance tests, tests of insulating oils, cells, fuses, switches, electrical machinery, and wireless equipment, and mechanical and chemical tests. The Laboratories also lend electrical testing instruments on hire and let workshops to experimenters. Many alterations have been made in the scope of tests and in the charges, and particulars of fees for any work not specifically mentioned in the list can be obtained on application to the Secretary, Faraday House, Southampton Row, London, W.C.1.

Books Received.

"The Electrical Contractors' Year Book," 1926–27. (London: Electrical Contractors' Association, Incorporated). 5s.

"Electrical Technology." By H. Cotton. Part I. (London: Sir Isaac Pitman and Sons.) Pp. xv + 48. 1s. net.

"Journal of the Institution of Electrical Engineers." (London: E. and F. N. Spon.) Vol. 64, No. 358 (October). 10s. 6d. net.

"The Theory of Electricity." Second edition. By G. H. Livens. (London: Cambridge University Press.) Pp. 427. 16s. net.

"Pitman's Electrical Educator." Part 28. Edited by J. A. Fleming, F.R.S. (London: Sir Isaac Pitman and Sons.) 1s. 3d. net.

"Electrical Contractors' Association of Scotland—Year Book and Diary, 1926–1927." (Edinburgh: T. Allan and Sons.) 3s. 6d. net, post free.

"Junior Technical Electricity." By R. W. Hutchinson. 2nd Edition. (London: University Tutorial Press.) Pp. viii+385. 4s. 6d. net.

"Corso Teorico-Pratico di Elettrotecnica." By L. Lombardi. (Milan: Dr. F. Vallardi.) Vol. I, pp. xii + 642, L. 70; Vol. II, pp. xi + 869. L. 100.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given.

SOUTH KIRKBY CHURCH.—Electric light installation. Particulars from the Vicar, South Kirkby Vicarage, near Pontefract.

DUNDEE CORPORATION, October 22nd.—Supply of 4-core, 3-core and 2-core h.t. paper insulated lead covered and double steel tape armoured cable, for working pressure up to 660 V. Specification, etc., from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

IRISH FREE STATE COMMISSIONERS OF PUBLIC WORKS, October 22nd.—Extension of electric lighting installation at Ordnance Survey Office, Phœnix Park, Dublin. Specification from Mr. J. J. Healy, Secretary, Office of Public Works, Dublin; deposit £1.

W.O.B. and E.C.A.

CONTRACTORS who are not yet W.O.B. enthusiasts should read what Mr. H. J. Miles, the president of the E.C.A., says about the campaign. He regards it as of supreme importance to the contracting industry, and says it is in essence a contractor campaign. "It is," he said the other day, "something larger and something better than has ever been attempted before in the way of electrical development on a co-operative basis."

STAFFORDSHIRE COUNTY EDUCATION COMMITTEE, October 23rd.—Electric wiring of Wolstanton Boys' New Secondary School. Specifications from Cramp and Frith, 33, Brazennose Street, Manchester; deposit £5 5s.

BARRY URBAN DISTRICT COUNCIL, October 25th.—Underground mains, sub-station, transformers and meters. Specification, etc., from Mr. T. Franklin, Gas and Water Offices, Barry, Glam, or from A. H. Seabrook and Partners, 146, Bishopsgate, London, E.C.2; deposit £3 3s.

BURY INFIRMARY, October 25th.—Equipment of new electro-massage and X-ray departments. Plans can be seen at the Infirmary or at the offices of Mr. A. C. M. Lillie, architect, Brownedge, Bamber Bridge, Preston.

EDINBURGH EDUCATION AUTHORITY, October 25th.—Electrician's work in connection with additions to Hermitage Park School, Leith. Schedules from Mr. T. Aikman Swan, 7, St. Colne Street, Edinburgh.

STIRLING CORPORATION, October 25th.—Electrical work in connection with the erection of 20 houses at Burnside. Specifications from the Burgh Engineer; deposit £1.

BLACKROCK AND KINGSTOWN DRAINAGE BOARD, October 26th.—Supply and fixing of electrically-driven pumping plant at the Eden Road pumping station, Dun Laoghaire. Specifications from Kaye Parry, Ross and Hendy, 48, Kildare Street, Dublin.

ILFORD URBAN DISTRICT COUNCIL, October 26th.—Supply and erection of one transformer kiosk, including transformer and switchgear, etc.; one switch kiosk, including switchgear, and l.t. (600 V.) paper insulated cables. Specifications, etc., after October 8th, from Mr. Arthur H. Shaw, Electricity Works, Ilford.

RATHMINES AND RATHGAR URBAN DISTRICT COUNCIL, October 27th.—Supply of cable. Specification can be obtained at the Electricity Works.

RATHMINES AND RATHGAR URBAN DISTRICT COUNCIL, October 27th.—Supply of steel poles, for the Electricity Department. Specifications can be obtained at the Electricity Works.

OTLEY URBAN DISTRICT COUNCIL, October 28th.—Electrician's work of 78 houses to be erected under the Harefield housing scheme. Form of tender, etc., from Mr. C. J. E. Atkinson, clerk to the Council; deposit £1 1s.

GRIMSBY CORPORATION, October 29th.—Installation of 15 H.P. slip-ring motor, rails and control panel and supply line at Isolation Hospital, Scartho. Specification (No. 189W) from Lt.-Col. W. A. Vignoles, borough electrical engineer, Grimsby.

INDIA STORE DEPARTMENT, October 29th.—Supply of 32 100 yards of paper insulated, lead sheathed and double steel tape armoured l.t. cable, and joint and house service boxes. Specifications (5s.) from the Director-General, Branch No. 10, Belvedere Road, London, S.E.1.

TYNE IMPROVEMENT COMMISSIONERS, October 29th.—One 3-ton and one 5-ton portal electric, travelling, level luffing cranes, to be erected at Albert Edward Dock, North Shields. Specification from Mr. A. Blacklock, Tyne Improvement Commission Offices, Bewick Street, Newcastle-on-Tyne; deposit £1 1s.

METROPOLITAN ASYLUMS BOARD, November 3rd.—(1) Automatic telephones and fire alarms; and (2) alterations to electric lighting installation at North-Eastern Fever Hospital, St. Anne's Road, Tottenham. Specifications from the Board's Office, Victoria Embankment, E.C.4; deposit £1 in respect of each work.

EASTBOURNE CORPORATION, November 5th.—Supply and erection of one water-tube boiler, economiser, feed heaters, two steel chimneys with induced draught, pipework, etc. Specifications from Mr. J. K. Brydges, Electricity Works, Eastbourne; deposit £1.

INDIA STORE DEPARTMENT, November 5th.—Two 50 kW oil engine driven generating sets and 5 000 yd. of dry core paper insulated, 40 wire armoured composite cable. Specifications (Nos. 2 and 3, respectively) from the Director-General Branch, No. 11, Belvedere Road, London, S.E.1; 5s. each.

SALFORD GUARDIANS, November 6th.—Electric wiring, fitting, etc., of the new mortuary and converted laundry buildings at the Union Infirmary, Hope, Pendleton, Salford. Specification from Mr. E. H. Inchley, Clerk to the Guardians, Poor Law offices, Eccles New Road, Salford; deposit £2 2s.

STOKE-ON-TRENT CORPORATION, November 10th.—Supply of e.h.t. switchgear for central power station (contract 2 620); e.h.t. switchgear, etc., for Stoke sub-works (contract 2 625); and neutral earth resistance for central power station (contract 2 626). Specifications from the City Electrical Engineer, St. George's Chambers, Wolfe Street, Stoke-on-Trent, on payment of £2 in respect of each contract.

GREAT WESTERN RAILWAY, November 19th.—Supply of stores, including (Form 18) telegraph instruments; (Form 19) electrical apparatus (insulators), etc.; (Form 20) electrical wires and cables; (Form 21) telegraph ironwork and tools; and (Form 22) telegraph drysalteries. Specifications and forms of tender from the Stores Superintendent, Swindon. Form 20 will not be available until November 10th.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Telephone plugs and sleeves. (Schedule C.120.) (Reference B.X. 2 799.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, October 26th.—Lamps, lamp caps, and lamp sockets. (Schedule C.124.) (Reference B.X. 2 800.)

DIRECTOR-GENERAL OF EGYPTIAN MUNICIPALITIES AND LOCAL COMMISSIONERS, November 1st.—Supply of about 30 000 electric lamps. Tenders to the Director-General, Savoy House, Cairo.

SYDNEY ELECTRICITY DEPARTMENT, November 1st.—Supply, delivery, erection, setting to work, testing and maintenance at Bunnerong power station of boiler feed pumps. (Reference A.X. 3 470.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Supply of 110 000 V transformers for Waikaremoana power scheme (section 17). (Reference B.X. 2 744.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

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NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Indoor control gear and switchgear for Waikaremoana electric power development (section 14). (Reference B.X. 2 675.)

CAPE TOWN MUNICIPALITY, November 3rd.—Two automatically-controlled, electrically-driven sewage pumps, etc. (Reference A.X. 3 617.)

VICTORIAN RAILWAY COMMISSIONERS, November 3rd.—Supply of 77 miles of seven-strand h.d. copper cable.

VICTORIA RAILWAY COMMISSIONERS, November 3rd.—Pole changing transformer (contract 39 822). (Reference B.X. 2 915.) Pole transformers (contract 39 823.) (Reference B.X. 2 914.)

POSTMASTER - GENERAL'S DEPARTMENT, MELBOURNE, November 4th.—Supply of primary battery material. (Reference B.X. 2 900.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 4th.—Supply of one electrically-operated 40-ton Goliath crane. (Reference A.X. 3 657.*)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, November 8th.—Diaphragms, cords, etc. (Reference B.X. 2 860.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone transformers. (Reference B.X. 2 797.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone protective apparatus. (Reference B.X. 840.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, November 10th.—Supply and erection of steam-turbine-driven centrifugal boiler-feed pump. (Contract No. 770.) (Reference A.X. 3 534.) Supply and erection of motor-driven centrifugal boiler-feed pump. (Contract No. 771.) (Reference A.X. 3 536.)

SYDNEY CITY COUNCIL, November 15th.—Supply of 33 000 V cable and pilot cable. Specification (No. 1 047) from the Constructional Engineer, Electricity Department, Town Hall, Sydney.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 16th.—Supply of timing clocks for indicating the duration of telephone trunk line calls. (Reference B.X. 2 827.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 23rd.—Lightning arresters and transformers. (Reference B.X. 2 792.)

PORT ELIZABETH MUNICIPALITY, November 25th.—Supply and erection of duplicate electrically-driven automatic float controlled centrifugal sewage pumps, etc. (contract 24, Mill Park). (Reference A.X. 3 680.*)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 26th.—Primary battery material.

SYDNEY CITY COUNCIL, November 29th.—High and low tension cables (contract 1 057). (Reference B.X. 2 959.)

SYDNEY CITY COUNCIL, November 29th.—Three-phase oil-immersed induction voltage regulator. (Reference B.X. 2 936.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 30th.—Supply of 110 kW transformers. (Reference B.X. 2 874.)

SOUTHLAND ELECTRIC POWER BOARD, INVERCARGILL, N.Z., December 1st.—Supply of a 3 000 H.P. horizontal Francis turbine and 2 350 kW generator. (Reference B.X. 2 822.)

VICTORIAN RAILWAY COMMISSIONERS, December 1st.—Rotary converter or rectifier set, with switching equipment for its automatic operation.

STATE ELECTRICITY WORKS, MONTEVIDEO, December 6th.—Diesel-electric generating sets.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 7th.—Three-phase induction regulator for Waikato electric power scheme (section 206). (Reference B.X. 2 935.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 10th.—Electric motors. (Reference B.X. 2 861.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 15th.—Switchgear, cable, motor-generator sets, junction boxes, etc., for Hutt Valley Locomotive Workshops. (Reference, B.X. 2 949.)

VICTORIAN ELECTRICITY COMMISSION, December 15th.—Water tube boiler, with superheater, economiser, etc., for Yallourn power scheme. Specification (No. 28/82), from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.2; deposit £3 3s.

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 1st.—Supply and erection at site of Seru pumping and power station, of four Diesel engine alternator groups, three pumps and accessories. Specification (10s. 6d.) from Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 4th.—Supply of switchgear and transformers for Waikaremoana electric power scheme. (Reference B.X. 2 872.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 1st.—Storage battery and booster for Waikaremoana Electric Power Board (section 28). (Reference B.X. 2 937.)

Tenders Accepted.

CHELTENHAM T.C.—A. R. Fox, new motor, etc., for siren, £20.

LICHFIELD GUARDIANS.—Richards and Co., electric wiring and fittings, £60.

STEWARTRY COUNTY COUNCIL.—William Johnstone, supply and fixing of 11 public lamps at Dalry, £54 10s. 4d.; Dalry Electric Supply Co., Ltd., for the supply of electricity.

A view of the interior part of the new E.L.M.A. Lighting Service Bureau in Manchester.

WHITEHEAD TOWN COMMISSIONERS.—Northern Electric Supply Co., electric lighting of the town for three years, at £2 15s. per annum for each 100 c.p. lamp and £1 19s. for each 50 c.p. lamp.

TORQUAY CORPORATION.—Brackett and Co., Ltd., mechanical screening plant, Newton Abbot power station, £2 212; British Thomson-Houston Co., Ltd., e.h.t. cell work and instrument panel, £150; Aron Meter Co., meters, £135.

BRIDLINGTON CORPORATION.—Premier Cooler and Engineering Co., wooden cooling tower with tank, etc., at the Electricity Works, £1 772 15s.; W. H. Allen, Son and Co., Ltd. surface condenser and extraction plant, etc., £2 222 15s (both recommended).

NORTHFLEET URBAN DISTRICT COUNCIL.—British Electrical Installations Co., electrical installation for 28 houses on Northfleet House estate, £1 12s. 9d. per block of four houses. Other tenderers: R. Redman, £37 7s., H. and C. Caseley and Co., £40 8s., Capt. J. C. de Wardt, £63 6s.

ERITH URBAN DISTRICT COUNCIL.—Callender's Cable and Construction Co., Ltd., cable for new housing scheme, £588 7s.; British Electric Transformer Co., Ltd., three 100 kVA transformers, £385 1s.; British Thomson-Houston Co., Ltd., duplicate h.t. switch-panel at Callender's sub-station, £55 10s.

Electrical Freemasons.

New Lodge Formed in Newcastle-on-Tyne for Electrical Men.

UNDER the name of the Faraday Lodge, a new Masonic Lodge for electrical men has been formed in Newcastle-on-Tyne, and is, THE ELECTRICIAN learns, receiving enthusiastic support from local members of the electrical industry and trade. Mr. J. Gladson, a past-president of the Electrical Wholesalers' Federation, is the Founder and First Master.

At a meeting of the Kelvin Lodge to be held in London this (Friday) evening Mr. L. H. Euler, chairman of the Saxonia Electrical Wire Co., Ltd., will be installed by the present Master, Mr. F. E. Phillips, London representative of the St. Helens Cable and Rubber Co., Ltd.

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ELECTRICITY SUPPLY.

Extension of Plant at Newton Abbot—Salford Corporation buys Dutch Electric Cable—Extension of Basingstoke Electricity Works.

THE electric lighting of the town of Moville, co. Donegal, has been inaugurated.

Accrington Electricity Committee has approved the erection of additional sub-stations.

Sunderland Corporation has received the Electricity Commissioners' permission to borrow £20 000 for consumers' services.

Torquay T.C. has applied to the Electricity Commissioners for consent to the installation of a 6 000 kW generating set at the Newton Abbot power station.

AN EPSOM WINNER.

ELECTRICAL men who want to spot a winner in the "Better Home Lighting" stakes should take a tip from Epsom. One of the first Electrical Circles in the London area was formed here by the municipal electrical engineer, who with the local contractors, bids fair to have the whole of Epsom wired before Derby Day. Have you found the winner yet?

The Lancashire Electric Power Co.'s generating station at Padiham is now in operation, and current is being supplied in Sabden, Read, Whalley and Simonstone.

Lisburn U.D.C. has approved an agreement with a Belfast company for a supply of electricity to the town, and the Electricity Commissioners' sanction has been applied for.

Winchester Corporation has received sanction to loans of £4 000 for mains and services and £1 500 for meters. A sum of £250 is to be expended on the purchase of cookers to be let out on hire.

Drayton, Berks, has now its electricity supply system, Edwards and Armstrong, Ltd., having brought a line from Abingdon. It is hoped shortly to install the light in St. Peter's Church.

Swansea Electricity Committee has received a request for an extension of the electricity mains to Walter Road, Llansamlet. The borough electrical engineer is to report on the matter.

Walton-on-Thames U.D.C. has decided to offer £89 000 to the Urban Electric Supply Co. for its Walton undertaking, and has applied to the Electricity Commissioners for a loan to cover the cost.

A supply of electricity is expected in Holywell in about three week's time. Poles have been erected for carrying the overhead cables, and the distributing company is arranging for an independent plant to generate the supply.

The Clitheroe electricity scheme is being pushed forward with all speed. The Corporation has already secured powers to supply Chatburn. The prices of current will be 6d. per kWh for lighting and 1½d. for cooking or domestic power.

The electric lighting on the Barlby Road and at Barlby and New Barlby, on the river Ouse, near Selby, has been commenced. The current is supplied by the Olympia Oil and Cake Co.'s works, by arrangement with the Parish Council.

Carlisle's Extensions in Outside Areas.

Mr. C. W. Salt, city electrical engineer, has recommended Carlisle Electricity Committee to carry out mains extensions to link up Harraby and Currock, at a cost of £1 638 10s., and to lay down ducts from Wigton Road to the area boundary at a cost of £335.

Torpoint (Cornwall) Council has decided not to arbitrate with the Torpoint Electricity Co. in regard to the proposed purchase of the undertaking, but to leave this question to the Electricity Commissioners, and proceed with the application for a Provisional Order.

A Government inquiry has been held relative to the application of Douglas (Isle of Man) T.C. for a loan of £83 000 for extensions to the electricity works, plant, mains, services, etc. It is proposed to install a steam driven 1 000 kW plant. There was no opposition.

Salford T.C. has adopted the Electricity Committee's recommendation to accept a Dutch tender for the supply of cables amounting to £1 062. An amendment that the tender of W. T. Glover and Co., Ltd., at £1 248, be accepted was defeated. Coun. Worthington, who moved the amendment, said he feared if this policy was pursued they would probably close down British cable industries, with the result that Continental cable manufacturers would increase their prices.

Aberdeen Corporation proposes to appeal to the Valuation Appeal Court against the valuation of its electricity undertaking by the local assessor under the Lands Valuation Acts. That official has applied what is known as Lord Skerrington's judgment, and refused to make an allowance for revenue raised for interest and sinking fund, in respect of capital expenditure on incomplete and unproductive works. The Municipal Electrical Association has agreed to support the appeal.

Dronfield U.D.C., on the suggestion of the Electricity Commissioners, has decided to apply for a Special Order authorising the Council to distribute electricity in the town. Mr. I. Scott Mackenzie has been appointed electrical engineer and adviser in connection with the application. The Council proposes to obtain a supply of electricity in bulk from the Staveley Coal and Iron Co., and the probable prices will be: lighting, 5d. per kWh; heating and cooking, 2½d.; and power, 1½d. and 2d.

Basingstoke Corporation is applying to the Public Works Loan Board for an advance of £10 501 for the purpose of extending the electricity generating station. Application is also to be made to the Electricity Commissioners for sanction to the borrowing of £3 570 for the laying of a new feeder cable and distributors, necessitated by the continual growth of the undertaking. It has also been decided to purchase 3 000 copies of the booklet, "Electric Lighting in the Home," and to distribute them by post.

Wayleave Dispute at Bath.

Bath Corporation has received the Electricity Commissioners' sanction to the borrowing of £34 000, on account of £92 928, for the scheme to give a duplicate supply to the West Wilts Electric Light and Power Co., and supplies to Batheaston, Bathford, Bathampton, South Tiverton and Lower Oldfield Park. The General Estates Co., owners of Batheaston Bridge, require £200 as wayleave for a cable across the bridge. The Corporation offer £1 1s., and will probably appeal to the Ministry of Transport.

Bucks County Mental Hospital Committee has adopted a report by Edwards and Shaw, consulting engineers, who were called upon to advise whether it would be the best policy to shut down the present electrical plant at the hospital and obtain electricity from Aylesbury Corporation at 1½d. per kWh or carry out additions to the existing plant. The engineers advise that it would pay to generate electricity and make full use of the exhaust steam. The cost of extending the plant would be £4 800. The Committee has decided to accept this advice.

Liverpool Corporation Electricity Committee's Extension Sub-Committee has decided to extend the mains to supply new houses at Hunt's Cross subject to the Electricity Commissioners' sanction.—The Liverpool Electricity Department is extending distribution systems in the vicinity of new housing estates. Application is being made to the Electricity Commissioners for sanction to the borrowing of £15 655 for mains and service lines for the Fazakerley Hall housing estate. The Commissioners have sanctioned the borrowing of £2 300 for sub-station buildings and plant on the Walton-Clubmoor housing estate.

The Electricity Commissioners have decided to grant the application of Cheltenham T.C. in respect of an amended area of supply, including parts of the rural districts of Tewkesbury, Winchcombe, and Cheltenham; and the application of Gloucester Corporation in respect of the rural district of Gloucester. The Commission has refused the application of the West Gloucestershire Power Co., Ltd., so far as it relates to the rural districts of Cheltenham, Gloucester, and Newent, and will proceed with consideration of the application on the basis of the reduced area of supply, namely, the urban district of Usk, the rural district of Monmouth, and parts of the rural districts of Chepstow, Lydney, and Pontypool.

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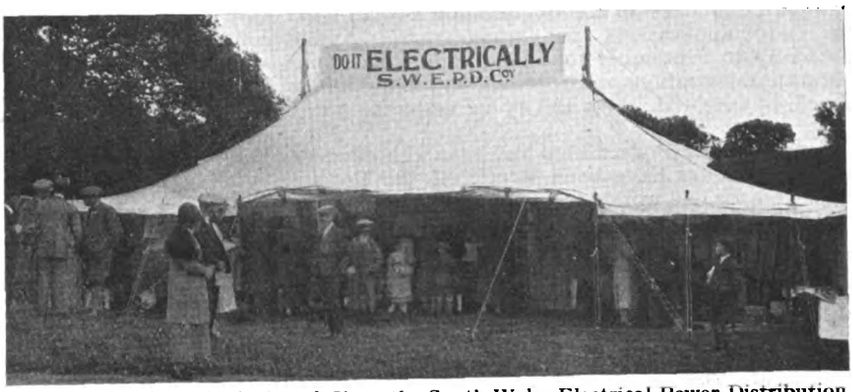
ELECTRICAL NEWS IN PICTURES

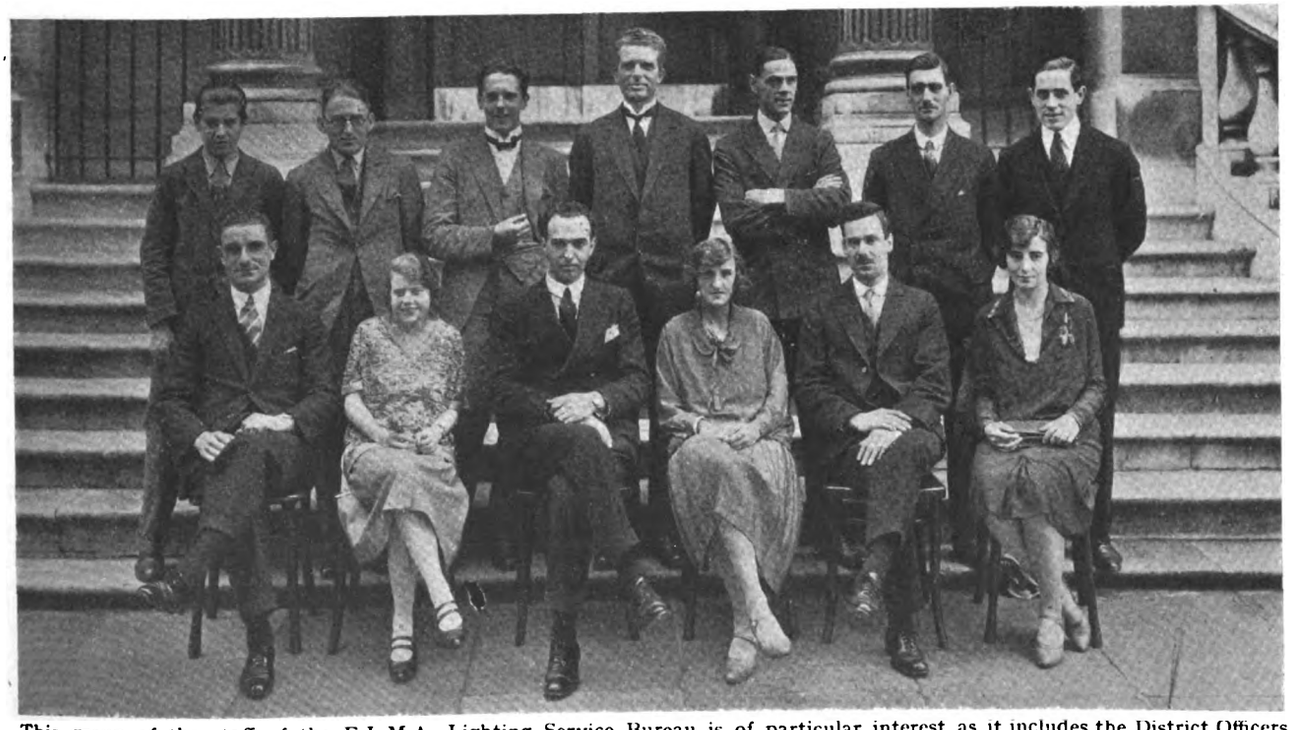
Mr. G. Chauvin, who died on October 12th, aged 80 years, was managing director of Siemens Bros. and Co. for a quarter of a century. (p 481)



At the St. Mellons Agricultural Show the South Wales Electrical Power Distribution Co. had this unique exhibit of domestic electrical appliances. Although the show was only half-a-day in duration, the exhibit was visited by over 600 people, including the Mayor of Newport and other local notabilities.

Last week we illustrated electrical exhibits in the Manchester Pageant of Industries. Here is another vehicle, entered by Matthews and Yates, Ltd.

At the Liverpool motor parade the Walker electric vehicle seen on the left was awarded the first prize in the electric vehicle section.



This group of the staff of the E.L.M.A. Lighting Service Bureau is of particular interest as it includes the District Officers who are running provincial bureaux or engaged on the "Better Home Lighting Campaign." In the front row (left to right) are Mr. E. S. Evans, Miss D. E. Milne, Mr. W. E. Bush, Miss E. L. Anderson, Mr. W. J. Jones, Miss F. G. Hodge. In the back row are Mr. G. Maskell, Mr. R. C. Hawkins, Mr. H. Lingard, Mr. H. E. Hughes, Mr. H. Girdlestone, Mr. J. L. H. Cooper, and Mr. K. C. Brangwin.

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THE NATIONAL REGISTER.

Executive Committee Report Progress to the Registration Board.

SINCE the inception of the National Register of Electrical Installation Contractors (states the latest report of the Executive Committee to the Registration Board) there have been 1 119 applications for registration. Applications accepted up to September 1926 totalled 915, and there were 48 branch registrations. Altogether 112 applications were declined, 17 were withdrawn and 26 are undergoing investigation.

In 49 cases the registration has been cancelled and the contractors' names have been struck off the Register. Of these 2 were for bad workmanship; 4 for failure to substitute duly qualified managers; 14 by reason of death and for retiral from business; 13 were firms which went into liquidation or bankruptcy; and 16 had not renewed their registration.

With regard to the renewal of certificates for the year 1926-27, various local advisory committees reported in favour of the renewal of all except two, both of these firms being struck off the Register for adequate technical reasons. One of the firms concerned have since made another independent application for registration.

A slight alteration has been made in the form of the current certificate of registration, which will in future only necessitate the attachment to the certificate of a notification extending its currency. This, it is hoped, will meet the objection of the registered contractor to the trouble and expense at present incurred in returning his expired certificate, and save the expense and labour entailed in preparing and issuing new certificates every year.

Few Complaints regarding Registered Firms.

Complaints against registered contractors investigated by the Register included one case of alleged exorbitant charges. The Executive found on investigation that the job in question involved an abnormal amount of work, the charges for which, under the circumstances, were not unreasonable. This was reported to the complainant, an architect, who is understood to be quite satisfied with the decision.

Three complaints of bad workmanship were investigated by the Executive. In the first case, where a supply engineer complained of inferior work, the Executive found that the work was done a long time ago, and as the engineer admitted that he was quite satisfied with recent work done by this contractor, they concluded that the complaint was not serious, and no action was taken. In the second case the contractors concerned were called before the Executive Committee for explanations; these were found inadequate and the firm was struck off the Register.

The third case of alleged bad workmanship was investigated and proved to the satisfaction of the Executive, who decided to strike the firm off the Register. However, before this could be done the firm went into liquidation, but none the less (the report adds) the case should be included amongst those in which disciplinary action has been taken.

Wiring Rules Discussion.

The Council of the E.C.A. passed and forwarded to the Executive (the report continues) a resolution calling upon the National Register to adopt a code of wiring rules. The Executive, after consideration, decided to invite a deputation from the E.C.A. to meet them for a full discussion of the subject. This invitation has been accepted, and it now remains to fix a date convenient to both parties.

A Local Advisory Committee has been formed for South Shields, and the Corporation has passed a resolution in favour of the employment of registered contractors.

In addition to the sum of £2 000 invested (as shown in the last balance sheet) the Executive has placed the sum of £600 from the current account to deposit account pending further decision.

Grimsby T.C. recently expressed its readiness to give Cleethorpes U.D.C. a further bulk supply of electricity, but desired to limit its liability in the event of failure of supply. The U.D.C. was not prepared to accept such terms, but the Electricity Commissioners having offered to arbitrate in the matter, the Council is recommended by the Lighting Committee to agree to such procedure.

WIRELESS NEWS.

Exhibitors of Wireless Apparatus at the British Industries Fair.

AT the next British Industries Fair to be held at the White City, London, the firms showing wireless apparatus and accessories will include S. G. Brown, Ltd., Hart Accumulator Co., Ltd., Tungstone Accumulator Co., Ltd., Telegraph Condenser Co., Ltd., J. J. Eastick and Co., Ltd., British Electric Sales Corporation, Ltd., British General Manufacturing Co., Formo Co. (Arthur Preen and Co., Ltd.), Ever-Ready Co. (Gt. Britain), Ltd., Watmel Wireless Co., Ltd., Beard and Fitch, Ltd., Brownie Wireless Co., Ltd., Spauldings, Ltd., S. Bird and Co., Halcyon Wireless Co., Ltd., Western Laboratories, Ltd., M. and A. Wolff, Ltd., H. Ashton, Kemp's Mills, Ltd., J. W. Gee and Sons, Ltd., R. F. Graham and Co., Technical Agencies, Ltd., Truphonic Wireless Co., Ltd., Whittingham Smith Co., and A. Hinderlich.

Wireless News in Brief.

The Commissioners of H.M. Works, etc., invite tenders for the erection of a wireless station at Mablethorpe, Lincs. It is stated that the station will do the ordinary coastal work, such as communicating with and warning ships at sea, and naval and shore work, and that it will eventually take the place of the temporary Humber station.

A correspondent of the "Manchester Guardian" calls attention to the need for the experts to revise their theories as to the correct difference in wave-length necessary to separate stations on kilocycles so as to prevent interference. Birmingham is 479 metres and Frankfort 470 metres, or, interpreted into kilocycles of the respective wave-lengths, a difference of more than 11 kilocycles, but a heterodyne whistle with which the Birmingham station's transmissions have recently been accompanied is attributed to the powerful emission of Frankfort, which has recently changed its power to 9 kW. If it is proved necessary to allow a greater margin than 10 kilocycles between stations the proposed wave-length allocation for European stations will, presumably, have to be abandoned.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

Brighton General Purposes Committee recommends the Council to have a scheme prepared for railless trolley vehicles.

From July 1st, when Glasgow Corporation's new scale of tramway fares (including the 2d. maximum fare) came into operation, until October 11th there was a net increase in revenue of £1 357.

With the opening of the new extension to Morden, and the consequent increase of rolling stock, the London Underground Railways now have 250 trains, or 1 750 cars, moving at the same time over 130 route miles.

Mr. C. W. Mathews, Chairman of London County Council Highways Committee, states that experiments are being made in warming the tramcars, but the Committee is not yet in a position to make a recommendation for the heating of tramcars generally.

The Allerton Welfare Council has discussed with the Chairman and Deputy Chairman of Bradford Tramways Committee and the tramways manager (Mr. R. H. Wilkinson) a suggestion to introduce a railless trolley car service to the Allerton district. A portion of the tramway track from Four Lane Ends to Allerton has been condemned, and the cost of its relaying is estimated at £67 000, while its preparation for the railless system would, it is calculated, only cost half that sum.

London County Council's Financial Committee reports that the net deficiency on the working of the Council's tramways for the six months ended September 30th, 1926, is now estimated at £150 000. This deficiency can be met by the special county account without increasing the rate, owing to the balance on the account at the beginning of the year being now estimated at £142 000 as compared with the original figure of £6 000. This improved position is due to the fact that the tramways deficiency for 1925-26 proved to be £114 629, as compared with the revised estimate of £252 582, the largest item accounting for the difference being the income-tax adjustment for earlier years.

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COMPANY NEWS.

Westminster Electric Supply Corporation and St. James' and Pall Mall Co. to Capitalise Reserves—Burndept Wireless Circular to Shareholders.

NO special trend has been noticeable during the past week in the electrical share market, and price movements have been irregular, with some amount of weakness in the equipment section. Johnson and Phillips ordinary shares at 63s. 9d. are half-a-crown lower, and English Electric 1s. 9d. at 14s. 6d.; while Ferranti debenture stock is down to 90, and General Electric shares have eased 3d. to 30s. Exceptionally, Telegraph Constructions are ½ up. In the supply department, London Electric shares have risen 2s. and County of London, 1s. 3d.; Westminsters, on the other hand, are 1s. 3d. lower. District and Metropolitan railway ordinary stocks have risen 1½ and ½, and Metropolitan debenture stock has risen a point.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
	Electricity Supply.				
10	Brompton & Kensington Ord. ..	31/3	31/3	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	90	90	100	67
15	Charing Cross Elec. Ord. (£1) ..	48/9	48/9	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	42/6	42/6	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	50/7½	50/7½	52/6	20/3
6	,, ,, 6% C.P. ..	23/-	23/-	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	65/-	63/9	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	17	17	13⅛	3⅛
10	Lon. Elec. Sup. Ord. (£1) ..	37/-	35/-	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	40/7½	40/7½	41/6	8/-
4½	,, ,, 4½% C.P. ..	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	22/6	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord. (£5) ..	18½	18½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	47/6	48/9	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
	,, ,, 6% C.P. ..	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	140½	140½	123	24
6	,, ,, 6% Pf. Stk. ..	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd)	69	69	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	78½	78½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	50½	50½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98⅜	52
5	Lon. & Sub. Trac. A. Deb. ..	76½*	78½	89	65
4	Lon. Un. Trams. 1st Deb. ..	43½	44½	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	65½	64½	101½	49
5	,, ,, 5% Deb. ..	66½	66½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	61	60½	84½	19
3½	,, 3½ Pf. Stk.	63½	63½	88½	40½
3½	,, 3½% Deb.	69½	69½	92½	51
3½	Met. Dis. Ord. Rly. Stk. ..	54	52½	58	12⅜
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb. ..	68	68	73½	48½
*5	Yorks. (W.R.) Trams. Ord. ..	11/6	11/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	70/-	70/-	62/-	26/6
6	,, ,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	22/6	22/6	23/4	19/7
7	,, ,, ,, 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	26/10½	26/10½	29/-	10/-
‡15	Callender's Cable Ord.	66/3	66/3	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref.	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)	12/9	12/9	28/9½	1/1
7½	,, ,, 1st Pref. ..	22/6	22/6	26/-	5/-
10	Elec. Construction Ord. ..	31/10½	31/10½	30/4	6/7
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	14/6	16/3	29/3	7/3
6	,, ,, 6% C.P. ..	17/6	18/-	21/3	10/6
—	Ericsson Telephones 7% Pref.	21/10½	21/3	21/-	12/7
6	Ferranti 6% Pref.	18/9	18/9	18/6	16/9
7	,, 7% 2nd Pref. ..	18/-	18/-	19/-	13/9
5	,, 1st Mort. Deb. Stock	95	91½	96½	80½
7½	General Elec. Ord.	30/-	30/3	59/-	13/6
20	W. T. Henley's Ord.	82/6	82/6	86/6	23/3
17½	Johnson & Phillips Ord. ..	63/9	66/3	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	25/7½	25/7½	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	47/6	47/6	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	30/-	30/-	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	30½	30	56/2/6	19
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½*	61½	68½	40
4	Commercial Cable 4% Deb. ..	74½	74½	87⅜	60
10	Eastern Ord. Stk.	189½*	190½	213½	113/2/6
3½	,, 3½% Pref. Stk. ..	66½*	66½	84/17/6	49
4	,, 4% Deb.	79½	79½	103½	60
10	Eastern Extension Ord. (£10) ..	10*	19½	21½	10/12/6
4	,, 4% Deb. ..	78½	78½	97½	60
22	Gt. Northern Telegraph (£10) ..	27½	27½	42/12/6	19
‖10	Indo-European (£25)	47½	47½	59⅜	25
—	Marconi's Wireless T. Ord. ..	13/9	13/9	9/16/3	20/9
7½	,, Int. Mar.	21/3	21/3	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	18½	18½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	78½	78½	10	60/2/6

* Ex dividend.
‡ Plus share bonus. ¶ Plus 1 o.c. in respect of 1921. ‖ Including bonus.

ORIENTAL TELEPHONE AND ELECTRIC CO., LTD.—Intm. divs. 3½ p.c. on 7 p.c. cum. pref. shs., less tax, and 4 p.c. on ord. shs., tax free.

INDO-EUROPEAN TELEGRAPH CO., LTD.—Intm. div. for half-year ended June 30th, 1926, at rate of 5 p.c. p.a., tax free, payable November 1st.

WESTMINSTER ELECTRIC SUPPLY CORPORATION, LTD.—It is stated that company is about to capitalise reserve funds amtg. to £630 000 and that an issue of bonus shares will be made.

HURST, NELSON AND CO., LTD.—Mr. R. F. W. R. Nelson, presiding at the meeting at Motherwell, last Friday, said he thought, considering the times they had passed through, the report before the meeting was more than satisfactory.

A WINTER PASTIME.

IN the autumn and winter fogs we often walk in Circles, but this year we all have to TALK in Circles. The circles in which the talking will be done are Electrical Circles. The subject, how to share in "Wiring the Homes of Britain."

MONTREAL LIGHT, HEAT AND POWER CONSOLIDATED.—The preferred stk. recently issued in connection with change in capitalisation will be paid off and an issue of 5 p.c. bonds made. Proposals are announced for creation of $75 000 000 first refunding and collateral trust bonds.

PERAK RIVER HYDRO-ELECTRIC POWER CO.—At statutory mtg. last week it was announced that arrangements had been made for issue in near future of £1 250 000 of 5 p.c. deb. stk.

METROPOLITAN ELECTRIC SUPPLY CO., LTD.—A mtg. yesterday (Thursday) of 3½ p.c. deb. holders was to consider a resolution sanctioning proposed arrangement for redemption of stock and transfer to stockholders of British Govt. Conversion stock in proportion of £105 conversion stk. to £100 deb. stk.

ST. JAMES'S AND PALL MALL ELECTRIC LIGHT CO., LTD.—Directors recommend capitalisation of £440 000 of reserves. Ord. shareholders are to receive 11 fully paid £1 ord. shs. for every £5 ord. sh. held. It is also proposed to subdivide existing £5 ord. and pref. shs. into shs. of £1 each, and to increase capital to £800 000 by creation of 500 000 £1 ord. shs.

JOSEPH LUCAS, LTD.—Directors recommend div. on the ord. shs. of 10 p.c., making 15 p.c. for year ended August 31st, 1926, with bonus of 2s. p. sh., both less tax (1926 issue participating at half rate on old shs). In February last it was decided to take over C. A. Vandervell and Co. and Rotax (Motor Accessories), and this decision has since been carried into effect.

NEW YORK TELEPHONE CO.—Proposals will be received until November 1st, at office of Farmers' Loan and Trust Co., 22, William Street, New York, for sale to trustee of a sufficient number of first and second mortgage sinking fund bonds at not exceeding par and interest to invest the sum of $750 000 of the sinking fund.

ARGENTINE LIGHT AND POWER CO., LTD.—Result of past year's working is credit balance, £136 521, plus £15 133; brt. fwd. For redemption of deb. stk. required £12 777; sh. cap. redemption £7 500; gen. res. £35 000; div. on 7 p.c. cum. pref. shs., after deduction of income tax, £52 242, leaving £44 135, and ord. div. 4 p.c., after deduction of tax, £29 606; fwd., £14 528.

UNITED ELECTRIC TRAMWAYS CO. OF CARACAS, LTD.—Net rev. for year ended June, 1926, £27 511, plus £22 796 brt. in. Div. of 10 p.c. (less tax); £33 308 fwd. Result of the working of local company for year shows increase in gross receipts £17 573. Threatened competition by omnibuses has not adversely affected company's takings. Increase in expenses, £13 924, is chiefly due to increased wages bill, which became operative in July, 1925, and amounted to £7 957 over that of previous year; and to the effect of the long and severe drought in Venezuela, which increased cost of power by £4 357.

BURNDEPT WIRELESS, LTD.—A circular has been addressed to pref. ord. shareholders pointing out that response received

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from this class of shareholder to debenture issue has been "so negligible as to leave the impression that the shareholders do not understand the gravity of the situation." It is pointed out that every pref. ord. shareholder is entitled to 100 deferred ord. shs., free of expense, for every £100 deb. subscribed for and allotted. Unless preferred ordinary shareholders between them, the circular adds, subscribe for at least £10 000 debentures issue cannot go to allotment, and liquidation must face the company.

KENSINGTON AND KNIGHTSBRIDGE ELECTRIC LIGHTING CO., LTD.—An extraordinary general meeting was held last week to consider resolutions relating to certain changes in share capital. Mr. F. J. Walker, who presided, said under the London Electricity Acts, 1925, company was permitted to pay to ord. shareholders a standard div. of 10 p.c. on amount of ord. shs. subscribed in cash up to December 31st, 1922, and 7 p.c. on any free reserves capitalised. As from January 1st, 1932, percentage allowed to be paid on ord. shs. would be reduced to 7 p.c. and board proposed to capitalise £189 000 and distribute it among ord. shareholders by issuing nine new fully paid £1 ord. shs. for every £5 ord. sh. now held. This resolution and a further resolution to divide each existing £5 ord. sh. into shs. of £1 each were approved.

BUSINESS ITEMS.

Changes of Address, Representatives, and Other Developments.

The Robinson and Hands Electrical Co., Ltd., have opened new branch premises at Glebe Street, Stoke-on-Trent.

T. H. Arnold and Son, electrical contractors, of Stowe Street, Lichfield, are opening showroom premises in Tamworth Street, Lichfield.

On and after October 30th, the offices of the British Electrical and Allied Industries Research Association will be at 36 and 38, Kingsway, London, W.C.2. Telephone: Holborn 0171.

Owing to confusion of his telephone number with that of the Air Ministry, Mr. Alan Wright, sole sales organiser for "Inventum" electrical appliances, has changed his numbers to Holborn 1312 and 1313.

We illustrate below the interior of one of the showrooms at the British Thomson-Houston Co.'s new premises at 10-11, Snow Hill, Birmingham, to the opening of which reference was made in THE ELECTRICIAN last week.

A view inside the new Birmingham showrooms of the British Thomson-Houston Co. Ltd.

The London Electrical Co., wholesale electrical and wireless suppliers, are opening new premises at 35, Great Suffolk Street, Southwark, London, S.E.1, where large stocks of tubing, conduit, heavy cable, etc., will be held. The stores at 23, College Hill, London, E.C.4, will still be at the disposal of city clients.

The new premises of the Metropolitan-Vickers Electrical Co., Ltd., and Metro-Vick Supplies, Ltd., at 74, Waterloo Street, Glasgow, consist of a handsome six floor building which is to be the companies' headquarters in Scotland. A fine display of electrical fittings is made in the showrooms, and the building is "all electric."

EDINBURGH ELECTRICAL PROPAGANDA.

Good Display of Electric Lighting, Heating and Cooking Appliances at Local Exhibition.

The Edinburgh Electricity Department is exhibiting electric light fittings and electric heating and cooking appliances at the Home, Food and Confectionery Exhibition which was opened last Saturday at the Waverley Market, Edinburgh. Demonstrations of cooking food and of washing and ironing clothes electrically are given, and a good example of electric shopwindow lighting is shown. Amongst other electrical exhibitors are L. G. Hawkins and Co., Ltd., who show the Kelvinator refrigerator, Universal labour-saving appliances and Ivanhoe lighting units; the Singer Sewing Machine Co., Ltd., and the British Vacuum Cleaner and Engineering Co., Ltd.

Among the lectures to be delivered in connection with the exhibition is one by Mr. H. E. Hughes, who will speak on Thursday next on "Electricity: a Talk on Modern Lighting." The exhibition will close on October 30th.

British Industries Fair.

Election of Sub-Committee for Electrical Section.

AT a meeting at Birmingham, on Wednesday, the following gentlemen were elected as an Advisory Sub-Committee for the Electrical Section of the British Industries Fair: Dr. W. H. Eccles, and Messrs. J. W. Beauchamp, H. H. Berry, R. A. Chattock, E. J. Jennings, R. P. Sloan, A. H. Railing, C. W. Sully, Allen, Batt, Collis, East, Kent and Martin. Mr. Martin said electrical firms exhibiting already numbered 70, and the Committee was assured that the electrical show this year would be much better than last year's.

New Electric Gramophone.

Demonstration with Electrical Device in Place of the Usual Soundbox.

AT the Café de Paris, London, last week, Count Anthony de Bosdari, of British Brunswick, Ltd., demonstrated the new "Panatrope" gramophone, which is rotated by an electric motor and has, instead of the usual soundbox, an electrical device known as a magnetic "pick-up," which is guided over the record, converting the mechanical vibrations imparted to the needle into electrical vibrations, these being applied to a low frequency power valve amplifier to operate a loud peaker. Piano, organ and orchestral pieces were reproduced.

Metal and Chemical Prices.

TUESDAY, October 19th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£64 15 0	15s. 0d.	—
Electro Wirebars	,,	£67 0 0	15s. 0d.	—
H.C. Wire, basis	per lb.	9⅝d.	⅛d.	—
Sheet	,,	9¼d.	1/16d.	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 0⅛d.	⅛d.	—
Brass 60/40—				
Rod, basis	per lb.	7¼d.	—	—
Sheet, basis	,,	9¼d.	—	—
Wire, basis	,,	10¼d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£6 2 6	5s. 0d.	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 0 0	—	—
Lead Pig—				
English	,,	£32 10 0	15s. 0d.	—
Foreign or Colonial	,,	£31 5 0	15s. 0d.	—
Tin—				
Ingot	,,	£315 10 0	—	—
Wire, basis	per lb.	3s. 11½d.	—	—
Aluminium Ingots	per ton	£112 0 0	—	—
Spelter	,,	£34 7 6	5s. 0d.	—
Mercury	per bottle	£16 15 0	5s. 0d.	—

Sulphur (Flowers)—Ton £11 10 0 *Sodium Chlorate*—Per lb. 2¼d.
,, (Roll-Brimstone)—,, £10 5 0 *Sulphuric Acid* (Pyrites, 168°)
Copper Sulphate— ,, £25 to £25 10s. per ton, £7 0 0
Boric Acid (Crystals) ,, £37 *Sodium Bichromate*—Per lb. 3¼d.
Rubber—Para fine, 1s. 7¼d.; plantation 1st latex, 1s. 8⅛d. to 1s. 8⅜d.

The metal prices are supplied by British Insulated Cables, Ltd.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

FARRAR, Campbell, 3, Little Sussex Place, W., electrician. £19 1s. 5d. September 13th.

LEIGH BROTHERS, 290A, St. Paul's Road, Highbury, wireless factors. £26 17s. September 6th.

MILNES (HERBERT) AND SON, 8, Trinity Street, Huddersfield, electrical engineers. £64 3s. 4d. September 9th.

NYMAN (SYDNEY M.) AND CO., 16, Chapeltown Road, Leeds, electrical engineers. £23 8s. 4d. September 14th.

SAVAGE, Frederick George (late trading as H. W. TYLER), 3, Station Buildings, Beckenham, electrical engineer. £28 15s. 5d. September 15th.

SCIENTIFIC AND ELECTRIC UTILITY CO., 30, Gerrard Street, Halifax, wireless dealers. £18 5s. September 13th.

Receiverships.

BARLOW AND REDRUTH, LTD.—L. H. Shedden, of 77, Darlington Street, Wolverhampton, was appointed receiver and manager for the debenture holders on August 13th.

GATES (E. AND C.), LTD.—S. B. Saunders, of 26, Park Row, Nottingham, was appointed receiver on October 8th, 1926, under powers contained in debentures dated April 7th, 1925.

WADSWORTH (L. H.), LTD. E. S. Thorn, of 68, Coleman Street, E.C.2, was appointed receiver and manager on October 4th, under powers contained in debenture dated May 29th, 1926.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

LEATHERHEAD AND DISTRICT ELECTRICITY CO., LTD., London, E.C.—Registered October 9th, £200, £200 and £200 debentures, part of amount already registered; charged on property at Fetcham, also general charge. *£60 950. March 31st, 1926.

NORTH SOMERSET ELECTRIC SUPPLY CO., LTD. (late CLEVEDON, PORTISHEAD AND DISTRICT ELECTRIC SUPPLY CO., LTD., and CLEVEDON AND DISTRICT ELECTRIC SUPPLY CO., LTD.).—Registered October 2nd, £30 000 mortgage and debenture to H.M. Treasury Solicitor; charged on all freehold and leasehold hereditaments, etc., comprised in debenture dated October 30, 1922, and a debenture dated February 23, 1925, and all property, assets and undertaking charged by same. *£39,360. June 2nd, 1926.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

AUTOCHROME SIGNS, LTD.—The statutory meeting of creditors in this voluntary winding-up was held on October 15th, at the offices of the liquidator, Mr. Howard Button, 61-62, Lincoln's Inn Fields, W.C. A statement of affairs was submitted which disclosed liabilities of £599, all due to unsecured creditors, and net assets estimated to realise £603, insufficient to meet the debentures and interest amounting to £795. The issued capital of the company is £800. It was reported that the company was formed in July, 1924, and traded at a small profit for the first year. During the last year, however, the company had done very badly, and it was affected particularly by the coal strike, as no electric signs were allowed to be used. The debentures were issued in June, 1925, and £750 was put up in cash. The receiver for the debenture holders stated that the assets were of a very meagre nature, and if he had attempted to sell them under the hammer they would have realised practically nothing, but he had obtained an offer of £500 for the business, and the amount of the book debts, which made up a total of £660. After the debenture holder had been paid the unsecured trade creditors could not expect to receive any dividend.

WATES BROS., LTD., 12, 13 and 14, Great Queen Street, Kingsway, London, W.C.2, electrical manufacturers. A largely attended meeting of the creditors of the above was held on October 14th, at the Institute of Chartered Accountants, Moorgate Place, E.C. The chair was occupied by Mr. W. B. Anderson, C.A., of 40-43, Norfolk Street, Strand, London, W.C., the liquidator in the voluntary liquidation of the company. The statement of affairs presented showed liabilities of £6 250, of which £4,268 was due to the trade and £1,982 to cash creditors. The assets were estimated to realise £1,549, from which had to be deducted £141 for preferential claims, leaving net assets of £1 408, or a deficiency so far as the creditors were concerned, of £4 841. There were various contingent claims in respect of uncompleted contracts. At the moment only one claim had actually been received for £1 226, and it had not been included in the liabilities. The full amount of the contingent claims was not known. The issued share capital was £4 998, but in addition shares which had previously been allotted were sold and the company received £2 150, bringing the total deficiency up to £11 989. Of that amount £9 379 was accounted for by the estimated loss on the realisation of the assets, and the balance of £2 610 represented trading losses during the last nineteen months. Mr. Anderson reported that the company was registered on August 13th, 1923, for the purpose of taking over as a going concern the business of manufacturers and dealers in all kinds of electrical goods which had previously been carried on by Mr. F. G. S. Wates, at Great Queen Street, Kingsway. The whole of the deficiency shown in the statement of affairs had arisen since March 1st, 1925. In 1923 the company secured the sole selling rights for certain wireless appliances. Good profits were earned on the appliance, and up to February, 1925, that business was satisfactory, but the selling expenses and overhead charges were high. The company started without any fresh working capital and became short of money, with the result that it was not possible to buy to the best advantage. As far as he could gather, the stock which the company possessed during recent months, and which could be readily turned over, was considerably less than the figure at which it appeared in the balance sheets. Since his appointment as liquidator he (Mr. Anderson) had been able to make arrangements with wireless manufacturers for the supply of goods which he had been able to dispose of at a profit. He had also completed all h.t. batteries which were in process of manufacture. The company had conducted a mail order business, and some customers had remitted money about the time of the liquidation and had not received the goods. That money was received in good faith, and it was anticipated that the goods would have been sent. The orders, however, could not be executed, as there was not the stock in the warehouse at the moment. In addition, it was hoped, up to the very last moment, that the efforts being made to obtain new finance would be successful. It was not anticipated that customers who sent cash for goods would not receive them. Those customers could only rank as ordinary creditors. Mr. Wates possessed an instrument for sending automatic messages from aeroplanes, airships, or small ships. That invention was transferred to the company. It was believed to be a valuable invention, the Japanese rights alone being sold to the Government of that country for £1,000, whilst machines had also been disposed of to the British Government and the Tank Corp. A resolution was unanimously passed confirming the voluntary liquidation of the company with Mr. Anderson as liquidator and a committee of the principal creditors.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Company Winding-up Voluntarily.

GOOD BROS., LTD. E. W. Bond, 10, Cook Street, Liverpool, appointed liquidator, October 6th.

Bankruptcy Information.

HARTLEY, Francis Augustus, and HARTLEY, Ralph, trading as F. A. HARTLEY AND SON, 98, Katherine Street, Ashton-under-Lyne. First meeting, October 28th, 2.30 p.m., Official Receiver's Offices, Byrom Street, Manchester. Public examination, November 29th, 1.45 p.m., Town Hall, Ashton-under-Lyne.

SEGAL, J., 2, Vine Street, Tooley Street, London, electrical accessories merchant. Receiving order, September 2nd. Creditor's petition.

Bankruptcy Proceedings.

SMITH, Harold Laurence, 156, Tredegar Road, Bow, and late of 10, Ordell Road, Bow, E., electrician. The statutory meeting of creditors was held last week. No statement of affairs was filed, but, according to a rough estimate, he returns his liabilities at £1 543, and values his assets at £43. Debtor began business as an electrician in 1912 from his parent's address, 10, Ordell Road. In 1915 he joined the Forces, and on his return he continued the trading from his parent's address until March, 1925, when he took a weekly tenancy of a shop at 156, Tredegar Road, at £1 a week. Before the war he had conducted a remunerative business. Since re-opening he has, however, been greatly handicapped by a wound received on service. A private meeting of his creditors was recently held when an offer to pay a composition of 5s. in the £ was made. This, however, fell through. He attributes his failure to ill-health and to alleged mismanagement by his late manager.

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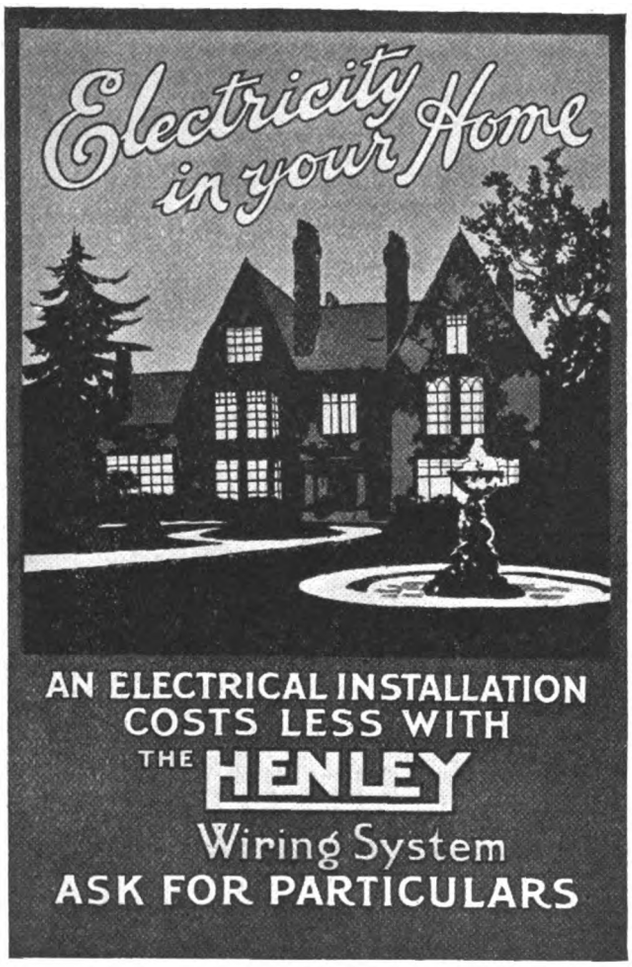
PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

235 141 Naamlooze Vennootschap Philips' Gloeilampenfabrieken. Electric discharge tubes. (4/6/24.)
244 621 J. Fothergill. Electrically controlled lifts. (19/3/25.)
242 221 Sachsenwerk Licht-und Kraft Akt.-Ges. Compensated alternating current machines of the kind having a commutator winding. (31/10/24). (Addition to 231 895.)
244 635 Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.). Multiplex telegraphy. (25/4/25.)
233 718 Edison Swan Electric Co., Ltd. Thermionic valve systems. (7/5/24.)



An impression of a striking six colour showcard (measuring 10 in. by 15 in.) which W. T. Henley's Telegraph Works Co., Ltd., have produced for use by electrical contractors.

234 822 P. C. Rushen (Hazeltine Research Corporation). Control of alternating current motors, particularly induction motors. (4/7/24.) (Convention date not granted. Divided application on 218 675.)
234 841 British Thomson-Houston Co., Ltd. Dynamo electric machines. (29/5/24.)
235 894 B. E. D. Kilburn (Norske, etc.). Electrodes for electric furnaces. (5/1/25.) (Convention date not granted.)
240 129 British Thomson-Houston Co., Ltd. Connector hooks for use in electric distribution systems. (16/9/24.)
244 657 British Thomson-Houston Co., Ltd. (General Electric Co., N.Y.). Electric shunts for instruments or other devices. (22/6/25.)
236 215 M. R. Fichter. Wattmetrical element for electric meters of the induction type. (24/6/24.)
237 258 British Thomson-Houston Co., Ltd. Electron discharge devices. (17/7/24.)
239 214 Siemens-Schuckertwerke Ges. Rotors for electrical machines. (27/8/24.)
239 232 Felton and Guilleaume Carlswerke Akt.-Ges. Method of manufacturing uniformly loaded conductors used for signalling purposes. (1/9/24.)
244 682 General Electric Co., Ltd. Process for the manufacture of tubular electric incandescent lamps known as "strip light" lamps. (11/3/25.)

Applications for Patents.

September 20th.

23 152 British Thomson-Houston Co., Ltd. Thermionic tubes for generation of oscillations. (17/10/25, U.S.)
23 156 B. Doctories. Method of transmitting pneumatic power in closed circuit. (26/9/25, Hungary.)
23 131 E. H. Doyle. Electric headlight control.
23 186 Ferranti, Ltd., and A. H. Higgs. Electrical measuring instruments.
23 191 W. Hesse. Electrical contact pin. (18/9/25, Germany.)
23 151 International General Electric Co., Inc. Electric transformers. (22/9/25, Germany.)
23 168 L. Kilborn. Diaphragms for magnetic receivers.
23 158 W. H. Le Breton. Grid leaks, etc.
23 178 H. Weinert. Electric pole changing systems. (21/9/25, Germany.)
23 119 J. Wilfort. Electric insulators.

September 21st.

23 279 and 23 280 British Thomson-Houston Co., Ltd., J. C. Read, and F. P. Whitaker. Vapour rectifiers.
23 228 S. Culpan and L. F. Whitehouse. Electrical water-heating device.
23 264 English Electric Co., Ltd., and G. Tilstone. Electrical relays.
23 259 H. J. Fitton. Detectors for wireless telegraphy, etc.
23 229 and 23 230 H. Hargreaves and Jackson Boilers, Ltd. Control of electrically heated water boilers.
23 294 W. G. R. Jacob, N. W. McLachlan, and W. S. Smith. Telegraph systems.
23 301 J. Kremenezky. Wireless apparatus.
23 215 W. W. Lewis. Variable electric condensers.
23 244 S. P. Rivers. Electrically illuminated signs.
23 211 J. C. Robins. Electric alarm.
23 320 J. H. Runbaken. Electric lamps for motor cycles, etc.
23 310 A. E. Watkins. Coupling units for wireless circuits. (21/12/25.)

September 22nd.

23 404 E. Aichele. Automatic circuit breaker.
23 348 J. Anderson. Electric switches.
23 403 C. B. Backer. Insulated electrical conductors. (9/10/25, Norway.)
23 394 Callender's Cable and Construction Co., Ltd., and T. Petersen. Metal sheathed electric conductors.
23 335, 23 336 and 23 337 W. J. Daniel, Harris and Sheldon, Ltd., and Powell and Hammer, Ltd. Electrically-operated wind screen wipers
23 445 C. Carew-Gibson. Telephone systems, and recording devices therefor.
23 439 B. L. Klemens. Electric heaters.
23 431 O. Lohaus. Means for indicating current impulses.
23 367 S. P. Painter. Variable electric condensers.
23 372 I. H. Parsons. Electric bell indicator systems.
23 420 Standard Telephones and Cables, Ltd., and E. P. G. Wright. Automatic, etc., telephone systems.

September 23rd.

23 499 A. Braun. Electric transformers. (23/9/25, Germany.)
23 497 A. F. R. Curteis and C. Rodgers. Electric circuits for transmission of sound.
23 545 Istrumenti di Misura C.G.S. Soc. Anon and B. Usigli. Electric measuring instruments. (24/9/25, Italy.)
23 481 H. B. Jackson. Device for gripping flexible electric wires.
23 482 H. B. Jackson. Safety devices for electrical appliances.
23 468 H. J. K. Johnson. Thermionic valve holders.
23 519 Western Union Telegraph Co. Telegraph system. (6/8/26, U.S.)

September 24th.

23 591 J. Bell and Croyden, Ltd., and J. W. Mason. Electric lamp for judging, etc., coloured articles.
23 553 W. J. Charlesworth. Jack for electric connections.
23 643 H. J. Garnett, J. A. Holden and W. S. Smith. Alloys, and manufacture of electrical conductors.
23 592 General Electric Co., Ltd., and N. C. Smart. Electrical remote control systems.
23 581 R. J. Horton. Thermionic valves.
23 622 Metropolitan-Vickers Electrical Co., Ltd. Space current devices. (26/9/25, U.S.)
23 588 C. H. Oliver. Electrically driven gramophones.
23 576 R. R. Palmer. Reflectors for electric lighting.
23 584 W. H. Paulett. Thermionic valve holders.

September 25th.

23 700 H. J. Garnett, J. A. Holden, and W. S. Smith. Loaded electric conductors.
23 737 B. Hesketh. Shielding electrical inductances.

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Friday, October 22nd (To-day).

University of London.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Lecture II. by Prof. J. A. Fleming on "Ferromagnetism." 5.30 *p.m.*

Manchester Association of Engineers.—Engineers' Club, Albert Square. Opening meeting. Inaugural address by the President, Sir Benjamin Longbottom. 7.15 *p.m.*

Monday, October 25th.

Electrical Contractors' Association (Ealing Sub-Branch).—Ordinary meeting.

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Informal meeting. Discussion on "Does Heavy-current or Light-current Electrical Engineering afford the greater Scope to Young Men with Electrical Engineering Ability." (Opened by the President.) 7 *p.m.*

Institution of Electrical Engineers (Mersey and North Wales Liverpool Centre).—Laboratories of Applied Electricity, The University, Liverpool. Chairman's address by Mr. P. J. Robinson. 7 *p.m.*

Institution of Electrical Engineers (North-Eastern Centre).—Armstrong College, Newcastle-on-Tyne. Chairman's address by Mr. J. Rosen. 7 *p.m.*

Tuesday, October 26th.

Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting.

Institution of Electrical Engineers (East Midland Sub-Centre).—The College, Loughborough. Lecture by Mr. R. Borlase Matthews on "Electro-Farming." 6.45 *p.m.*

Institution of Civil Engineers.—Institution, Great George Street, Westminster. 32nd James Forrest Lecture on "Radio Communications" by Senatore G. Marconi. 6 *p.m.*

Illuminating Engineering Society.—E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Reports on "Progress during the Vacation and Developments in Electric Lamps and Lighting Appliances" 6.30 *p.m.*

Wednesday, October 27th.

Electrical Contractors' Association (Croydon Branch).—Ordinary meeting.

Electrical Contractors' Association (Cardiff Branch).—Ordinary meeting.

Electrical Contractors' Association (Belfast Beanch).—5, Bedford Street. Ordinary meeting. 3.30 *p.m.*

University of London.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Lecture III. by Prof. J. A. Fleming on "Thermionics." 5.30 *p.m.*

Friday, October 29th.

University of London.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Lecture IV. by Prof. J. A. Fleming on "The Electric Glow and Arc Discharge." 5.30 *p.m.*

Faraday House Old Students' Association.—Hotel Cecil, Strand, London. Dinner. 6.30 for 7 *p.m.*

Junior Institution of Engineers.—30, Victoria Street, Westminster. Lecturette on "Distortion in Wireless Reception." By A. V. Ballhatchet. 7.30 *p.m.*

Society of Technical Engineers.—Queen's Hotel, Birmingham. Address on "The Engineer's Bill." By Mr. R. Hazleton. 7.30 *p.m.*

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The Electrician.

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BRITAIN'S ELECTRICAL POSITION.

DR. W. H. ECCLES did the unexpected thing on Thursday in last week by not devoting his Presidential Address to the Institution of Electrical Engineers entirely to radio matters. Indeed, except as part of his general survey of Britain's electrical position, wireless was hardly mentioned, and either by accident or design he left to Mr. MARCONI the task of dealing with recent developments in this field, developments which have culminated, for the time being, in the inauguration of a short wave beam service between this country and Canada. This task was admirably fulfilled in the James Forrest lecture which Mr. MARCONI delivered on Tuesday. Dr. ECCLES on the other hand chose to deliver that type of Presidential Address which, as he himself said, deals "in an elementary manner about things that interest the Institution more generally." It is a well-known pattern, and it can be very dull. Dr. ECCLES, however, succeeded in making it most interesting by the simple process of taking one branch of electrical engineering after another and comparing its position in this country with the place it holds in other countries in the world. As might be expected from a scientist, the results are as precise as conditions allow, so that the address as a whole was not only attractive to hear delivered and to read, but will be exceedingly valuable as a work of reference.

As an aid to a more detailed examination of some of the president's conclusions it will be as well to state concisely where his investigations have led him. In the consumption of electricity, whatever basis of comparison is taken and whatever allowances are made, we lag behind other countries. As in other countries electricity with us is mainly used for power purposes, and the traction, domestic, and agricultural fields still await real development. Trams have progressed here as much as elsewhere, but little is being done with the "free" electric vehicle. The electro-chemical industries have made great and satisfactory advances, especially during the past few years. Telegraphically speaking, moreover, Great Britain is one of the most highly developed countries. But we are not great telephone users, only taking part in 23 conversations per annum as against the American's 191. In the use of carrier currents not much has been done, but our engineers are prepared to apply this method when the traffic demands it. Cable telegraphy is one of the most important of our electrical industries, both as regards the amount of capital invested and the length of cable controlled. In radio communication we own one end of the only long-distance telephone service and in telegraphic communication, both for ordinary purposes and such special applications as beaconing, direction-finding and hydrographic work we are well up in comparison with other countries.

So far the results of Dr. ECCLES's survey cannot fail to engender a certain spirit of pessimism in the reader, but that will give place to optimism when he comes to study our relative standing in the electrical world on the industrial side. Our home market, for obvious reasons, is depressed. On the other hand the export market has showed remarkable and encouraging features. In most items the value of the post-war annual exports exceeds the pre-war figures, and forms a striking contradiction to the well-known postulate that a big export trade cannot be built up without a much larger home market. British electrical exports are now 25 per cent. of the total turnover of the industry, the corresponding proportion in Germany being 15·7 per cent. and in America 5·5 per cent. On the other side of the balance sheet imports of electrical machinery are less heavy than before the war, though in the smaller goods the increases are uncomfortably high, lamps showing a rise of 115 per cent. and batteries one of no less than 610 per cent. In electrical instruments our imports nearly equal our exports, while Germany imports scarcely any instruments and exports them to a value of £1 556 000. Generally, while in 1913 the order of export importance of heavy electrical machinery was Germany, Britain, America, now it is Britain, America, Germany. In cables we still lead, as we did in 1913, but in wireless America leads, and we are far behind.

Finally, Dr. ECCLES examines the patent situation. The number of patents granted in this country in 1925 was much lower than in either America or Germany, though the proportion of electrical patents was 21 per cent., 10·8 per cent. and 9·8 per cent. in Britain, Germany and America respectively. Unfortunately, of these British electrical patents 59 per cent. are of foreign origin, a fact which Dr. ECCLES points out seems to indicate that we are not doing our due proportion of the highest form of brain work which is required by our electrical industries. This is confirmed by the relative smallness of the number of patents

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held by Englishmen in America and Germany. On the intellectual side of the industry we have a big adverse trade balance for which we pay a correspondingly large tribute in money. Mr. FRANK GILL some time ago pointed out that our two main national resources were brains and coal. It would seem that we are not at the present time making good or sufficient use of either.

An address of this kind which leaves the reader in no doubt as to our position and in which every argument is supported by statistics would, as Dr. ECCLES recognises, fail of its purpose did it not indicate a remedy. The PRESIDENT states that remedy is clear from a study of the American and German records of education and research. We have to choose between two courses: Spending money on technical education and research at home, or paying other nations for the brain work we require. This choice cannot be evaded, least of all by inaction. The industry as a whole must provide more financial support for research, so that not only may brain workers be encouraged, but our knowledge kept abreast of that of our more immediate rivals. We may add that the results of such research work as is done should not be treasured up in the archives of some Association. That is hiding our talent with a vengeance. It must be made available so that all may derive the full advantage from it. As Dr. ECCLES clearly sees, this remedy, though fundamental, is a plant of slow growth. It is of more immediate importance to cheapen power to industry by turning Britain into a single power zone. If that is not done we shall lose our position as a manufacturing country.

We heartily recommend this address to the study of every electrical engineer at the present time. A true knowledge of the present weaknesses in our organisation is the first step to paving a way to improvement.

Current Topics.

Interconnection.

IN his presidential address to the Institution of Electrical Engineers last week, to which we refer in general terms in our leading article, Dr. W. H. ECCLES had some wise words to say on the subject of interconnection. He pointed out that in this country each kilowatt of plant installed only generates 1 730 kWh per annum, as against 3 430 kWh in the United States and 4 250 kWh in Italy. In other words, we are only getting 4¾ hours' work a day out of the machinery in a number of our best stations. This is not due to the fact that electricity is much more expensive in this country than elsewhere or because we have no water power, but because of our neglect to use the principle of interconnection for cheapening our supply. For lack of efficiency in machinery, though regrettable, is less a hindrance than lack of interconnection. Centralisation and interconnection are therefore the two main steps which must be taken to cheapen electricity supply, and what is equally important to render it more generally available. In a word, Britain must be turned into a single power zone, so that not only may industry be stimulated, but the benefits of use of electricity in the home be conferred on the public generally.

Time for Co-operation.

THE theory of this statement will be pretty generally admitted. The difficulty arises, as Dr. ECCLES realises, when it comes to applying it in practice. For, as we have amply seen during the past few months, there is divergence of view whether this progress should be left to the ordinary operation of natural forces or compelled by new legislation. We have always maintained that new legislation is necessary, if only to clear away the obstacles which unwise earlier measures imposed upon the progress of the industry. Unless those obstacles are cleared away we cannot obtain the single power zone of which Dr. ECCLES speaks. With this end in view, on the recommendation of their technical advisers, the Government introduced a measure which—it is ancient history—has been subjected to fierce criticism and considerable amendment. It now awaits final treatment. We regard it as a good measure, but in any event the Government are determined to see it through, and it would therefore be well for all sections of the industry to accept that decision and to indicate that they propose loyally to carry out its provisions with energy and enthusiasm. Without it a national electrical zone would be impossible. There are, we know, some who do not want such a zone, and who regard any attempt to provide one as a disaster. We know also that there will be some inconveniences of a temporary kind. But as a result, not only the electrical industry, but the people generally will benefit.

Imperial Research.

IN his speech to the Imperial Conference on Friday Mr. S. M. BRUCE, Prime Minister of Australia, said that if he was asked to name the most important thing for the promotion of Empire trade for ensuring efficiency in production and competitive power in the markets of the world he would put first the application of science both to our primary and secondary industries. He added that greater co-ordination of all the efforts that were being made to-day to bring the assistance of science to the aid of industry was essential and urged that the Committee which had been appointed to consider the question should endeavour to bring about some system of co-operation in regard to scientific research in its application to industry on an Empire-wide basis. He suggested also that the conference should approach the respective industries with a view to obtaining a measure of standardisation which would improve the efficiency of Empire production and remove many of the difficulties which the Dominions find stand in the way of their buying British goods for some of their major requirements. These are two matters to which we hope not only the Imperial Conference but the electrical industry will pay close attention. Every effort is needed to increase our export trade. Our Dominions form the best markets for that purpose. The more work therefore that producers and customers can do in co-operation to add to the sum of our knowledge and assist marketing by introducing greater simplification the better. Moreover, the British Empire is such a large market that if it can come together on these matters the rest of the world will follow suit.

The "Canadian Beam System."

ON another page of this issue we give an account of the Bridgwater receiving station which will deal with the British end of the Canadian and South African short-wave services which were opened to the public at the beginning of the present week. It forms the other link in the chain of which the Birmingham station, which we described last week, is the transmitting end. The inauguration of this service is not only highly interesting from the technical point of view, but closes, we hope finally, a chequered chapter in the history of Imperial wireless communication. The power used is low and the "load" that can be dealt with is high, as was abundantly shown during the acceptance tests which incidentally were interfered with by extraordinarily bad atmospheric conditions. At Bridgwater the aerial system is a duplicate of that at Bodmin, and the receiving wave is 26 m. Special steps are taken to aggregate the aerial energy, all of which is taken to the receiving apparatus. The speed of the receiver is only limited by the mechanical means of transmission and reception available. Three stages of high-frequency amplification are used, after which the signals are rectified. Heterodyning is used in both these stages, the second being used either for giving an audible beat or for changing the wavelength of the signals up to 10 000 m. After further amplification the signals are again rectified. The whole equipment bears abundant witness to the ingenuity of Mr. MARCONI and his engineers, and we hope that the service will be as successful in practice as it has been during its trials.

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The British Broadcasting Corporation.

THE following have been recommended by the Prime Minister for appointment as the original governors of the British Broadcasting Corporation: The EARL OF CLARENDON (chairman), Lord GAINFORD (vice-chairman), Sir J. G. NAIRNE, Dr. M. J. RENDALL and Mrs. PHILIP SNOWDEN. Of these only Lord GAINFORD is on the directorate of the British Broadcasting Co., and none of the others have any technical experience or represent the technical side of the organisation. Lord CLARENDON'S career has been entirely political, Sir J. G. NAIRNE is a director and was Comptroller of the Bank of England, Dr. M. J. RENDALL was headmaster of Winchester for many years, and Mrs. PHILIP SNOWDEN is the wife of the first Labour Chancellor of the Exchequer, and is herself a well-known Socialist. It may, therefore, be predicted that more attention will be paid to the educational side of broadcasting; but we hope at the same time that the entertainment side will not suffer. That also is unrepresented on the new committee. The present organisation has done well inspite of many difficulties and numerous obstacles. If it has not satisfied everyone, neither will the new body.

Broadcasting and Music.

ON Friday evening a London evening journal published the startling information that that well-known home of high-class concerts, Queen's Hall, was to be converted into a cinema, and added the still more startling comment that this was due to the subsidised competition of the British Broadcasting Co. At first it puzzled us to hear that broadcasting was being subsidised, because we are well aware that only a proportion of the income derived from licences is handed over to that concern. But apparently what has happened is that the public are admitted to the National Concerts, which the Broadcasting Co. hold at intervals at the Albert Hall, at rates less than they would pay if the music performed was not also being broadcast. This may be undercutting, but it is hardly subsidisation. We are interested, moreover, to see that the views of the musical world are not unanimous on this question. Sir LANDON RONALD points out that 90 per cent. of the concerts given in London have been for some time hopeless financial failures, and it is therefore ridiculous to say that the B.B.C. concerts have affected the position. On the other hand, the B.B.C. has been an inestimable boon to the musical profession in general by enabling young artists to get a hearing with a very large public. This supports the view that we have always held, that broadcasting is more a help than a hindrance both to the newspapers and to the purveyors of music.

Report on the Newcastle Accident.

MAJOR G. L. HALL'S report to the Minister of Transport on the accident which occurred at Manors Junction, Newcastle, on August 9th, has now been issued. It will be remembered that an electric train ran away, being finally brought to rest by a sidelong collision with a goods train. It was subsequently found that the automatic control apparatus had been deliberately tampered with by the motorman, who was himself found dead at the side of the line some distance from where the collision took place. Major HALL recalls that a similar accident in which the motorman also lost his life occurred on the Brighton Railway in 1916. The inspector states that it is useless to speculate upon the driver's reasons for leaning out of the train. Nothing can, however, excuse his action in deliberately tying up the control. He also considers whether the accident could have been prevented by any action on the part of the various signalmen or the guard, and comes to the conclusion that they were blameless, and that the driver alone was responsible for the accident. Having regard to the position of signals, it is doubtful whether the train would have been stopped had an automatic trip such as is employed on the London underground railways been in use in sufficient time to prevent the accident. A satisfactory feature of the accident was the manner in which the rolling stock withstood the shock of the collision.

Rubber Export Restriction.

AS from November 1st the export of rubber from Ceylon and Malaya will be subject to new regulations, which it is expected will hold good for at least twelve months. If the price of rubber in London is between 1s. 9d. and 1s. 3d. per lb., the percentage of standard production which may be exported will be reduced by 10, though if the figure from which the reduction to be made is 100 the reduced percentage will be 80. If the price is between 1s. 9d. and 2s., the percentage will not be changed at once, but will be raised by 10 if the price persists for three consecutive quarters. If the price is above 2s., the percentage increase of 10, or from 80 to 100, will take place at once, and similarly if it falls below 1s. 3d., the percentage will be reduced to 60. In no case will the percentage be increased above 100 or decreased below 60. This action will, it is stated in the City, result in a decrease of between 40 000 and 50 000 tons in the years' rubber supply from Ceylon and Malaya.

Flicker and Voltage Irregularity.

AN interesting account of an investigation undertaken by the British Electrical and Allied Industries Research Association to ascertain the limits observable by the human eye of cyclic irregularity in the voltage of the supply to incandescent lamps is given in the current issue of the Journal of the Institution of Electrical Engineers. This follows on the work made by a former investigator, K. SIMONS, which tended to show that the eye is most sensitive to flicker occurring with a periodicity of about 6 cycles per sec. He also showed that the percentage variation of light which can be detected by the eye decreases with a large increase in intensity of illumination. The investigation was undertaken with a cyclic irregularity having a frequency of 0 to 15 cycles per sec. on a 50 W 200 V metal filament lamp, and as far as it goes confirms SIMON'S conclusions. It should be observed that between limits of frequency of 6 to 10 cycles per sec., which is within the limits of speed of gas engines, the percentage fluctuation should not be more than 0·2 per cent., equivalent to a cyclic irregularity of 1/500. This report furnishes therefore no support of the contention that the B.E.A.M.A. Standardisation rules are too severe, and though the investigators deliberately took an unfavourable case for test the conditions are not abnormal.

Luminous Piezo-Electric Radiator.

IN an article published some four years ago in the "Proceedings" of the Institute of Radio Engineers, Mr. W. G. CADY described the peculiar effect of small pieces of quartz cut in a certain way when subjected to an alternating current field. Under such conditions a combination of mechanical and electrical oscillations sets in, which may lead to resonance and to vibrations of very pronounced amplitude. As the logarithmic decrement of these is very small, resonance occurs very sharply, for which reason Mr. CADY recommended the use of such crystals as resonators. In an article in a recent issue of "Elektrotechnische Zeitschrift," Mr. E. GIEBE states that he has discovered that if such a quartz rod is enclosed in a partly evacuated glass bulb full resonance will cause the rod to grow uniformly. Partial resonance and higher harmonic oscillations are shown by the rod becoming partially luminous. It is thus possible to determine visually the nature of the electrical characteristics of a circuit merely by observing the quartz rod in the dark. Beautiful configurations can be produced by high harmonics, as is shown by photographs illustrating the appearance of a quartz rod up to the twenty-first harmonic. The use of these simple resonators for the regulation of a broadcasting station to its proper wavelength is recommended.

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DR. ECCLES' PRESIDENTIAL ADDRESS.*

A Comparative Summary of Electrical Progress—Lack of Interconnection the Chief Cause of Our Backwardness—Britain Leads the Way in Submarine Telegraphy.

THE life of the Institution of Electrical Engineers is intertwined with that of the electrical industry, and this close contact is the surest sign of its health and strength. A comparative summary of the electrical progress of some of the chief commercial nations will make it possible to distinguish the branches in which we are weak from those in which we are strong.

In making this survey it is convenient to begin with the electricity supply industry, the outstanding feature of which is the tendency to concentrate into big units of management and production. In America and most of the European countries electrification has been pushed forward on a national scale, not only because of economic pressure, but also because the building of power stations and transmission lines, the wiring of factories and the manufacture of industrial plant and locomotives provide employment of the highest type. In addition to these immediate and visible forces there has been impulsion due to the instinctive feeling that a modernisation of the basic industries was impossible without previous electrification on a national scale.

Electricity Supply Position.

In estimating the relative electrical progress of the nations, one of the favourite comparative figures is the consumption per head of population. This is not sound in itself, and another comparison may be obtained by taking the most fully electrified industrial areas of each country. Still another comparison is offered by the average price at which electricity is sold in the different countries. Both this comparison and that showing the annual consumption of electricity per head, are very hard on Great Britain, but they are somewhat unfair, because they ignore our many private industrial generating plants and the fact that an average does not show that in many cases the cost of electrical power in this country is as low as in corresponding areas in America or Switzerland.

A method of comparison, which points an important lesson, consists in finding for various countries the amount of energy delivered by each kilowatt of machinery installed. This gives a figure of 1 730 kWh per kW for Great Britain, which indicates that we are getting only 4½ hours' work per day out of the machinery in a number of our best stations. Again, in 1925 America obtained 35 kWh per annum, while Great Britain only obtained 28 kWh from each pound sterling invested. The reasons for this are the smallness of the machines and stations in this country and the rigid separation of the undertakings.

The recent change in the German position where the output per kW rose from 1 540 kWh in 1913 to 3 460 kWh in 1923 is due to the installation of larger equipment combined with thorough interconnection.

Steam Developments.

It is sometimes thought that electrification has advanced rapidly in foreign countries because natural facilities for hydro-electric generation of power make electricity cheaper than in Britain, but Belgium, which is more highly electrified than Britain has no water power stations, and Germany generates only 10 per cent. of its electricity in that way. The fact is that the cost of transmission limits severely the region to which hydraulic power can be delivered cheaply. There is a continual struggle between thermal and hydraulic plant. As fast as hydroelectrics have been developed, the efficiency of thermal plant has risen and the net cost of fuel per kilowatt hour generated has fallen. An increase of steam engine efficiency to 25 per cent. would reduce the area of profitable transmission of hydro-electric power to half its present figure. Even if no such figure matures, the promise held out to-day by high pressures, high temperature steam, pulverised fuel, and the sale of by-products, justifies the opinion that thermal generation will continue to be more economical than hydraulic generation in most of the existing industrial areas of the world.

Our backwardness in electrical development seems, therefore to be due to a complex of primary causes, economic and political, but the chief electrical cause is our neglect to use the principle of interconnection for cheapening the supply. Another less important reason is that many of our installations are not efficient, judged by modern standards. This, however, regrettable as it is, does not greatly increase the price of electricity.

The principle of interconnection may best be explained by an extreme example. Imagine the inhabitants of a great Garden City to go by electric train daily to work in a crowded area of warehouses, shops and offices. Under the old system of electricity supply three separate generating stations would be installed, one for delivering power and light to the commercial quarter, one for propelling the trains, and one for lighting the residential city. As a rule it would be found that only one of these generating plants would be working on full load at any particular time, and each would stand idle, or nearly idle most of the waking hours. Yet each of the installations would have to be big enough to meet its maximum load. The principle of interconnection points out that by aid of transmission lines each plant could be lent to help the neighbours with the heaviest load, and therefore each could be much smaller. Centralisation and interconnection are indeed the two main principles of the organiser who is going to cheapen electricity supply. Both of them have been applied logically during the last five years in the creation of the great power zones in Germany and other countries. Though the largest of our stations are practically as efficient as the greatest of the foreign super-stations, the national load factor is still less than half that of some other countries, and the area of country adequately served is less than two-thirds of the whole. That this state of affairs should be remedied all will agree, but there is some divergence of view as to whether we need electrify so intensely or so rapidly as the other nations. There are also strong differences of opinion as to the means by which the change should be made—whether it should be left to the operation of economic forces, or compelled by new legislation.

Electricity in Industry.

Information respecting our use of electricity in industry is vague, but it has been estimated to have been 33 per cent. in 1924. In Belgium, the proportion is 61 per cent., in Germany 60 per cent., and in American 68 per cent. The industrial consumption from the public supply in Great Britain, which is 68 per cent. of the whole output, is increasing at the rate of 18 per cent. per annum, and will increase faster as electrical power is cheapened.

In every country railways should be one of the principal users of electricity, and though a good deal of progress has been made in Switzerland, and some in France, Germany and America are not much ahead of Britain in this matter, the opinion being that the substitution of the electric for the steam locomotive cannot make much difference in the cost of working a main line railway. This is not a national aspect of railway electrification for, as Mr. Merz has pointed out, the wholesale electrification of the main lines of Britain would help the financing of national interconnection networks, and would extend electrical facilities into areas otherwise unavailable as modern factory sites. But although electric propulsion has not yet proved to be cheaper than steam on main lines, it is supreme on suburban railways.

Two forms of road transport utilise electricity—the tram and the free vehicle. The development of the former has generally been satisfactory, but the latter, especially the battery type, is less encouraged here than abroad. It is estimated that there are about 18 000 lorries at work in America, and only 1 000 here, though the battery vehicle is more economical than the petrol vehicle for short distance work. These economies can only be attained if the supply authorities organise the expeditious replacement of exhausted batteries by fresh ones at suitable stations. New York experience shows that 03 per cent. of the charging is done in off-peak hours, and that one vehicle consumes on an average more energy than twenty residential consumers. It is doubly regrettable that a form of transport which avoids the importation of fuel from abroad and which improves any load factor, is so neglected in this country.

In the electro-metallurgical and electro-chemical industries which use electricity in a different way, adverse trade balances have been turned into favourable trade balances in the case

* Abstract of the Presidential Address delivered by Dr. W. H. Eccles, F.R.S., to the Institution of Electrical Engineers on October 21st.

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of aluminium, electrolytic copper, sodium and magnesium. Works for the fixation of atmospheric nitrogen have been firmly established, and we are now beginning to export synthetic ammonia and nitrates. In the production of calcium carbide and its derivatives, however, we cannot compete with the great water power countries.

The farmer should be a large consumer of electric power. Electric light is as welcome on a farm as anywhere, and the electric drive is applicable to about a hundred agricultural operations, while electricity can also be used for heating, electro-culture and bacteriological work. In Germany, more than 90 per cent. of farms have an electricity supply, while in this country only 0·8 of one per cent. are connected, and their consumption is insignificant. Compared with America, the distances are small, and there is therefore no physical difficulty in opening up a large market for electrical power.

As regards the domestic use of electricity, in Switzerland, where coal is dear, 90 per cent. of the dwelling houses are electrified, and in Great Britain, where coal is cheap, only 18 per cent. are electrified. In Tokio, the figure is 70 per cent., in Amsterdam, 88 per cent., while in Glasgow and Manchester it is less than 10 per cent. Actually, the domestic consumption in this country is 10 kWh per head per annum, whereas it should be 40 to 60 kWh. For every reason, therefore, it is hoped that the campaign of the Electrical Development Association and the Electrical Lamp Manufacturers' Association will meet with the success it deserves.

Turning to electro-communication engineering, the President pointed out that on the basis of mileage per unit of area, Great Britain was one of the most highly developed telegraphic countries, and this conclusion was confirmed by the traffic dealt with. On the other hand, statistics indicated that our people were not great telephone users. Not only that, but the number of telephones per hundred of population was less than in most other countries, and while the average American talked 191 times per annum, the average Englishman talked 23 times. Our telephone population is, however, increasing at the rate of 10 per cent. per annum. Though complete statistics regarding the use of carrier telegraphy are not available it is sufficient to note that our engineers are prepared to apply this method on a large number of existing circuits, if the increase in traffic should demand it.

The World's Wireless Stations.

As regards submarine telegraph cables, the British Empire controls double the length of cable controlled by America, and more than four times as much as France. In 1924, an eight-pair continuously loaded telephone cable was laid to Holland, and recently one with 14 pairs was laid to Belgium, thus making a great contribution to Mr. Gill's vision of international telephony. It may be concluded, therefore, that Britain is the most highly equipped country in respect of submarine cables.

Data kindly supplied by the Wireless Telegraph Board and the Wireless Section of the Post Office Engineering Department shows that there are 86 radiotelegraphic stations operating with long waves, and 41 operating with short waves. The data for the long wave stations are quite trustworthy, but the data for the short wave stations are uncertain, though an endeavour has been made to include only those which are known to be engaged upon, or intended for commercial traffic. It should be added that the only transoceanic telephony circuit in the world is between the Long Island station of the Radio Corporation of America and the Rugby station of the Post Office. Through these stations it is physically possible to place any telephone subscriber in Western Europe in touch with any telephone subscriber in North America. Statistics show that there were 1 350 short-range land stations in operation in 1924, many of them being devoted to communication with ships. In 1924 the United States possessed 46 beacon and direction finding stations, France 18, the British Empire 13, of which 8 are in Canada, Norway 5, and Germany 4. Of hydrographic stations for conveying ice warnings, Canada had 35, Australia 11, and Great Britain 10, the United States 43, France 21, Germany 11, and Russia 9. For communicating with aeroplanes, France had 41 land stations, Britain 23 and the United States 14 in 1924. There are 10 507 ship stations, of which Great Britain possessed 3 996. These figures include naval vessels. The United States possesses 556 broadcasting stations, of which only one is over 50 kW, and Great Britain possesses 21, one of which is between 10–50 kW.

A table which the President exhibited showing the total number of transmitting stations used for broadcasting indicated that from the point of view of the cost or magnitude of the equipment, the industry was of small importance compared with other branches of the wireless industry, the total power of the world's broadcasting transmitters being only about 620 kW. On the power basis it is clear, however, that our broadcasting equipment compares satisfactorily with that of the other European nations.

Comparative Export Figures

The survey of our relative position in the electrical world must include a reference to the home and export markets in electrical machinery and apparatus. The home market has of course, shared in the general depression of the basic industries, the home orders for electrical machinery being 15 per cent. lower in 1925 than in 1924. Colonel Morcom estimated that in 1925 the total turnover of electrical manufactures in America was £284 000 000, in Germany £90 000 000, and in Great Britain £70 000 000. The export market, on the other hand, showed remarkable and encouraging features. In most branches the value of the post-war annual exports exceeds the pre-war. These figures cannot be read without admiring the technical efficiency, and the excellent business organisation which has achieved such results, especially when we reflect on the smallness of the home market. The figures are a striking contradiction of the well-known postulate that a big export trade in manufactures cannot be built up without a much larger home market. British electrical exports are now 25 per cent. of the total turnover of the industry, the corresponding proportion for Germany being 15·7 per cent. and for America 5·5 per cent. The result of all this activity is that American, British and German electrical exports are now nearly equal. Before the war German electrical exports were more than the British, American and French put together. The drop in the export of submarine cable for telegraphy and telephony in 1925 compared with 1913 merely marked a state of waiting for the development of the loaded cable. Since 1924 about 12 000 miles of loaded cable has been ordered. This is either loaded with permalloy or mumetal, and has been, or is being, all manufactured in England, excepting a length for connecting Emden with the Azores. It is satisfactory that so large a part in the newest of submarine cable developments is being played by Great Britain.

Electrical imports except in the case of heavy electrical machinery are generally larger than in 1919. Some of the increases are uncomfortably high, and the largeness of the wireless imports are disappointing. An estimate of our position among the three principal exporting nations shows that in heavy electrical machinery the order of importance in 1913 was Germany, Britain, America; in 1925, it was Britain, America, Germany. In cables, the order in 1913 was Britain, Germany, America; in 1925, it was the same. In telegraphic apparatus, Germany was far ahead in 1913; in 1925, the order was Britain, Germany, America. The position in the wireless industry is very disappointing, and another disappointing item is the position of the British electrical instrument industry. Can this institution do anything by promoting an Electrical Instrument Convention to stimulate this particularly important industry?

Patent Statistics.

One of the most useful tests of the health of the scientific industries of a country is afforded by the statistics of its patent office. This particularly applies to the electrical industries. In 1925, about 49 000 patents were granted in America, 16 000 in Germany, and about 15 000 in Great Britain and Northern Ireland. In America 89·2 per cent. were native inventors, in Germany 77 per cent. ,and in Britain 57 per cent. Of the whole number of patents the electrical proportion was 9·8 per cent. in America, 10·3 per cent. in Germany, and 21 per cent. in Britain. Of the American electrical patents 13·5 per cent. were of foreign origin, of the German, 26 per cent. were foreign, and of the British, 59 per cent. were foreign. This appears to indicate that we as a nation are not doing our due proportion of the highest form of the brain work required by our electrical industries. This is confirmed by statistics showing the relative smallness in number of the patents held by Englishmen in America and Germany. The main conclusion is that Englishmen are, at the present epoch, making fewer electrical inventions than is expected of them.

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THE CANADIAN BEAM SERVICE.

Details of the Bridgwater Receiving Station—Arrangements for Checking Signal Strength.

IN last week's issue of THE ELECTRICIAN we gave some details of the Bodmin transmitting station which forms part of the short wave Imperial communication system between this country and Canada and South Africa.

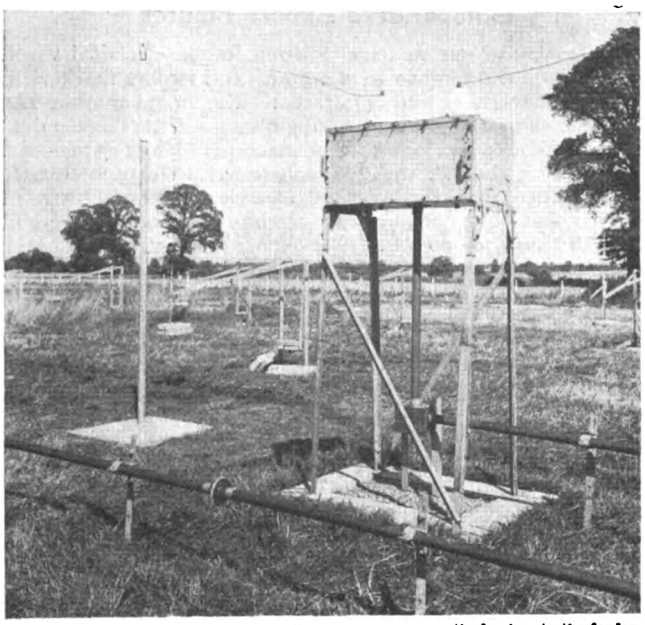

Fig. 1.—Aerial coupling box connecting one pair of vertical wires to the feeder system. The vertical aerial wires are connected to balance coils inside the copper box. (Bridgwater station.)

The receiving end of this system is situated at Bridgwater, where there are two sets of aerials which will deal respectively with the Canadian and South African messages. The Bridgwater receivers are arranged for the reception of signals from Canada on a wavelength of just over 26 m., though a different wavelength may be used if the other aerial bay is employed. The masts are duplicates of those at Bodmin, except that the feeder tubes are slightly smaller. They are erected at right angles to the direction in which the received signals come in, so that the effect of the reflector wires is not only to screen the

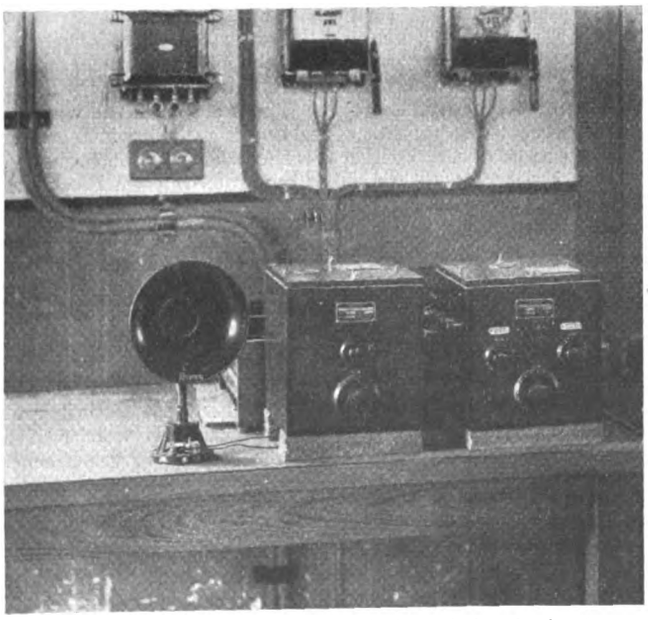

Fig. 2.—Local oscillators which, beating with the outgoing signals, give an audible note in the loud speaker, enabling to check the steadiness of the signals. (Bodmin station.)

aerial from signals coming from behind, but also to reflect back energy received from the front of the system, and thus a considerable increase in the energy is received as compared with a non-directional aerial.

By means of transformers and a specially designed feeder system (Fig. 3) the energy of all the aerial wires is added and the total energy is conveyed to the receivers via the main feeder tubes, which terminate at what is known as a feeder unit of the receiver.

In order to avoid inter-action between the Canadian and South African circuits, the frequency of the bands of the two first filter amplifiers and the two second amplifiers are suitably spaced, otherwise the receivers are identical. The complete receiver comprises nine units each contained in a copper screened box. These units are mounted in vertical iron racks and can easily be changed if the need should arise. The control panel enables the various voltages of the valves to be tested, and their characteristics can be checked by using a special socket.

The feeder terminal unit, at which the aerial system is joined to the receiver, has two low loss tuned intermediate circuits which can be very weakly coupled so that additional selectivity and freedom from atmospherics are obtained. It is customary to work with very loose couplings as the signals

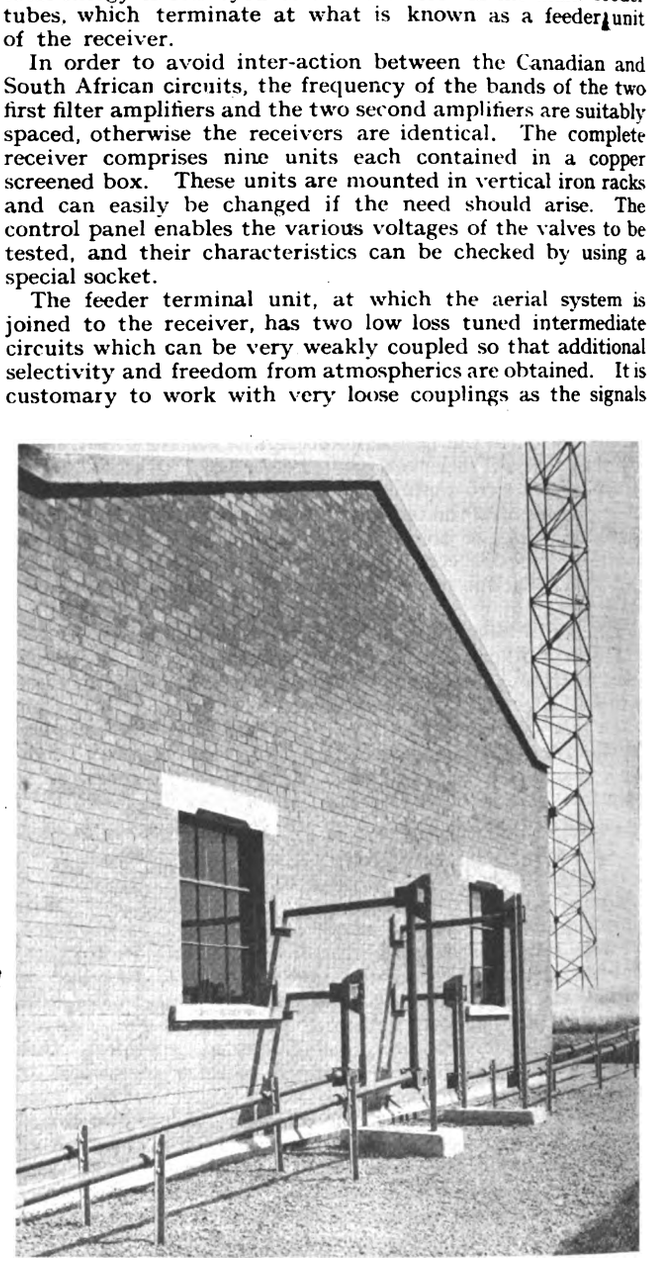

Fig. 3.—View of the feeder system leading into the receiving building. The two tubes going out to the left are part of the Canadian feeder system, the tube nearest the wall being for the lower wave band and the other tube for the higher wave band. The two tubes going out to the right are part of the South African feeder system, the tube nearer the wall being for the higher wave band and the other for the lower wave band. (Bridgwater station.)

are powerful, and thus the delivery of clear cut signals to the London circuits is facilitated. The second intermediate circuit is coupled to the in-put circuit of the receiver through a variable coupling. This in-put circuit is tuned to the frequency of the incoming wave, and is connected to the grids of two modulating valves working in push-pull. The in-put valves and the filtering amplifier valves all work on the push-pull system, as this gives perfectly stable and distortionless high frequency amplification.

The first heterodyne circuit is coupled to this circuit, and produces a beat wave of about 1 600 m. The signal on this new wave is subjected to three stages of high frequency push-pull amplification, the circuits being so arranged that a constant amplification is obtained over a 10 000 cycle band outside which it is practically zero. After the three stages of high frequency amplification the signals are rectified and again heterodyned so that the beat frequency is raised to

(Concluded on page 504).

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METER SHUNTS FOR HEAVY DIRECT CURRENTS

Some Important Points in their Design—Various Methods of Connection Discussed.

By F. A. DAHLGREN.

THE measurement of current and energy in large central stations for d.c. distribution often presents difficult problems to the designer of the busbar arrangements. The shunts, which are necessary for supplying the voltage drop to ammeters and meters, are heavy and bulky pieces of apparatus and the method of arranging the connections between the busbars and the contact pieces of the shunts must be decided with due regard to proper electrical working. It is not immaterial in what way the main current passes from one end of the shunt to the other, since in general the resistance of the contact pieces cannot be neglected compared with that of the resistance bars or tubes.

In the following the principles of the current flow through bar or tube shunts will be developed with regard to the resultant voltage drop between the mid points of the contact pieces, the current being fed into and taken out from these contact pieces in different ways. The voltage supplied to the meter is supposed to be taken from these mid points, but the current taken by the meter is neglected.

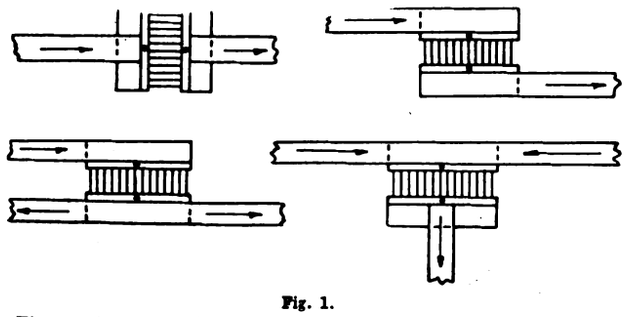

Fig. 1.

Fig. 1 shows various methods of connecting of shunt to busbars with single or branched current paths.

In Fig. 2 let x be expressed as a fraction of the total length of the contact piece. I denotes the current in the bars or tubes per unit of x, and i_1, i_2 currents along the contacts. The bars or tubes are supposed to form a continuum, yet with given rectilinear current paths. Let R denote the parallel resistance of these resistance elements, while r is the resistance of each contact piece along its total length.

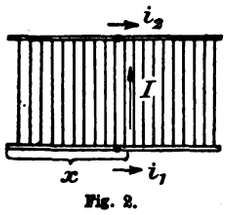

Fig. 2.

We then arrive at the following differential equations :—

$$\left.\begin{aligned} R\frac{dI}{dx} &= r(i_2 - i_1) \\ \frac{di_1}{dx} &= -\frac{di_2}{dx} = -I \end{aligned}\right\} \quad . \quad . \quad . \quad (1)$$

or, for the current I,

$$\frac{d^2I}{dx^2} - a^2 I = 0 \quad . \quad . \quad . \quad . \quad . \quad (2)$$

where $$a = \sqrt{\frac{2r}{R}}$$

The complete solution is :—

$$\left.\begin{aligned} I &= A \sinh ax + B \cosh ax \\ i_1 &= -\frac{A}{a}\cosh ax - \frac{B}{a}\sinh ax + C \\ i_2 &= \frac{A}{a}\cosh ax + \frac{B}{a}\sinh ax + C \end{aligned}\right\} \quad . \quad . \quad . \quad (3)$$

where A, B, and C are constants to be calculated from the current distribution in each special case. The voltage drop between mid points is :—

$$E = R\left(A \sinh \frac{a}{2} + B \cosh \frac{a}{2}\right) \quad . \quad . \quad . \quad (4)$$

We now proceed to apply these formulæ in a few special cases of practical interest. In Fig. 3 are shown three methods of connection, which we denote by I, II and III. The total current through the shunt is denoted by I_t.

The determination of the constants A and B in these cases does not present any special difficulty, but the calculations are lengthy and are omitted. The resulting formulæ obtained in inserting in equation (4) are as follows :—

$$\left.\begin{aligned} &\text{I} && E = R \times I_t \times \frac{a}{2 \tanh \frac{a}{2}} \\ &\text{II} && E = R \times I_t \times \frac{a}{2 \sinh \frac{a}{2}} \\ &\text{III} && E = R \times I_t \times \frac{a}{4 \tanh \frac{a}{4}} \end{aligned}\right\} \quad . \quad . \quad . \quad . \quad (5)$$

Since $a = \sqrt{\frac{2r}{R}}$ is a small quantity, the following approximate expressions can be given :—

$$\left.\begin{aligned} &\text{I} && E = R \times I_t \times \left[1 + \frac{r}{6R}\right] \\ &\text{II} && E = R \times I_t \times \left[1 - \frac{r}{12R}\right] \\ &\text{III} && E = R \times I_t \times \left[1 - \frac{r}{24R}\right] \end{aligned}\right\} \quad . \quad . \quad . \quad (6)$$

These formulæ show, in the first place, that with a given shunt and given resistance in the meter circuit, the shunt constant is somewhat different in the three cases referred to. They show, in the second place, that, in each of the cases II and III, the multiplying factor of the shunt is quite independent of the relative currents in the parallel incoming or outgoing branches. This latter result, which may perhaps be regarded as surprising, is demonstrated by the absence of the factors p and q from formulæ (5) and (6).

If a shunt be connected to the busbars in any one of the methods shown in Fig. 3, and if the meters are calibrated and the leads adjusted for one current distribution, then the readings will be equally true for any ratio of branch currents.

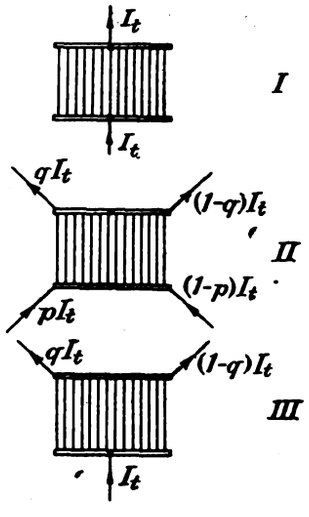

Fig. 3.

Formulæ (5) and (6) are not suitable for exact numerical calculations, since in deducing them considerable assumptions have been made, but they sufficiently show the general influence of the various methods of connection and also give information as to the order of magnitude of the errors.

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ELECTRICAL PROPULSION OF SHIPS.

Its Proved Advantages—Drawbacks of Diesel Arrangement—Determination of Power Requirements—Control and Braking Devices.

By W. A. VIVIAN, B.Sc(Eng.), Foreign Department, Allgemeine Elektricitäts-Gesellschaft, Berlin.

AS was inevitable, the electrical propulsion of ships has passed from a proposition to proved practice. That electrical propulsion is unconditionally best suited for every type of ship, in all circumstances, is not at present claimed. In every case where electrical propulsion is proposed, not only must the relative merits of other types of drive be fully considered, but every factor, depending upon the type and service of the ship, must be individually taken into account.

There are, however, certain points regarding modern electrical equipment which are no longer open to conjecture.

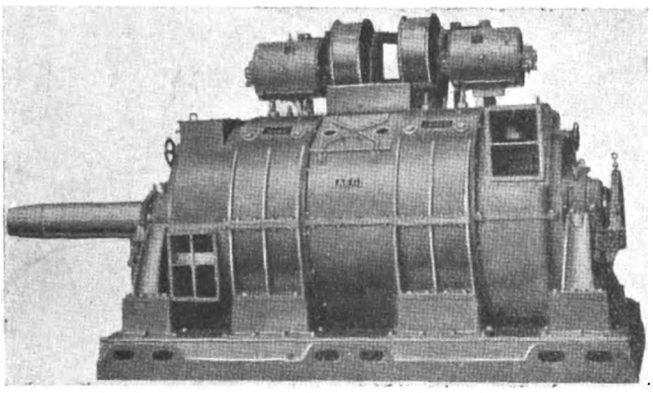

Fig. 1.—View of propeller double motor with forced ventilation. Rated at: 1000 kw, 275 revs. per min., for one hour. 700 kw, 240 „ „ continuously.

Of these, reliability, flexibility and high efficiency—all of fundamental importance—are perhaps more fully realised with electrical propulsion than with any other kind of propulsion. There is little to choose between electrical equipment and geared turbine equipment with regard to the weight and the space occupied. A geared turbine has only a slight advantage with regard to weight, whilst the space required slightly favours the electrical equipment. The following table, due to Mr. W. E. Thau, gives a comparison of the fuel consumption and the machine weights for a ship of about 3 000 s.h.p. having a normal speed of about 11 knots and making 14 trips per year, each of about 4 000 nautical miles.

In each case the comparisons are referred to the geared turbine = 1.

	Fuel Consumption	Machine and Engine Weights
Geared turbine	1·0	1·0
Turbo-electric drive ..	1·06	1·05—1·10
Diesel direct drive ..	0·49	1·10—1·125
Diesel-electric drive ..	0·57	0·75

These figures, of course, would not apply to a completely new equipment. With turbo-electric drive, for example, the fuel consumption would be less by utilising the waste heat from the electric machines.

In comparing Diesel-electric drive with Diesel direct drive the increased fuel consumption of the former is more than compensated for by the saving in weight and space.

Although the efficiency of a first class gear transmission is somewhat higher than that of electrical transmission, experience has shown that the gears are subject to injury through vibrations in the ship's structure or through wear in the bearings. The retention of the correct alignment of the shafting between the gearing and the propellers is also most essential for efficient transmission.

With electric drive only very short shafts are necessary, the motors being direct coupled and as near the propellers as the presence of the main thrust bearing permits. With turbo-electrical propulsion the grouping of the boilers and machines permits of shorter lengths of steam piping with a consequent reduction in the weight and the steam pressure drop.

The efficiency of the electrical transmission is independent of the ratio of the prime mover speed to the propeller speed, the most efficient speed for both being chosen. The greater the ratio, the greater the justification for electrical transmission.

With electrical propulsion the most economical use of the available space can be made and the weight can be allocated as desired. When two prime movers are used they can be arranged fore and aft along the centre line of the ship, and they may be installed at a sufficient height to permit placing the main condensers immediately underneath.

With electric drive the prime movers rotate always in the same direction and, with a direct current system, the speed of the prime movers can be kept constant for all speeds and both directions of rotation of the propeller motors.

Unidirectional rotation of the prime mover eliminates the reversing mechanism and considerably simplifies the valve gear in the case of a Diesel, whilst in the case of a turbine the special turbine for astern travelling is eliminated, with a consequent saving of steam. Further, when travelling at low speeds only one prime mover need be in service, the switchgear being so arranged that all propeller motors can be simultaneously supplied, at the reduced input, from only one of the generator sets.

This arrangement of the switchgear would also be adopted in the event of failure of one of the turbo- or Diesel-generator sets. With high power geared turbine propulsion two turbines per propeller shaft are always desirable. With electrical propulsion this provision is quite unnecessary when two or more propellers are employed.

As the only mechanical parts connected to the propeller shafts are the thrust bearings and the electric motors, no damage which would be likely to occur would prevent the shafts from freely rotating, whether they were being driven by the motors or not. This cannot be said of geared turbine or Diesel drive.

As the possibility of failure must be taken into account with any drive, immunity from the possibility of having a propeller not free to rotate when the ship is driven by the other propeller or propellers would be of considerable importance in the event of a breakdown. The power wasted by a fixed propeller may amount to 15 per cent. of the total power required to drive the ship.

Electricity and Submarines.

During the dark days which are past, some development was made in the application of electrical propulsion to underwater craft. Due to the noise caused by the prime movers, the difficulty of confining or dispersing the exhaust gases and the impracticability of taking large supplies of compressed air or oxygen in a submarine, electric drive became a necessity. The direct current motors were supplied from storage batteries, charged by the Diesel-driven generators when the submarine was not submerged. The outstanding disadvantages of this system were the weight of the storage batteries and the pollution of the air by the hydrogen and the sulphur dioxide given off by the batteries. Speed regulation of the propeller motors was effected by a series-parallel arrangement of the batteries.

A speed higher than that given by all the batteries in series was obtained by diverting the motor fields, whilst a minimum speed was obtained by connecting the armatures of the double motors (or two motors on one shaft) in series; the motors, of course, then running on full field and being supplied from the batteries connected in series-parallel for the minimum voltage. With the connections thus arranged, comparatively small starting resistances with only one or two sections were required to protect the batteries against excessive current peaks when starting the motors.

On account of the very limited voltage with the battery system, larger outputs required heavier current-carrying apparatus. Contactors operated from auxiliary circuits were therefore installed. The adoption of contactor control considerably extended the use of battery-driven equipments. A saving in copper and manual labour was effected, the contactors being placed near the motors, whilst the auxiliary control was placed in the most convenient part of the submarine. The batteries and the oil engines could be used simultaneously, the batteries being charged when the demand on them fell below the generator output, the generator output being controlled by its excitation. The fact that all peak loads, when starting or rapidly reversing the propeller

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motors, were taken by the batteries, enabled a considerably smaller prime mover to be used. The Diesel engines were started by momentarily running the generators as motors, supplied from the batteries. The necessity for auxiliary starting apparatus was thus eliminated.

The cooling of the low speed totally enclosed propeller motors was usually effected by small auxiliary motor-driven fans, mounted on or near the main motors (as shown in Fig. 1). In the opinion of the writer, fans concentric with the motor shaft and driven by gearing at three or four times the speed of the motor might prove a satisfactory means of eliminating the auxiliary fan motors usually employed with low speed totally enclosed motors. If, however, the motors be required to work for long periods at considerably reduced speeds, adequate cooling would not be effected, as the speed of the fan varies directly with that of the motor. The gearing would be an additional point of possible failure in plant which must be of exceptionally robust and simple design. Radial vanes, or vanes only slightly biased in the direction of normal rotation, would be required. With auxiliary driven fans having to revolve in one direction only, vanes having a higher efficiency would be designed.

The power demanded from motors and prime movers in marine work can now be accurately determined and, except for slight variations due to the depth of the propellers, the roughness of the sea and the position of the rudder, it is constant for any speed. The assumption can be made that for normal changes in the speed of the ship the torque varies as the square of the propeller speed, whilst the output of the motors varies as the cube of the propeller speed. In spite of the great slip of the propeller when starting, in most cases the torque required is below the normal. The overloads incurred when turning the ship in small circles and when rapidly bringing the ship to a standstill are well illustrated in Figs. 2 and 3.

Fig. 2 shows the results of tests, made in America, on the U.S.S. "New Mexico"—a ship having four propellers, the motors being supplied from two generators. The loads are thus referred to the generators and not to individual motors.

The rudder was fixed at an angle of 35°. The generator supplying the propeller motors on the inner side was overloaded by 45 per cent., whilst the load on the generator supplying the outer motors, fell to almost 70 per cent. of full load. Higher overloads are incurred when rapidly bringing the ship to a standstill by means of reversing the motor, the overload varying with the rate of retardation.

Fig. 3 shows the propeller characteristics determined experimentally by tests on models of the propellers used in

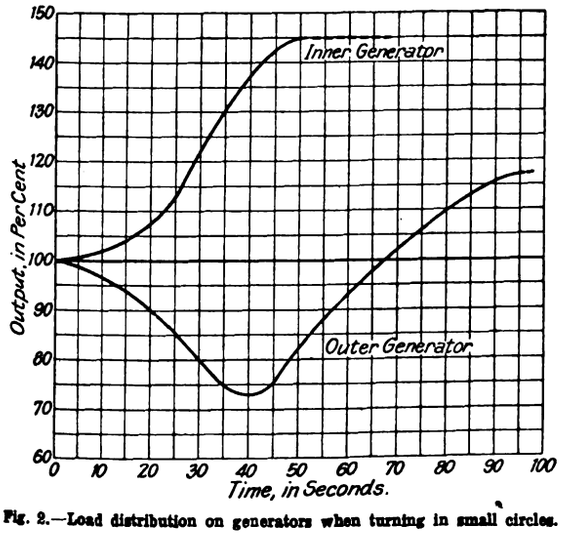

Fig. 2.—Load distribution on generators when turning in small circles.

the "New Mexico," the design of the motors having been based upon these characteristics.

The curve shows the relation between the propeller torque and the propeller speed when the ship is travelling at full speed. Full speed of the propeller, corresponding to the torque required to drive the ship at full speed, is represented by 100 per cent. on the X and Y axis respectively. It will be seen that when no driving power is applied to the propeller, it rotates driven by the water, with a slip of about 27 per cent. If the propeller speed be further reduced by applying a braking torque to the motor, it will be seen that a braking torque very nearly equal to the full load torque is required before the propeller can be brought to rest. The maximum torque occurs at a propeller speed of about 35 per cent.; below this speed the required braking torque falls. A minimum torque of about 42 per cent. must be exerted to keep the propeller at rest whilst the ship continues to travel forward at its full speed. In order to bring the ship rapidly to rest the propeller must now be revolved in the opposite direction and if only the full load torque of the motor were available the backward speed of the propeller would not exceed about 33 per cent. of its normal speed.

To meet the contingency of rapidly bringing the 3 500 ton passenger ship "Cuba" to rest, a braking torque of 200 per cent. of the normal torque was obtained. This ship was

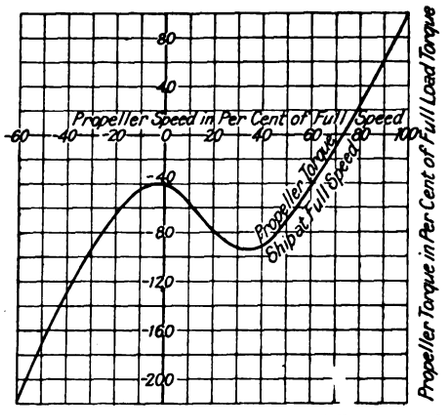

Fig. 3.—Propeller characteristics of U.S.S. "New Mexico."

equipped with synchronous motors yielding 3 000 S.H.P. The propellers could be brought to rest from full speed ahead in 2½ sec., and in 7½ sec. to full speed backward; the ship was thus brought from full speed ahead to a standstill in 140 sec.

With electrical propulsion the determination of the system—i.e., direct or alternating current—is at present largely dependent on the type and output of the prime movers. The whole of the auxiliary plant throughout the ship can be operated by either system. Water, air and oil pumps, compressors for refrigerating and other plant, steering gear, winches, lighting and signalling, etc., etc., can all be operated from the main or auxiliary electrical supply. The motors for the auxiliary as well as for the main electric plant would, as far as practicable, be made interchangeable, so that a minimum number of spares need be carried.

For the main propelling equipment, however, direct current has many advantages. Regulation of the speed and reversal of the main motors can be effected by very simple means and almost without losses whilst the generators are driven at constant speed.

The shunt fields of the main generators and motors are excited by auxiliary generators and the whole of the control is effected by regulation of the fields of these auxiliary generators. Electrical interlocks are provided to guard against starting the main motors on a weak field and to ensure the correct sequence of operations of all parts of the equipment.

The control apparatus can be installed on the bridge, or in any other part of the ship. It is possible to arrange for the whole of the normal operation, from full speed ahead to full speed astern, to be effected by movement of only one lever. With double generator sets and double motors on the propeller shafts the connections would be such that for prolonged travelling at low speeds the generators could be connected in opposition and the two motors in series. The adoption of direct current is, however, limited to comparatively small outputs. Commutation at high speed and at high voltage is not yet without definite limits. Commutation at 1 800 V is practicable, but not at high speeds and high current densities. Several direct current generators could be connected in series, but with low speed prime movers even in this way only limited outputs could be obtained. The plant also becomes heavy and costly on account of the heavy windings required for the large currents.

For large outputs and therefore high speed prime movers, two- or three-phase alternating current is adopted, at voltages from 2 000 to 5 000 V, or even higher.

When designing, the propeller speed is chosen as high as efficiency for the required type and speed of ship permits. With a given propeller speed, the number of poles required

(*Concluded on page* 504.)

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MR. MARCONI ON RADIO COMMUNICATION.

Less Known To-day than Five Years Ago—Theory and Practice Undergoing a Change —Recent Developments of the Beam System.

THE thirty-second James Forrest lecture was delivered at the Institution of Civil Engineers on Tuesday by Mr. G. Marconi, who took " Radio Communications " for his subject.

In his introductory remarks Mr. Marconi said that the subject of radio communication, which had become a most important science and industry, in the future would still be dependent on scientific research and speculation, and already required the sound application of good engineering principles and knowledge for its practical and successful working. He hoped he would not be thought too visionary if he said it was possible that some day electric waves might be used for the transmission of power over moderate distances, should devices be perfected for projecting waves in parallel beams so as to minimise the diffusion of energy into space.

A Radical Change.

We were still far from being able to say that wireless was based on well understood foundations. There was no doubt that speaking generally radio engineers five years ago thought they knew much more about the subject than we thought we knew to-day. Laws and formulas were announced and accepted showing which wavelengths were best adapted for various distances and indicating what amount of power would be necessary in order to be able to communicate over any given distance. Unfortunately, it soon became apparent that the logical application of these laws and formulas led to the necessity of employing such enormous and expensive aerial systems and such large amounts of power for long distance transmission as to make the method so costly in capital expenditure and operation that only a very small margin of profit would remain when the system was worked in competition with modern cables and land lines. He was convinced, therefore, that the whole theory and practice of long-distance radio-communication was undergoing a radical and beneficent change, for the upsetting of so many pet theories was having the welcome result of increasing the efficiency and usefulness of wireless telegraphy to an enormous and almost unhoped for extent, while at the same time it was opening up what might prove to be fertile fields for research.

Over four years ago he had stated that we had got into a rut by confining all our researches and tests to long waves. Up to very recently commercial long-distance wireless telegraphy had been carried out exclusively by stations employing wavelengths from 8 000 to about 30 000 m., and using several hundreds of kilowatts at the transmitting end. These stations included those at Rugby and Carnarvon in this country, at Buenos Aires, in the Argentine, and many others of similar sizes and type in the United States, Germany, France and Italy. Their cost was of the order of £500 000 each, and, owing to the fact that their speed of transmission was not very high, their running expenses were considerable.

Short Wave Experiments.

Continuing, Mr. Marconi said that ten years ago he began to consider a possible alternative of using waves only a few metres in length. He was greatly impressed by the advantages which such a system would possess owing to the saving in energy and freedom from interference. He began some experiments on these lines in Italy, and continued them in consultation with Mr. Franklin at Carnarvon, with the result that in 1917 a range of over 20 miles was readily obtained with a wavelength of 3 m.

At that time the general impression prevailing amongst most experts was that the daytime range of short waves would be very short, that the night ranges, though occasionally considerable, would be variable and freaky and, therefore, unreliable, and that any considerable stretch of intervening land, especially if mountainous, would seriously reduce the distance over which it might be possible to communicate.

Tests carried out between Poldhu and the " Elettra " in 1923 showed conclusively that the daylight ranges were very much greater than had been anticipated, that the night ranges were reliable, and that intervening land constituted no obstacle. Moreover, atmospheric electrical disturbances were very much less troublesome than with long waves and fading proved to be much less serious than was anticipated.

Experiments made in 1924 proved satisfactorily that daylight absorption decreased very rapidly with the shortening of the wavelength below 92 m, a discovery of great practical importance, and one which raised scientific questions of the highest interest.

Having briefly referred to the appointment in 1924 of a sub-Committee of the Cabinet to consider proposals for the employment of a short wave system for Imperial communication, and the resulting work which had led up to the successful establishment of short wave communication between this country and Canada, Mr. Marconi went on to say that the working of these stations had shown that atmospherics had ceased to exist as a serious hindrance to the working of high speed radio between England and Canada. The use of reflectors also had the advantage of diminishing fading, and that when this did occur it could be got over by using still shorter waves.

It was known that the ether was becoming very congested over a considerable range of wavelengths, and it might be well, therefore, roughly to figure out the number of channels which could be used without danger of mutual interference. If it was assumed that long waves might be classed between 5 000 and 30 000 m., and short waves between 5 and 100 m., on the basis of the rule adopted by the Government Committee for submission to the next International Radio Conference, there were 3 700 wave bands practicable for short waves between 5 and 100 m. and only 90 for the long waves between 5 000 and 30 000 m. In addition to this very great advantage of the short waves there was the further one due to the possibility of restricting a large proportion of their power within a narrow angle. The screening effect of the reflector at the receiving station also reduced the possibility of interference, and tended to increase the number of separate services which could be worked by means of these waves.

High Speed Working.

Very high speeds of working were only possible if short waves were employed, and there was no theoretical reason why, with a frequency of 3 000 000, the possible speed should not be 200 times as great as that attained with a frequency of 15 000.

The high power long wave stations in this country were capable of transmitting and receiving each way at an average speed of 20 words per min. over a daily average of 18 hours, but the beam stations have already been proved capable of working at an average speed of at least 100 words per min. for 18 hours. With cables the capital cost of the cable itself increased in direct proportion with its length, but in experimenting with short wave wireless it had been noticed that it was possible to send messages to Australia with an even smaller amount of electrical energy than was necessary to send them to Canada.

Beam stations were absolutely essential for such a service, as it would require an enormous amount of power to obtain the same average signal strength in any other way. The results obtained on the Canadian service had convinced him that a good directional system was the system of the future for point-to-point radio communication over long distances. The beam system, moreover, was not by any means limited to wireless telegraphy. He felt confident that it could be utilised for placing wireless telephony on a much more practical basis than it was at present, besides helping the systems of picture and facsimile transmission, including television. It might also be of assistance to broadcasting.

Trade Publications.

British Insulated Cables Ltd., Prescot, Lancs, send us their catalogue (P. 199) of " Prescot " terminal boxes and sealing ends. This is an elaborate publication, consisting of 40 pages of useful information and reproductions of drawings of boxes suitable for various types of cable.

Tucker adjustable grid boxes for flush mounting are described in folder S1, emanating from J. H. Tucker and Co., Ltd., King's Road, Tyseley, Birmingham. The grids are of steel, and the bases of black enamelled cast iron. A feature of these boxes is that the switch plate is held firmly against the heads of the adjusting screws, which rise and fall with the grid, and are therefore always at the correct distance from the switches.

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NEW BARTON GENERATOR.

The Largest in the Country—Combined Main and House Set.

A TURBO-ALTERNATOR set of 41 000kW capacity has been ordered from the Metropolitan-Vickers Electrical Co. by the Manchester Corporation. It is to be installed at the Barton power station and will bring the capacity of that station up to 119 000 kW.

The turbine will be of two-cylinder design with duplex exhaust in the low-pressure cylinder. It will operate at 1 500 revs. per min., under the existing steam conditions of the station—viz., 350 lb. per sq. in. gauge pressure, 700 deg. F. total temperature and 29 in. vacuum at the economic rating (32 800 kW). Provision will be made for multi-stage feed heating to a feed temperature of 300 deg. F. at the economic rating.

The Largest Alternator.

The main alternator is the largest which has ever been ordered in this country, a single unit of 50 000 kVA capacity. The weight of the machine will be 161 tons. The rotor will be a single forging 31 ft. 6 in. in length and weighing 61 tons. This alternator will be direct coupled to the turbine and will generate at 6 600 V 50 periods. It will be ventilated on the Metropolitan-Vickers patent closed circuit system, part of the air being supplied by fans mounted on the rotor and part by a separate motor driven fan.

An auxiliary alternator of 1 250 kVA capacity at 420 V for house service will be direct coupled to the main alternator, together with two exciters, one for each machine, which are mechanically built as a single unit.

The present generating equipment of Barton power station includes three 25 000 kW turbo alternator sets supplied by the Metropolitan-Vickers Electrical Co. The new set will conform to the arrangement adopted in the existing sets in that the main alternator will be permanently connected to 33 000 V step-up transformers, with switching carried out on the high-tension side.

State Aid in Industry.

Inauguration of Meetings to Discuss Aspects of Individualism.

THE first monthly luncheon of the Individualist Bookshop which has been established to bring under one roof and into one catalogue all existing non-socialist publications, and to make them more readily available, was held at the Hotel Cecil on Tuesday, under the presidency of Sir Ernest Benn. At these gatherings it is proposed that a short address shall be given on the various aspects of individualism, and an admirable beginning was made by Sir Hugh Bell in the address he delivered on "State Aid in Industry."

Introducing the speaker, Sir Ernest Benn said the world had now almost reached the stage when no man could work until his union had decided the terms, conditions, and amount of that work; when no business man could take an order until his association had decided the conditions governing that order; when almost every action required its appropriate passport, with numerous *visas*. He calculated that as a nation we spent as many hours sitting on committees as we did in normal times digging coal.

In the course of his address Sir Hugh Bell remarked that for the last 40 years there had been developing an insidious disease which might be called "sloppy sentimentalism." This had undermined gradually the great characteristics which used to be almost peculiar to this island, and which were embodied in the spirit of personal enterprise. Men had been led to suppose that there was something outside themselves which would get them what they desired. The coal trade dispute was a typical example of how not to do things. If only the Government had left the parties alone from the beginning they would have settled this dispute among themselves. The difficulties were not to be overcome by boards of arbitration or Royal Commissions. They must get people to believe that commerce was co-operation and not conflict, and that the only bargain that was good was one from which both parties derived benefit. The country needed to get back to the position in which the Englishman held his own all over the world without any assistance from the Government.

ELECTRICAL DEVELOPMENT

Widened Scope of Electrical Industry in Recent Years.

IN the course of his address as chairman to the North Eastern Centre of the Institution of Electrical Engineers on Monday, Mr. J. Rosen, said commencing as a Society of Telegraph Engineers, the Institution now occupied itself with the advance of the entire electrical engineering industry and its allied branches. In proportion as the scope of the Institution's activities had widened so had the electrical industry itself expanded. The science of electricity in enlarging its field of commercial use touched the boundaries of many other sciences, and invaded the most unexpected territories.

Considering present day advances we were now confined to what might be termed minor technical details pending the discovery of some new principle.

In the field of electrical power generation, considerable advance was being made by the use of pulverised fuel, and several important developments might be looked for in the near future. Further problems which were receiving the uninterrupted attention of engineers were the discovery of a cheap, efficient and durable storage battery capable of storing a quantity of electrical energy comparable with the output of our largest generating stations, which would get over the poor load factor and many other difficulties; the switching of large powers at high voltages and the introduction of a high voltage alternator eliminating step-up transformers; research into both mechanical and electrical materials used in electrical machinery; and several others. The possibilities of greater exploitation of electricity in this country were clearly shown by the enormous developments in power utilised abroad.

Apart from developments of purely scientific and technical interest, there were even broader problems to be faced in the economic investigation of workshop methods to bring about improvement in quality and increase in output of our products. This involved problems of education and training, and it is essential that the best methods should be discovered of making available an adequate supply of trained and skilled staff who should be utilised to the fullest extent by a proper delegation of work and responsibility. This was absolutely essential to commercial and engineering success.

The evolution of the most suitable system of education and training of the student engineer continued to receive the closest attention, and nowadays considerable facilities were provided by the industry. The magnitude of a modern electrical undertaking was such that an employer had perforce to be represented by a welfare supervisor whose duty it was personally to look after the interests of the young engineer, and to see that he was given a fair trial. Welfare supervisors had now formed an association by means of which they meet and exchange ideas to the benefit of all concerned.

A representative example of a scheme of apprentice training served to show the trend of modern ideas, namely, the benefits to be gained by the student engineer from workshop experience and close association with the workmen; and on the other hand, the increasing necessity for the higher training of the whole personnel including both management and workmen.

Further assistance in the training of young engineers is given by the formation of local centres of the Institution, and the instigation of informal discussions in which no one need be afraid of putting forward an opinion. For the industry as a whole, great energy and application of its members are essential in order to effect further progress, and some apt quotations from the published writings of scientists and engineers of experience may well be pondered by the younger generation.

Export of Power.

FOLLOWING on the discussion on the interchange of power between countries, which took place at the Basle World Power Conference, it is interesting to learn that an agreement has been reached between the Governments of Quebec and Ontario, under which the export to the United States of the power developed at the Carillon Falls on the Ottawa River will be prohibited, and the energy divided between the two provinces. The contract with the National Hydro-Electric Co. for the development of the Carillon Falls will cover 75 years, and the company is required to spend £8 000 000. It will also pay a rental of £5 000 plus 25 per horsepower. The power, which will be supplied to Ontario, will be distributed by the Ontario hydro-electric system.

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Electrical Propulsion of Ships.

(*Concluded from page* 501.)

increases in direct proportion with the frequency. With induction motors, an increase in the number of poles means larger and heavier motors, an increased magnetising current and therefore a decreased power factor.

When designing the plant, the number and size of the alternators has to be determined with regard to the difficulties which exist when running alternators in parallel for ship propulsion. Apart from the auxiliary methods of varying the speed of the propeller motors, the speed is largely controlled by varying the frequency, i.e., by varying the speed of the prime movers. The difficulty of simultaneously varying the speed of two or more sets is perhaps greater with Diesels than with turbines. It will be seen that in the design of alternating current motors for ship propulsion the special characteristics due to change of frequency have to be taken into account.

The type of motor and the method of varying the speed will depend partly upon the service of the ship. Many ingenious and economical methods of changing the speed of the motors are possible: pole changing on the motors, pole changing on the alternators, i.e., frequency changing, cascade connections, etc., etc. Of these methods, however, pole changing on the motors is mostly used in ship propulsion, in conjunction with frequency changing by varying the speed of the prime movers.

Braking Torque.

The choice must be made between synchronous and induction motors with regard to the braking torque required and the method of control. It has been seen from the curves (Figs. 2 and 3) that the demands on the motors are greatest during rapid retardation of the ship. Induction motors having wound rotors would require very large resistances, whilst ordinary squirrel cage motors would be quite unsuitable.

A special squirrel cage induction motor has been developed, having practically all the advantages of an induction motor with a wound rotor, without the disadvantages. Two squirrel cage windings are built into the rotor. The outer, high resistance, low reactance winding takes the place of the rheostat when starting and reversing. The inner, low resistance, high reactance winding is in use when the motor runs at normal speed. The functioning of the respective windings is, of course, entirely automatic. When starting or reversing, the frequency of the induced rotor currents is a maximum. The inductive effect of the low resistance winding chokes the flow of a heavy current, whilst the high resistance but low impedance winding allows the heavy starting current to flow. The frequency of the induced rotor currents decreases inversely as the motor speed increases and so the flow of current in the inner winding increases whilst the current flow in the outer winding decreases.

With these special squirrel cage induction motors the switchgear is very simple. With synchronous motors, however, the direct current excitation involves auxiliary switchgear. When synchronous motors are employed, they are started as induction motors through the damping grids, the frequency of the supply also being reduced (by reducing the speed of the prime movers and not by pole changing on the alternators). After the motors have pulled into step, they are fully excited and run synchronously with the alternators to full speed.

Rapid reversal of the synchronous motors is effected in a similar manner. The speed of the prime movers is reduced to about one-third, the excitation of the alternators and motors being also reduced. The connections of the motors are changed for the reversal, the motors then run as alternators driven by the propellers. At this point the excitation of the motors is further reduced whilst the excitation of the alternators is strengthened. When the motors pull into step, in their reversed direction of rotation, the speed is increased synchronously with that of the alternators, as at starting.

Although the electrical propulsion of ships is still in its infancy, it seems to be assured of a bright future.

Books Received.

"Electric Lighting and Power Distribution." Vol. I. By W. Perren Maycock. (London: Sir Isaac Pitman and Sons.) Pp. xiii+562. 10s. 6d. net.

"Tables Annuelles de Constantes et Données Numériques de Chimie, de Physique et de Technologie." Vol. V. Part II. (Paris: Gauthier-Villars et Cie.)

REVIEWS.

"Die Fernsprechanlagen mit Wählerbetrieb." By Dr. Ing. Fritz Lubberger. (Munich: R. Oldenbourg.) Pp. xiii+277. M.11.

It is perhaps a tribute to this work that a third edition should be published so soon after the second, which appeared in 1924.

In the main the treatment is the same as in the second edition, but there are several differences in detail. Principal among these is the inclusion of considerable new material, especially in respect of the Automatic Electric Co.'s director system (now being installed in London) and the rotary system of the Bell Telephone Manufacturing Co. of Antwerp. A fresh chapter has also been introduced on power supply.

For the sake of those who have not seen the previous edition, it may be well to summarise the contents of the book. An outline of the principles of automatic working is followed by brief descriptions of apparatus and by the application of the principles to exchanges of 100, 1 000, and 10 000 lines. Traffic matters are next dealt with and then follow detailed apparatus and circuit descriptions, and chapters on metering of calls, trunking methods, and various special problems. At the end of the book circuit descriptions of the following system appear:—Siemens and Halske (as used by the German Post Office), the Automatic Electric Co.'s Director, the Rotary and the Ericsson.

The treatment of the subject is clear and comprehensive, and the value of the work is increased by a bibliography and by frequent references to German patents. G. F. O'Dell.

Engines of High Output. By H. E. Ricardo. (London: Macdonald and Evans.) 8vo, pp. viii+110. 7s. 6d. net.

We are always glad to read anything from the pen of Mr. Ricardo. This little volume is an interesting addition to his two large volumes on the internal combustion engine.

The keynote to the book is given in a paragraph from the author's conclusion:

"Many engines of all shapes and sizes are submitted to the author's laboratory to test every year, but throughout, all the records tell the same story, namely, that the engines which will run a complete series of tests without failure and loss of tune are in every case the efficient engines, that is, those which make the best use of the air they consume, and that troubles with carbonisation, pitted or burnt valves, and gummed up piston rings belong only to those which are not efficient."

This sounds like glad news and gives additional reasons for watching the "miles to the gallon." The argument ably followed out deals really with the high proportion of utilised heat as "work" to "waste heat" as absorbed by metal parts in an engine of the highest efficiency.

We are therefore to understand the title not as referring to large engines, but to the degree of output obtained from a given cylinder volume.

The book deals almost entirely with the physical and chemical aspects of cylinder reactions, and is intensely interesting in two directions. One of these is the effect produced by a late opening of the suction valve in cooling the residual gases (volumetric efficiency) and the other is on the considerations relating to detonation (maximum temperatures and compression ratios).

We can heartily recommend the book to thoughtful readers and note that we are promised a further volume on the constructional side. W. M. Selvey.

The Canadian Beam Service.

(*Concluded from page* 498.)

about 30 000 cycles, at which frequency it is subjected to three more stages of high frequency amplification. This second filter amplifier is similar to the first, except that the band is only 5 000 cycles wide. The signals are then again rectified. In order to provide a means of checking the signals when passing to the line an audible frequency oscillation (Fig. 2) of 1 200 cycles is superimposed on the first heterodyne, so that when the incoming signal is heterodyned the resulting frequency passed through the first band filter amplifier has an audible note superimposed upon it, and at the end of the circuit, after the final rectification, a single valve circuit tuned to this note frequency is coupled to the main circuit. By this means it is possible to listen to the signal, which gives a perfectly steady note of constant strength at two points without the necessity of using an oscillator at either point to give an audible beat frequency, even if the frequency of the incoming signals are varying, provided the variation does not cause the first beat frequency to alter so much that it occurs outside the band limits of the first filter amplifier.

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FALSE PROPHETS.

An Electrical Manufacturer Says Electric Irons are Dangerous.

THE electrical industry has long treated with an attitude compounded of irritation and contempt the heresy, which is held by the uninitiated, that all fires are caused by the fusing of an electric wire. It is so palpably false that it seems a pity to deprive the reporter and the Chief of the Fire Brigade of the use of a high-sounding phrase and to force them to cudgel their brains for some expression which, though less grandiloquent, would be more truthful. For statistics show that in reality few fires are caused by electricity. Or, if statistics be suspect, the fact that insurance companies do not demand increased premiums where electric lighting is installed is a sufficient testimonial to its safety. Moreover, it cannot be said that the public have shown any great reluctance to instal electric light on account of its danger.

These minor prophets of falsehood might, therefore, be left to be fused by their own wires were it not that they have recently received a recruit. The assertion that electricity is dangerous, made partly in ignorance and partly for propaganda purposes, enters, with the advent of this recruit, a new phase. Attempts are now being made to check the increasing use of electric irons, and these attempts, curiously enough, are being made not by the flat iron makers or the gas iron interests, but by an electrical manufacturer.

The electric iron is used in thousands of houses in this country owing to its convenience, efficiency and ease of control. It is not fool-proof, for if it is left unattended on circuit it may overheat and cause trouble. Whether attempts should be made to rid it of this disability, or whether the good sense and frugality of the housewife should not be depended upon to remedy what is after all a very small matter, are two conflicting views that are at least open to argument. But what is not open to argument is the evil of asserting that, because fires occasionally occur when electric irons are misused, their use should be condemned, unless a particular device, which is designed to overcome the disability that has just been mentioned, is employed. It is bad salesmanship to decry a rival product. It is still worse salesmanship to make statements which will damage a flourishing industry, including incidentally the product in whose interests the statement is made.

A Boomerang Effect.

For if the public once get the idea that electric irons are dangerous they will not distinguish between those which are said to be safe and those which are said to be unsafe. The manufacturer of almost any product could dig out of the daily journals snappy paragraphs and flaunting headlines and use them to show that his rival's goods were more dangerous, more contaminated or less efficient than his own. But that is not business; it is murder and subsequent suicide of the murderer. It is legitimate to state the good points of one's own product, but to emphasise the weaknesses of a rival's goods has a boomerang effect, which is, to say the least of it, undesirable.

Coming from the general to the particular we hope that the attempts which are now being made to over-emphasise the remote dangers of the electric iron in the interests of a certain safety device will cease. That such attempts are being made is obvious both from newspaper paragraphs and advertisements. The British Electrical Development Association have called the attention of the manufacturers concerned to the matter. They have received the reply that the safety from fire hazard is their principal selling point, and that if the technical Press refuse to give publicity to the matter their only course will be to appeal to the public through the daily Press. This is a threat which the technical Press can afford to ignore, and of which we hope those who made it will speedily see the foolishness. They can easily find some other way of stating the advantages of their products without antagonising the whole of the electrical forces of the country.

A new box-making factory to accommodate about thirty machines is being erected by William Fiddes and Son, Ltd., Torry Sawmills, Aberdeen. All the box-making machines will be fitted with individual electric drives. The firm is generating its own current. A new electrically-operated plant for exhausting the sawdust and delivering it to the furnace is also being installed.

CORRESPONDENCE.

"ORTHODOX"—"CONVERSE"—AND "————"

[TO THE EDITOR.]

SIR,—The article in the current issue of THE ELECTRICIAN on "Electricity Supply and the Consumer" is a rather curious study of statistics.

The author presents two items from the Weir Committee Report as inconsistent. The Report, however, does not connect them. They are independent and unrelated, so far as anything that appears. The curve copied from the Report purports to show the relation between the independent variable—the average price per kilowatt hour and the dependent variable—kilowatt hours sold per head. It must be assumed that the figures on which it is based were so taken as to exclude so far as possible the effect of other variables which obviously affect the dependent variable.

Mr. Blaikie says that from an inspection of the curve "the orthodox school will claim that the price is likely to fall to 1·05d. when the output reaches 500 per head." This is an inversion of the independent and the dependent variables. The true inference from the curve is that *under the circumstances and at the time* to which the data relate a price of 1·05d. per kWh will result in a consumption of 500 kWh per head.

At any rate the Weir Committee made no such "converse" calculation.

Paragraph 14 states that the figure of consumption in 1940 is based upon the present annual increase of 19 per cent., and that it is problematical if an output of 500 kWh per head would be attained if existing methods continued, resulting—so they are advised—in an average price of from 1·5d. to 1·75d. So the Committee here took the "orthodox" view. But they go on to say, supposing 500 kWh per head is reached, then at the two extremes of the calculated results of the continuation of present methods the cost to the consumers will be so many million pounds. This is simple arithmetic, independent of any assumed relation between cost and consumption. It does depend upon the accuracy of the estimates of its technical advisers of the price results of continuing on present lines.

The figures given in Table 4 of the Weir Report correspond to an annual increase of 10·2 per cent. compound between 1923 and 1940. My criticism of this calculation is that if the average price can be brought down from 2·047d. to 1d. or under, progressively, the rate of increase has been taken very conservatively.

Mr. Blaikie estimates the price from continuing on present lines up to the consumption of 500 kWh per head annually as 1·061d., against those of the Committee's advisers of 1·5d. to 1·75d. There is here a difference which one cannot examine in the absence of the corresponding figures of those advisers.

But when Mr. Blaikie comes to put his 1·061d. against the Report figure of 1d. or under, he makes a very serious misquotation from the Report, viz., he puts down the capital under the Weir scheme as £561 millions, whereas the Report figure is £399·5 millions. He has added the present capital invested—£161·75 millions—to the capital at 1940, whereas it is quite clear from the Report that the £399·5 millions includes the present capital, doubtless with due regard to amortisation, etc.

Mr. Blaikie gives the capital per kW demand on present lines as £64·6; the Weir Report figure is £49·2, not £69·2, as he states.

It is not necessary to show that this leaves the Weir average price below his own calculated 1·061d., and besides this large correction it is hardly necessary to say that there is nothing in the Report to show that the estimated price of 1d. excludes undertakers' profits, which Mr. Blaikie gratuitously adds to the tune of 0·222d. per unit, though the addition exceeds the saving which he claims for following present methods.

What precisely Mr. Blaikie means by "converse" and "orthodox" schools is not made clear; presumably he is orthodox and the Weir Committee's advisers are "converse." I wonder if there is a "perverse" school?—I am, etc.,

HENRY M. SAYERS.

Streatham.
October 25th.

Mr. John Charles White seeks leave to amend the specification of letters patent No. 246 599, granted to him for "Improvements in electric lamp holders and like electric couplings."

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NEWS IN BRIEF.

Slot Meters for Heating Hotel Bedrooms—Electrical Refrigerators for Housing Estate—West Ham Results—The Agreed Municipal Trading Clause.

CAUSES of boiler accidents were dealt with by Mr. R. Kenyon at the Junior Institution of Engineers last Friday.

The proprietors of Llandudno Hydro seek permission to instal slot meters in the hydro bedrooms for heating purposes.

Hackney (London) Borough Council has invited tenders for the construction of an electricity sub-station at Stamford Hill.

Salford Corporation has invited tenders for the erection and completion of electricity showrooms and offices in Chapel Street, Salford.

Mr. G. N. Marriott delivered an interesting address on "The Romance of Electricity" before the Sheffield Engineering Society on October 19th.

Shanghai Municipal Council requires four charge engineers, one meter and testing assistant and one assistant controller of stores, in the Electricity Department.

Kincardineshire Education Authority has decided to instal electric light in the Kirkhill school on Lower Deeside and also to arrange for a similar installation at the schoolhouse.

News has been received by Crompton and Co., Ltd., that the electrical equipment supplied by them for Lhasa, the "forbidden" city of Tibet, has now been successfully installed.

A deputation representing the Association of British Chambers of Commerce submitted to Col. Wilfrid Ashley, M.P., last Friday proposals for the amendment of the Electricity Bill.

The incandescent oil lamp previously used on the Pendeen Lighthouse has recently been replaced by a gasfilled electric lamp, specially made by the General Electric Co. The lamp consumes 4 kW.

Councillor G. Gratten has contracted to instal a "Kelvinator" automatic electric refrigerator in each of the 2 500 houses now being erected on the Eden Park estate at Beckenham, Kent.

An electrical exhibition was held in the Victoria Halls, Helensburgh, from October 20th to 23rd, inclusive. The exhibition was promoted by the Clyde Valley Electrical Power Co., by whom electricity is now supplied to the town.

Promoted by Harwich Electricity Department, an attractive electrical exhibition has been held at the Drill Hall, Dovercourt. At the opening ceremony it was stated that 284 applications had been received under the assisted wiring scheme.

It is not expected that the first automatic telephone exchange in London will be opened before next April. The tandem exchange, which will act as a link between the manual and automatic systems, will be ready by the time the automatic system is put into operation.

Fylde Guardians have given consideration to the question of lighting the Institution by electricity. Only one firm sent in an estimate, and the Board has decided to ask its architect to draw up specifications for the wiring and supply of fittings, and to invite tenders for carrying out the work.

When a Banff electrical contractor's application for payment for a £300 hospital lighting installation was discussed by the trustees the chairman said they had no money, and one of the trustees said he feared the installation "would have to pay itself." Finally it was agreed to endeavour to raise funds for the purpose.

About 50 members of the Electrical Association for Women visited the Leyton works of the London Electric Wire Co. and Smiths, Ltd., last Wednesday, where they were received, in the absence through illness of the managing director, Mr. E. Leete, by Mr. B. Hawke, works manager, and Mr. G. C. Burnand, sales manager, and after touring the works, research laboratories and power house, were entertained to tea.

Just under 7 000 people visited the West Ham electrical exhibition, and of this number nearly 2 500 paid 6d. for admission. Already as a direct result of the exhibition (Mr. F. W. Purse states) orders have been received for 26 electric cookers, 40 radiators, 6 washers, 4 water heaters, 1 vacuum cleaner and 60 lighting installations. From the Electricity Department's Information Bureau alone, 58 000 pieces of propaganda literature were distributed.

A Japanese company is being formed to construct an electric railway around Mount Fuji.

Prospects for engineers in China were discussed by Mr. R. L. Sarjeant in a recent Junior Institution of Engineers lecturette.

The new hydro-electric installation at Alto Serra, Brazil, was inaugurated last week by the President of the State of Sao Paulo.

Dartmouth Commercial Association has decided to hold a trade exhibition in February. It will be confined to members of the Association.

An effort is being made to provide municipal houses at Halifax to be let at 5s. per week, plus rates. The houses will be lighted electrically.

An electric clock made by boys under 15 years old has been placed in the hall of the Lyulph Stanley Central School, Camden Town, London.

Sheffield Tramwaymen's football team defeated the Mexborough Tramways team by 4—1 in the first round of the National Tramways Shield on October 21st.

The inaugural meeting, on November 17th, of the new Wireless Section of the I.E.E., South Midland Centre, will be addressed by Prof. C. L. Fortescue, chairman of the Institutions's Wireless Section.

A direct Anglo-Swiss telephone service, without intermediate switching in France, is to be provided by the extension to Switzerland of two or three circuits of the latest Anglo-French telephone cable. It is hoped that the service will be available early in the new year.

December 3rd is the date fixed for the Manchester Electrical Engineers' Dance at the Midland Hotel, Manchester. Details are obtainable from Mr. J. Harcourt-Williams, King's House, King Street West, Manchester, or from Mr. G. H. Fawcus, 60, Stamford New Road, Altrincham.

Particulars of a new Research and Experimental Section at the forthcoming annual exhibition of the Physical and Optical Societies can be had from the Secretary, the Physical Society, Imperial College of Science and Technology, South Kensington, London, S.W.7, not later than November 16th.

Each of the first two lectures of the E.L.M.A. Evening Illumination Design Course has been well attended by representatives of all sections of the industry. In the next lecture on November 8th, Miss Florence Hodge will discuss "The Art of Home Lighting." This will be illustrated by demonstrations with the "revolving" house.

Blackpool Corporation is dismantling the Autumn illumination fixtures, the "season" having been abandoned through the coal dispute. The electrical engineer states that as there is no prospect of an early settlement of the dispute there seems no possibility of the illuminations being continued this year. About 90 per cent. of the materials will go into stock and may be used another year.

From an electrical point of view one of the most noteworthy stands at the Liverpool Civic Week Exhibition was that of Automatic Telephone Manufacturing Co., Ltd. The A.T.M. (Strowger) automatic telephone system was demonstrated by means of a standard chain of switches, including rotary line switches and connectors, visitors being given facilities for making calls and familiarising themselves with the operation of the dial.

The annual Ladies' Evening of the Birmingham Electric Club was held last Friday at the Grand Hotel, Birmingham, and took the form of a ball, with a whist-drive for non-dancers. Approximately 350 guests participated, and the evening was a great success. The Grosvenor Room and the adjoining lounges were specially illuminated under the direction of the General Electric Co., Ltd., and Metro-Vick Supplies, Ltd., with the assistance of E. Hill and Sons.

A memorandum regarding an agreed municipal trading clause for insertion in the Electricity (Supply) Bill 1926, is being circulated to members of Parliament. It is signed on behalf of the Accumulator Manufacturers', British Electrical and Allied Manufacturers', Electrical Accessories Manufacturers', Electrical Contractors', Electric Light Fixtures, Electric Lamp Manufacturers', and Incorporated Municipal Electrical Associations and the Electrical Wholesalers' Federation.

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"WIRING THE HOMES OF BRITAIN."—IX.

Electrical Contractors' Association Makes Further Contribution to Campaign—A New Poster and a Cardboard Model—Latest Reports from Districts.

ON Wednesday, the nearest approach to a "Wiring the Homes of Britain" barometer—the total number of competition booklets disposed of—had reached 800 000, an advance of 50 000 on the total of a week ago. Considering the time the campaign has been in operation this result is not bad, but it will have to be improved upon very materially in coming weeks if proper advantage is to be taken of the business-promoting possibilities of the electrical industry's great co-operative scheme. These booklets must be bought and circulated in very much larger quantities to the public, and in this connection it should not be overlooked that the competition books are very valuable propaganda, apart from competition considerations.

A Contractor's Confession.

One contractor recently told THE ELECTRICIAN that even if there were no advertising to the public, and no £2 000 competition, it would pay him to buy the booklets at a penny a time solely for their value in instructing the public in a clear, non-technical way, in the latest and best methods of home lighting. With this view we are entirely in agreement. Nobody could produce this information at a cost so small, and it is difficult to understand, not why so many people are enthusiastic campaigners, but why any single person in the electrical trade should have failed to obtain a supply of booklets.

Quite a number of electrical contractors who have purchased competition booklets still have no indication in their windows that the booklets are obtainable inside, and just wait for people to come in and demand a booklet. Even if it is not possible to make up the full competition window display, everybody can find room for one of the variety of small posters drawing attention to the campaign. Incidentally, a new and cheaper poster in colours has now been produced for use on hoardings and/or in shop windows. It costs 3d. for a single copy, and is supplied in quantities at the rate of 25s. per 100.

As stated in earlier articles, the special campaign window displays are intended to be changed every month, and the November display (illustrated on this page) is appropriately devoted to electric heating. Full instructions for making the display are given in "Home Lighting News," No. 3. In this fit-up, specimens of which can be inspected at the Lighting Service Bureaux in London, Newcastle, Glasgow and Manchester, various types of electric fires are displayed, in conjunction with the same background unit and competition poster as were used in the first month's display. The great merit of these special displays is that they allow traders to show just what they ought to be showing each month, and yet link up the window with the national effort.

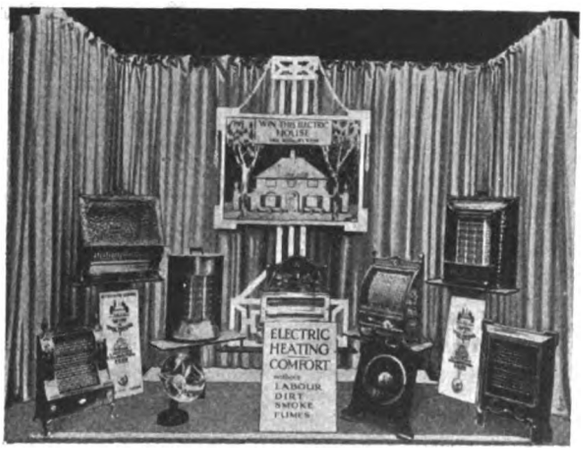
Every electrical activity should be linked up in some way with the campaign. The industry is paying for it and should make the best possible use of it.

On Linking-Up.

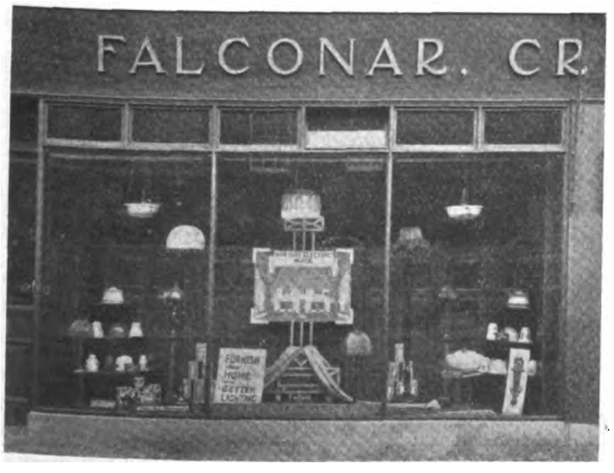
In one big city there has been a special electric house exhibition where, apparently, no effort was made to interest people in the campaign. To a great extent, therefore, the success of that exhibition has been lessened by the failure to link up. Glasgow Corporation Electricity Department, to quote just another case, has been putting out some really splendid large-space advertising on domestic lighting in the newspapers, but there has been no reference to the competition. While it is not essential that all electrical advertising to the public should be primarily devoted to the campaign, every advertisement should certainly make some incidental reference to it.

An attractive cardboard model of the prize electric house has been produced and will be supplied to electrical traders by the E.D.A. if sufficient orders are received to allow the models to be made at an economic price. If at least 500 are ordered the cost will be 5s. each, but a smaller total quantity would materially increase the price. This consideration applies

ON the right is seen the special Campaign window display for November as fitted up at the E.L.M.A, Lighting Service Bureau at 15, Savoy Street, London. It is hoped that this topical display will be reproduced in all electrical contractors' and municipal showroom windows during the coming months.



BELOW (left) is a good example of the first Campaign display in the window of Falconar, Cross and Co., at Newcastle. The other picture shows the effective appearance by night of a similar display which has attracted considerable attention at the Birmingham Electric Supply Department's showrooms.



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to certain posters and other campaign helps, so that campaigners should send along their orders as early as possible to ensure the cheapest unit price.

One of the free competition aids which should be better known is E.D.A. 1004, a 16-page booklet containing a lecture on electric light in the home, and suitable for delivery before groups of the general public. The lecture may be read by any person to any audience, the only condition being that no specific recommendations be made as regards particular makes of fittings and lamps. Demonstration equipment is advised wherever possible, but where fittings and lamps cannot be demonstrated conveniently the use of a complete set of

Reproduction of a striking announcement which appeared beneath a recent E.D.A. advertisement in the "Glasgow Herald."

24 lantern slides is advised. The slides can be loaned on request from the E.L.M.A. Lighting Service Bureau, 15, Savoy Street, London, W.C.2.

The portable revolving electric house devised some time ago by the E.L.M.A. Lighting Service Bureau is recommended for use in connection with the campaign, and a booklet has been produced describing its construction and operation.

The Sheffield "Blades" Again!

Contractors are in many places backing up the national advertising by contributing towards the cost of local publicity, and several instances of this kind have been referred to in recent issues. The Electrical Contractors' Association has given a further 200 guineas towards campaign expenditure, and the Sheffield E.C.A. branch has contributed 100 guineas for local campaign purposes.

Most contractors take the trouble to rubber-stamp their name and address on the backs of their competition books, but Mr. R. Moore, registered contractor, of Longsight, pastes on the back of each book a printed slip bearing the following words :—

"In handing you this booklet we take the opportunity to advise you that we can supply any of the electrical apparatus described herein. The rates of charge in the Manchester area are the lowest in the country, the charge on the all-in tariff being only ½d. per unit, plus a fixed quarterly charge dependent on the rateable value of the house. Electric cooking is now making great progress in Manchester, and cookers, complete with kettle, can be hired from 5s. per quarter. Enquiries on any of these matters will be welcomed."

By way of contrast, a certain contractor, who shall be nameless, told a customer who asked for a competition booklet that he had only got one and he couldn't spare it! It was discovered that the one booklet in question was the one enclosed in the explanatory campaign folio, and none had been ordered by the contractor.

Encouraged by the success of the first demonstration electric homes, Electrical Circles in many of the districts are now arranging similar demonstrations. As stated elsewhere, Birmingham's first house will soon open and Dewsbury and Batley are arranging demonstration houses. Goole and Harrogate are proposing to equip a house each for this purpose, and Southport contractors are making enthusiastic preparations for a local house exhibition. At Denton (Manchester) a local electrical contractor and a builder have expressed their willingness to finance a demonstration home, and work is well in hand at Lincoln and Aberdeen for a similar display. As previously recorded, two further houses have been opened in the Newcastle area, at Gosforth and at Tanfield.

A Call to the Coasts.

Progress in the formation of Electrical Circles is maintained, but many more of these informal committees are needed, particularly in Greater London and around the coasts. Down the centre of England the Circle density is satisfactory, and there is no reason why the coast towns should not make a better showing; for the purposes of this campaign many of them possess even richer possibilities than the industrial districts, where so far Circle activity has been greatest.

It should be emphasised that an Electrical Circle is not a formal committee with the necessity for keeping minutes and conducting its meetings by an agenda. It is rather a local talking centre about campaign activities. Its members, which should include any and all electrical men in the district, should meet together periodically, say once a week, to discuss means for linking up the campaign with any local event, ways in which, by joint action, interesting campaign possibilities can be explored and demonstration homes arranged, and to exchange experiences of the working of the campaign. Meetings can be held in the supply engineer's office or showroom, in a contractor's establishment, or at some local refreshment centre. Advice on any points about which there is any doubt is willingly furnished to Circles either by campaign headquarters or by the district officer.

In addition to the Circles, the formation of which has already been reported in THE ELECTRICIAN, we are advised by headquarters that the following Circles were formed last week; the chairman's name, where available, is given in parentheses :—

Aberdeen (Mr. J. A. Bell); Carlisle; Darlington; Dewsbury (Mr. D. Jones); Durham; Ipswich (Mr. G. I. L. Garton); Keighley; Leatherhead (Mr. Horner, *pro tem.*); Saltburn (Mr. T. T. Willis); Sunderland (Mr. A. S. Blackman); Torquay (Mr. H. F. G. Woods); Tottenham (Mr. F. T. Hall); and Whitby (Mr. J. W. Piggott).

The district officers last week paid some fifty visits to towns outside their district headquarters cities, and the places at which district meetings have been held include Greenock, Liverpool, Southport, Aberdeen, Leicester, Walsall, Wolverhampton, the Potteries district, and Dewsbury.

With characteristic energy the North Western District, after being a little behindhand at the start of the campaign, is now going "all out," states an ELECTRICIAN representative. Barratt and Co., of 4, Platt Lane, Rusholme, Manchester, are the first electrical dealers in the area to take a really active part in the equipment of an all-electric house. This firm has

(Concluded on page 518.)

The "Campaign Smile" as caught by a photographer at a London meeting to discuss the progress of the great W.O.B. effort.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

MR. D. M. Pitt, lately with the British Electric Transformer Co., Ltd., has been appointed heating and cooking sales representative to the Cables Accessories Co., Ltd.

Mr. G. H. Lake.

Mr. G. H. Lake, deputy borough electrical engineer of Derby, who, as previously announced, is to succeed Mr. T. P. Wilmshurst as borough electrical engineer, served his apprenticeship with a large Staffordshire electrical manufacturing firm, after which he was articled to Mr. Wilmshurst. At Derby he progressed through various positions in the Derby undertaking to the deputyship, which he has held since 1917.

London County Council has appointed Mr. J. W. J. Townley, deputy city electrical engineer of Bradford, as electrical engineer to the Tramways Department. Fifty-three applications were received for the appointment, and the Highways Committee, while recommending the appointment of Mr. Townley, submitted also the names of Mr. F. G. Penny, assistant executive engineer of power stations, Shanghai Municipal Electricity Department, and Captain G. D'Arcy Meynell, assistant electrical engineer, L.C.C. Tramways Department, and out of these three applicants the Council made the final selection. The salary attaching to the position is £1 200 per annum, rising to a maximum of £1 500, making with temporary additions, on present basis, £1 404 15s. 10d., and £1 686 6s. 1d., respectively.

Speculations are being made as to the choice of a chairman for the Electricity Board, a post of vital importance, and one that will doubtless carry with it a fitting salary. The name of Lord Reading has been frequently mentioned of late in this connection.

The engagement is announced of Lieut. F. V. du Pasquier, R.N., only son of Mr. A. E. du Pasquier, of the Metropolitan-Vickers Electrical Co., Ltd. and Mrs. du Pasquier, and Miss M. K. Spenser, younger daughter of the late Dr. W. Miles and Mrs. Miles, of Fairfield, Treforest.

Mr. R. D. Ringang, the young Tibetan engineer, who is reported to have safely installed electrical generating plant in Lhasa, the "forbidden" capital of Tibet, after many adventures, gained his electrical experience in this country. In 1918 he spent some time at the Dolgarrog hydro-electric station of the NorthWales Power Co.

Mr. J. Hawksey.

Mr. J. Hawksey, whose portrait is reproduced herewith, is the manager of the Chloride Electrical Storage Co.'s new Manchester depot at 18, Bridge Street.

While motoring on the new arterial road at Blackburn last week Mr. James Heyes, electrical contractor, was involved in a collision with another car. Both vehicles were damaged, but there was no personal injury.

It is now officially announced that the London Power Co., Ltd., has appointed Mr. S. L. Pearce to be its engineer-in-chief in the place of Sir Alexander Kennedy and Mr. G. W. Partridge, who have been the advisers of the company since its inception in 1920. Sir Alexander Kennedy, it is explained, resigned the position on account of ill-health, and Mr. Partridge resigned on being elected a member of the board. Mr. Pearce takes up his duties on November 1st, when he retires from the Electricity Commission.

Obituary.

The following deaths have been announced :—

MR. GLYNN SALTER, in Tasmania. He was formerly engineer and manager of the Hamilton electricity undertaking.

MR. GEORGE DAVIS, at Boston, U.S.A. He was vice-president of the Tropical Radio Co., and a director of the Radio Corporation of America.

MR. E. H. QUARRINGTON, aged 51 years. For the past three years he had been chief engineer in the electrical department of Hazell, Watson and Viney, Ltd., Aylesbury.

A LAMP DEVELOPMENT.

British Company Starts Making 300 W Vitaglass Lamps.

NEWS of an interesting, and what may prove to be far-reaching, development in the manufacture of electric lamps reaches us from our Birmingham representative. One of the leading electric lamp manufacturing companies is to commence, in a few days' time, the manufacture of lamps made with a new glass, which has the important property of allowing a free passage to the health-giving ultra-violet light rays to which ordinary glass is almost entirely opaque.

"Vitaglass," as the new glass is called, was invented about two years ago by a Birmingham scientist, Mr. F. E. Lamplough, of Kings Norton, and has since been used experimentally at the London Zoo, where it has had a marked influence upon the health of monkeys and reptiles. It is now in use at a number of important hospitals, and Dr. Saleeby and other eminent medical men are advocating its use both for windows and in lamps. At Smethwick, Staffs, where the new glass is made, it has been used experimentally for windows in one of the schools, and after nine months of its use the schools medical officer reports a considerable improvement in the health, physique, and mental condition of the children who were exposed to the ultra-violet rays.

The great value of electric lamps made with "Vitaglass" (our correspondent states) is that they will provide a gentle source of ultra-violet rays, or "artificial sunlight," which will be extremely valuable, not only in hospitals, sanatoria, and similar institutions, but in our homes, offices and factories. The Edison Swan Electric Co., Ltd., have the rights of manufacture, and they will shortly put on the market a 300 W lamp made with Vitaglass. This will be retailed at 27s. 6d. and will be obtainable in the ordinary way through the trade, or from Mr. F. E. Lamplough. The 300 W size will, of course, be too large for use in the ordinary way in the average home, but it is probable that smaller sizes will be made as soon as the qualities of the glass are better known.

Forty Years Ago.

Brief News Extracts from "The Electrician," of October 29th, 1886.

A PERUSAL of THE ELECTRICIAN of exactly forty years ago shows that :—a Norwich firm introduced a combined motor and dynamo for converting high tension into low tension currents.

* * *

W. T. Glover and Co. arranged to supply cables of various sizes jointed together before being insulated.

* * *

Interest was being shown in a "big" electric motor "intended to develop no less than 670 H.P."

* * *

Referring to early work on distributing electricity by transformers Mr. C. Zipernowsky pointed out that the want of success was "in great part due to the fact that the transformers were connected up in series."

* * *

Commenting on the electrical position in Great Britain an American contemporary said : "There are many signs that the revival of electric lighting in England has begun, in spite of the tremendous obstacles that are placed in the way of those who desire to engage in the business.

Works Committees.

A Metropolitan-Vickers' Employee on their Scope and Function.

SPEAKING at Reading on the subject of "Workshop Committees : Their Scope and Function," Mr. S. Ratcliffe, of the Metropolitan-Vickers Electrical Co., Manchester, said workshop committees should be the media by which all matters of dispute and friction within a business or works could be ventilated and adjusted. He emphasised, in relation to their composition and functions, that no works committee must violate or compromise any agreement of a national character. Therefore, it was essential that the workpeople who formed them must have a general knowledge of the general policy and the national agreements of the trades unions with which they were associated.

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A NEW LOUD SPEAKER.

A Remarkable Advance in Radio Instrument Design.

THAT something very different from the conventional types of loud speaker was in operation was obvious to those who heard the British Thomson-Houston Co.'s type "R.K." loud speaker demonstrated at the Piccadilly Hotel, London, last Thursday, when parts of the B.B.C.'s National Concert from the Albert Hall provided the instrument with ample opportunities to justify the claim made for it that it misses nothing and distorts nothing.

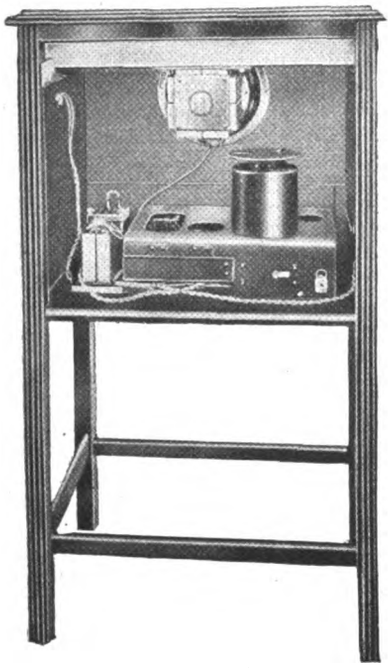

Fig. 1.—Back view of "R.K." loud speaker with door removed.

A representative of THE ELECTRICIAN who was present heard both music and speech reproduced so perfectly that without the knowledge that the sounds were being reproduced he would have taken them for the actual performance. The lowest notes of the music were fully brought out, and one heard the roll of drums as clearly and distinctly as if they had been in the room. The instrument is a departure from previous practice in loud speaker design, and undoubtedly opens a new epoch in the science of sound reproduction.

For the purpose of setting in motion the waves in the air by which the sound is conveyed to our ears, the "R.K." speaker (the invention of Mr. Chester Rice and Mr. Edward Kellogg and made by the B.T.-H. Co.) utilises a plain paper cone. The cone is so supported and actuated that it moves as a whole in a surrounding baffle plate, this baffle plate preventing loss of radiation of sound through circulation of air, the method of support and actuation rendering it free to respond to impulses of any frequency or intensity. The natural frequency of vibration of the cone is very low in the audible sound range, so that it does not distort the sounds that it reproduces.

Special Valves.

This means that the "R.K." equipment cannot distort transmitted sound by reason of the natural vibration of its wave producing member—thus avoiding the inherent defect that is present to a greater or less degree in other types of reproducers.

The equipment as the B.T.-H. Co. manufactures it for wireless purposes consists of the loud speaker complete with its amplifier, and it utilises B.T.-H. valves specially designed for the purpose.

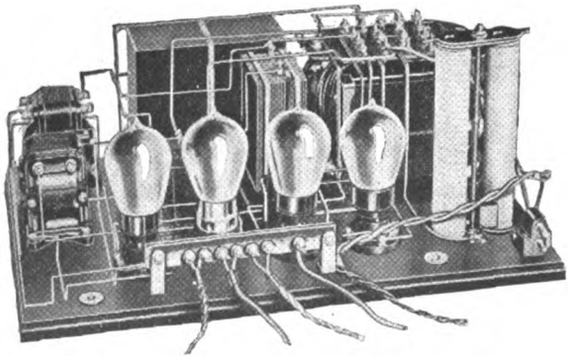

Fig. 2.—For use on a.c. circuits the amplifier is combined with a rectifier as shown.

No accumulator or dry cells are required to energise these valves, as the set is arranged to take its electrical energy from the lighting mains by means of the usual flexible cord and plug, made to fit the standard type of lamp holder or wall socket.

It is made for use on either alternating or direct current supply mains, and in this form can be used with practically any existing wireless receiving set of good quality, having one stage of low frequency amplification, that is free from distortion.

The pulsating current derived from the receiving set, after amplification, passes through a small annular coil attached to the diaphragm of the loud speaker, and located in an intense radially distributed magnetic field.

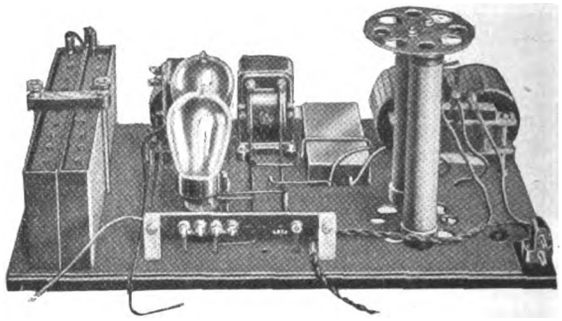

Fig. 3.—Amplifying unit incorporated in instruments operating direct from d.c. mains.

The magnetic field is energised by a field coil, the energy for which is also derived from the main supply.

In the first illustration above is seen a back view of the complete loud speaker with the door removed. Fig. 3 shows the loud speaker amplifying unit incorporated in instruments to be operated direct from d.c. supply mains. When the loud speaker is used on a.c. circuits the amplifier is combined with a rectifier as shown in Fig. 2.

Already several interesting applications have been found for this instrument, such as public address systems, band repeaters and the talking film. Another application is described below.

The Electric "Panatrope."

A Novel Type of Gramophone Convertible to a Wireless Reception Set.

AS briefly recorded in THE ELECTRICIAN last week, British Brunswick, Ltd., of 34, George Street, Hanover Square, London, W.1, is placing on the market a new type of gramophone called the "Panatrope." The turntable is rotated by an electric motor, the current for which can be taken from the ordinary household lighting supply, and the instrument can also be used as a wireless receiving set.

When acting as a gramophone, there is used, instead of the ordinary sound box, a magnetic pick-up. The needle is inserted in the end of a steel armature, and as the needle goes over the record the armature vibrates in a magnetic field which sets up varying currents in a coil, and these varying currents are then passed into an amplifier and thence to a British Thomson-Houston "R.K." loud speaker. A two-stage l.f. amplifier is used, in which B.T.-H. B.11 power valves in parallel are employed for the second stage, while a B.T.-H. B.7 valve is used for the first stage. The filaments are in series. Either alternating or direct current can be utilised, and the B.11 valves take ½ A at 6 V, the total current consumed being 0·65 A.

Use as Receiver.

When the instrument is used as a receiving set the pulsating current derived from the receiver passes through a small annular coil attached to the diaphragm of the loud speaker and located in an intense radially distributed magnetic field. This magnetic field is energised by a field coil, the current for which is also derived from the main supply. The magnetic field coil is also made to act as a choke in the amplifier circuit. The signals are imposed upon the grids of the two B.11 power valves by means of a transformer which has one primary and two secondaries. The grid bias on the power valves is −27 V.

When used as a gramophone, the apparatus gives uniform response to all frequencies, there are five degrees of amplification of tone, and the volume and quality of the tone are excellent, and even the lowest notes are faithfully reproduced.

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THE NATIONAL REGISTER.

"Electrician" Competition Prize Awarded to Bradford Electrical Contractor.

HAVING considered the suggestions made by readers of THE ELECTRICIAN for a suitable title for registered contractors, the Executive Committee of the National Register of Electrical Installation Contractors has reluctantly concluded that not one of the suggested words was suitable for adoption by the National Register.

Mr. Harry Moss, awarded "The Electrician" Prize for the best suggestion for a title for Registered Contractors.

Three words, however, were selected as being the best of the batch, namely, "Registractor," "Registrician," and "Electractor," and on attempting to obtain an order of preference the voting disclosed that six members of the Committee abstained from expressing an opinion, and, of the four remaining members, two voted for "Registractor," and the other two names got one vote each.

All three of these names were suggested by Mr. Harry Moss, registered contractor, of 82, Leeds Road, Bradford, and the first two were suggested by him alone. Although, as stated above, none of these names has actually been adopted by the Register, we have decided, under the circumstances, to award the £5 5s. prize to Mr. Moss.

Other interesting names suggested by Mr. Moss included "Electrifitter," "Electrineer," "Electristaller," "Electrinaire," "Faradician," "Voltician," "Wattician," "Reletractor," "Dynamician," "NaREICian," and "Guarantician."

In addition to Mr. Moss, seven other competitors submitted the word "Electractor." They were: Mr. G. E. Argent (Waterloo, Lancs); Major A. B. Ogle (London); Mr. W. Shelton (Woolwich); Mr. R. D. Ball (London); Mr. L. Stead (London); Mr. J. S. Simmons (Ilford); and Mr. W. J. Jones (London).

Other Suggestions.

Other titles submitted included the following: "Electricator," "Electrineer" (Mr. C. J. Heale, Stretford); "Electrer" (Mr. J. G. Christopher, London); "Narco," "Nareic," "Nareico," "Nareicon" (Mr. F. M. Spry, Cardiff); "Electraltor," "Electristaller," "Instalector," "Contralector," "Elestaller" (Mr. G. E. Argent, Waterloo); "Regelcon" (Mr. A. Long, London); "Regelecontractor," "Elecontractor (Reg.)," "Icer," "Reic," "Reginstaller" (Mr. C. H. Wright, Glasgow); "Regelinstor" (Mr. S. W. Bassett, Cambridge), "Electrader," "Electricist," "Electrogist," "Electrinstator," "Electricer," "Elexist" (Mr. W. J. Jones, London); "Electralist," "Electror," "Elactor," "Electrator," "Relectralist," "Relectrator," "Relectrilist," "Relectritor," "Relectror," "Relictror," "Relinstor," "Relinstrator," "Relectitor," "Rectitor," "Relecitor," "Regelinstor," "Regelinstrator," "Regectitor" (Mr. W. A. Surfleet, Gainsborough); "Tractist" (Mr. H. D. Dale, Northallerton); "Electrician" (Mr. G. J. Evans, Pontypridd); "Narecon," "Natreg," (Mr. E. A. Joyce, London); "Electragite," "Electrador," "Electradon," "Electrictor" (Mr. L. Stead, London); "Natrelectric" (Mr. J. E. Bradfield, London); "Relecta," "Relectra" (Mr. B. Levine, London); "Selectrician" (Mr. Edward Wilcox, Timperley); "Regelic," "Regelincs" (Mr. A. M. East, Abbots Langley); "Electricator" (Mr. W. E. Bush, London); "Installician" (Mr. G. E. Moore, Benton, Northumberland); "Electrologist," (Mr. H. Ashton, Manchester); "Electronist" (Mr. A. Elliott, Manchester); "Releinco," "Regeic," "Ciereg," "Reic," "Cier" (Mr. James Neil, Govanhill, Glasgow); "Switch Jobs" (Mr. G. T. Grant, Consett, co. Durham); "Electrifier," "Electrifuer," "Electrotendor," "Electracon," "Electratend," "Superclectric," "Superelectra," "Contactel" (Mr. P. M. Macintyre, Glasgow), "Elincon," "Electract" (Mr. P. W. Sankey, Richmond, Surrey); "Instalectors" (Mr. F. W. Hatfield, London); and "Electrocons," "Electroconeers" (Mr. G. C. Smith, Chorlton-cum-Hardy).

Although the object which prompted THE ELECTRICIAN offer has not yet been fully accomplished, the competition has brought forward some very interesting suggestions, and it is possible that further study of the variety of names submitted will even yet produce the long-sought word.

REGISTERED CONTRACTORS.

Electrical Contractors whose Names were on the Register on October 1st.

SINCE THE ELECTRICIAN published the list of electrical contractors whose names were on the National Register, frequent requests have been made for a repetition of the list from time to time. A new list, corrected up to October 1st last has now been issued by the Register, but owing to extreme pressure on our space it has been decided to publish the latest list in instalments, the first of which is given below. Towns are classified into sections for England and Wales, Scotland, Northern Ireland, Irish Free State, Isle of Man and Channel Islands :—

Aberystwyth.—Hanley Electrical Supply Stores.

Alderley Edge.—Alderley and Wilmslow Electric Supply, Ltd.; Frank Wood and Co.

Ascot.—Arthur D. Cozens.

Ashford (Kent).—Henry Featherstone; C. Hayward and Son.

Ashington.—John Girling and Son; H. Laws.

Ashtead.—H. Pengilly.

Ashton-under-Lyne.—Robert Butterworth; George H. Coop.

Aylesbury.—G. C. Gowan.

Bacup.—Bracewell and Prior.

Bakewell.—B. Needham and Sons.

Bangor (N.W.).—Owen and Palmer.

Bargoed (Glam.).—Jones Bros.

Barrow-in-Furness.—A. N. Moxon.

Barry Dock.—Mayer and Co., Ltd.

Bath.—G. Ellis; R. Kendall and Sons; J. Lambert and Sons.

Batley.—Crosland and Bateson.

Beckenham.—Beckenham Urban District Council, Electricity Department; Buchanan and Curwen.

Berwick.—Knox Bros.; Urban Electricity Supply Co., Ltd.

Bexhill-on-Sea.—R. D. Trevor-Roper.

Birkenhead.—Economic Electric Co.; James McKenzie; W. H. Trace and Son.

Birmingham.—H. H. Barratt; Baxter and Impey; Beckett and Wheatley; Brightside Foundry and Engineering Co., Ltd.; Burgess and Garfield; Colman and Co.; Couzens and Akers, Ltd.; S. Dagnall, Ltd.. Ellis and Ward, Ltd.; Thomas Glover; Gordon Hughes Electrical Co.; H. G. Gunner; S. R. Hare; Harrison and Searle, Ltd.; E. Hill and Sons; Knight and Keeley; R. H. Newton; Parker, Winder and Achurch, Ltd.; J. H. Payne and Co.; Reynolds and Bradwell; Smith Major and Stevens, Ltd.; Stuart Electrical Co., Ltd.; Walter S. Vaughton, Ltd.; Walker Bros.; S. N. Watkins; W. A. Webb and Co.

LANES OF CAMPAIGN PANES.

IF every electrical shop window had a special Campaign window display there would be at at least seven miles of windows spreading the domestic electrification gospel. Why not bring your window into this lane of Campaign panes?

Bishop Auckland.—D. Latham; Seymour and Warren.

Bishop's Stortford.—L. G. Attree and Co.

Blackburn.—Harry Baron; Thomas Blackshaw; C. T. Briscoe and Son, Ltd.; Farquhar and Heys; W. A. McCall; Robert Marr; John Marsden; Thomas Speak; John Walsh.

Blackpool.—R. Darbyshire, Ltd.; J. W. Fielding and Co.; Jones Bros.; George Morrison.

Blandford.—Pond and Sons, Ltd.

Blyth.—Clark and Cobb; G. Dudley and Co.; Robert Kirkland.

Bognor.—Thomas Baldwin; Bognor Gas and Electricity Co.

Bolton.—Walter Bradley (Engineers), Ltd.; Engineering Service Co.; Jas. Morris.

Bootle.—Acme Electrical Co.; Greaves and Liddle; Fred W. Mason; James Scott and Co.

(To be continued.)

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IN LIGHTER VEIN.

Further Forecasts of Electrical Developments in the Future.

CONTINUING his remarks on industrial amalgamations our tame humorist records another important amalgamation, this time between the General Electric Co. and the proprietors of "Glaxo." The new company (he states) is now trading under the name of The Glaxo Electrical Co., Ltd., which, of course, permits the continued use of the original abbreviation of "G.E.C."

The new "Little Play of Moonshine" poster.

* * *

We reproduce on this page a copy of the new poster entitled "A Little Play of Moonshine," which serves admirably to illustrate how well the mutual interest can be served by one expense. The first joint booklet recently published, is an excellent example of educational advertising. It is entitled "Household Hints, External and Internal," and the following extracts will give some indication of the useful nature of its contents.

* * *

IF BABY CRIES.—There must be a reason, probably one of the following :—

He has not enough fresh air.—*Switch on the Freezor Fan.*
He is too hot or cold.—*Switch on the refrigerator or the radiator.*
He is hungry.—*Bring out the Glaxo.*
The light hurts his eyes.—*Fit a proper shade and use a Pearl Osram bulb.*

* * *

A FEW INTERESTING FACTS ABOUT GLAXO BABIES.—If all the Glaxo babies were placed end on end in one line (weather and mothers permitting) they would reach from Tooting to Timbuctoo, and if they were placed in two lines they would reach half as far. The noise would be equal to 13 loud speakers (8 valve amplifiers) in parallel on three different wavelengths in a room 6 ft. by 6 ft. without doors or windows.

* * *

FROM A FATHER.—"I wish to express my warm appreciation of your bulbs. Before using them our Bill was so small that he was given up by the supply company as hopeless. We tried your bulbs and after the first carton our Bill picked up steadily and is now so heavy that we are unable to support him. Except for a slight increase in temperature and going black in the face, we have had no trouble since. You are at liberty to make what use you like of this statement, and also of the quarterly statement enclosed."

Points of View.

Interesting Pronouncements on a Variety of Topical Electrical Subjects.

THE electric furnace replacing the gas furnace has been one of the large steps forward.—*Mr. Henry Ford.*

* * *

The proposed new [Chiswick] generating station has already been called "Chiswick Folly," and I would add to that "Dante's Inferno."—*Mr. J. Hopkin Morris.*

* * *

On the power side it is no secret that American-made high voltage cables have given a good deal of trouble to users.—*Capt. P. Dunsheath.*

* * *

Wireless has become a necessity to the economic and strategic welfare of the British Dominions.—*Sir James Parr (High Commissioner for New Zealand.)*

* * *

Women must be made to feel as much at home in the electrical contractor's shop or showroom as they do in the millinery department of a great store.—*Miss C. Haslett.*

THE MOTOR SHOW.

Interesting New Electrical Accessories for Use on Cars.

ONCE again we have to record the absence of an electrically propelled car from the Motor Show at Olympia, London, which, as usual, has much of interest in the shape of electrical accessories for cars by way of compensation.

Electric windscreen wipers are again prominent, a novelty being the Berkshire Dyneto wiper (Houdaille Hydraulic Suspension Co., Ltd.), a motor-driven wiper which has neither brushes, armature nor commutator. Another electrical wiper with an independent motor is the Stewart Model 209 (Cooper-Stewart Eng. Co., Ltd.), the mechanism of which is entirely closed in a small metal case.

Wireless Pipe Lighter.

Quite a number of electrical accessories are shown by S. Smith and Sons (M.A.), Ltd. One takes the form of a pipe or cigar lighter. The lighter is fitted in an insulated holder which fits into a groove in a base attached to the instrument board. On pressing a switch a heating element in the lighter is brought into action, and the lighter, which is not connected by wires to the base, can be removed with one hand. Several cigarettes or pipes can be lighted with one heating.

Instrument panels are provided by this firm with concealed lighting for night driving, and the instruments can be read with an entire absence of glare.

Several night signalling safety mirrors were seen, the Smith accessory for this purpose being notably effective. The device, which gives illuminated arrow indication of left and right hand turnings and slowing down or stopping, is controlled from the driving seat by means of a neat switch. A similar appliance by the Cooper-Stewart Eng. Co. is operated by a novel type of switch situated on one of the spokes of the steering wheel.

A new system of dynamo regulation is shown by S. Smith and Sons, and it is interesting to note that the brush gear on all this company's dynamos and starters consists of pressed brass brush boxes, nickel-plated, either moulded or mounted on a separate bakelite moulding.

Car Batteries.

Car starter batteries are shown by the Chloride Electrical Storage Co., Ltd., the Edison Swan Electric Co., Ltd., the Hart Accumulator Co., Ltd., and Peto and Radford, Ltd., and though most have made some detailed improvements there is—as Mr. D. P. Dunne said at the annual reunion luncheon of the Chloride Electrical Storage Co.—no new development of a major character in design. The Chloride Co. is showing batteries in monobloc containers which are attractive in appearance and are particularly suitable for running board mounting, as no outer wooden container is necessary.

Space does not permit detailed reference to all the electrical exhibits, but it may be mentioned that the Benjamin Electric Ltd., are showing electric horns and the Benjamin "Autoreelite"; the British Thomson-Houston Co., Ltd., present magnetos and various types of lighting and starting equipments, etc.; while the Lucas Electrical Co., Ltd., Rotax (Motor Accessories), Ltd., and C. A. Vandervell and Co., Ltd., all make representative displays of their electrical equipments for motor cars.

Huddersfield Technical College.

Decision to Open New Electrical Engineering Department in January.

HUDDERSFIELD Town Council has decided to subdivide the Physics and Electrical Engineering Department at the Technical College, with separate heads for each.

On January 1st next the new Electrical Engineering Department will be formed under Mr. Walter M. Wilcox. Mr. Wilcox, who is a full member of the Institution of Electrical Engineers, has been lecturer in the Department since 1913, and during that time the number of students of electrical engineering has increased seven-fold. Some idea of the character of the work can be obtained from the fact that last session nine students were awarded the Higher National Certificate in Electrical Engineering.

The head of the new Physics Department has not yet been appointed. The new departments are to be congratulated on this development, which should be conducive to still further progress.

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POLES FOR OVERHEAD TRANSMISSION.

A New Type of "A" Pole with Strengthened Foundations—Results of Comparative Tests—Use on a Kentish Line.

ANYTHING which tends to reduce capital charges on the transmission of electricity is of interest, and a new type of "A" pole, for which letters patent (No. 224 732) have been taken out by Electrical Improvements, Ltd., of 34, Victoria Street, London, S.W.1, certainly comes within this category.

A representative of THE ELECTRICIAN who saw the actual erection of some of these poles near Cobham (Kent) on a 0·15 sq. in. 3-wire, 33 000 V line from the Bevans sub-station to the Medway river (which is being erected by W. T. Henley's Telegraph Works Co., Ltd., for the County of London Electric Supply Co., Ltd.), states that this is another of those seemingly obvious inventions, of which one is generally constrained to exclaim "Why was it not thought of before?"

Hitherto the development of the full available strength of the "A" or "H" type of wooden pole has been restricted by the relative weakness of the foundation. When the expense of setting in concrete has been undertaken, these poles have proved to be highly efficient structures. But as ordinarily designed and set with the usual earth footing, failure would occur at a fraction of the load at which it would occur if the pole had been set in concrete. The patented pole is of the "A" type, and the improvement is found in its form of strengthened foundations. It is very much more strongly "anchored" than is the ordinary type of "A" pole, and the appropriate name of "Anchora" has been given to it.

Anchoring Methods.

Reference to the accompanying illustrations shows that on the new pole main foundation baulks are provided on both sides of the legs, and that anchor baulks are secured at right angles to the edges of these. The main baulks are placed at the extreme ends of the pole butts, and galvanised wrought iron ties are fitted for transferring the upward pull on the legs to the foundation. The angle iron ties connect either the main baulks or the anchor baulks to the legs at a convenient distance above the main baulks, and are below ground level. Bent metal plates of channel section are provided for transferring the compression load on the legs to the foundation, the plates passing over the top of the main baulks and underneath the pole butt.

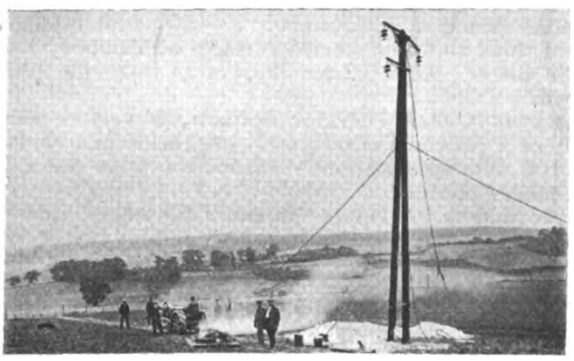
In excavating foundations the hole is undercut at right angles to the plane of the "A" and at each side, so as to receive the anchor baulks which are fixed after the pole has been erected in the hole. Thus the anchor baulks have above them solid, undisturbed earth with consequent increased resistance to overturning of the pole.

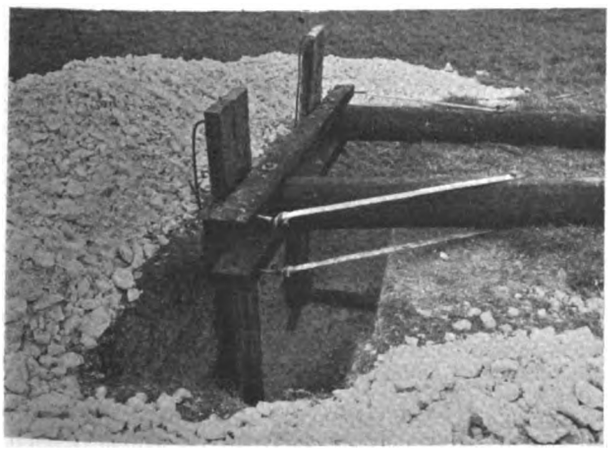
Tests on a 40 ft. "Anchora" pole in comparison with an ordinary "A" pole have proved the "Anchora" capable of withstanding a load applied at 31 ft. above the ground level in each case, of 70 cwt. against 15 cwt. sustained by the ordinary "A" pole. The "Anchora" pole withstood a load of nearly 40 cwt. without any signs of the foundations giving, while the foundations of the ordinary "A" pole began to fail at 10 cwt. The poles were sunk the same distance in the ground, and the tests were made with them side by side in the same unturned earth.

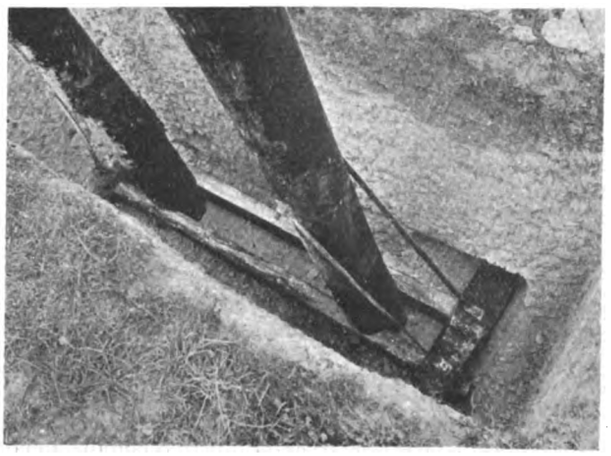
Wider Spacing Possible.

With the "Anchora" foundation, both the space between the poles and their individual height can be much greater than with the usual type of foundation. Comparative estimates for a typical 20 000 V three-phase line of 0·1 sq. in. section show that with the ordinary "A" pole it would be most economical to use 36 ft. poles and space them 180 ft. apart, while with the "Anchora" construction it would be economical to use 40 ft. poles spaced 400 ft. apart. The difference in the cost of the two types of line shows a saving in favour of the "Anchora" construction of about 20 per cent. on the total cost of the line. Apart from the saving in first cost, the fewer supports required for a given line with the new construction should make its use particularly attractive in the country, where transport is difficult and wayleaves are expensive and not easily obtained. The erection is done by means of a Fordson tractor which is seen below dragging the tackle to the next pole. This method saves a considerable amount of time and labour in erecting poles.

THESE pictures show the erection and construction of the new type "A" pole, described above. On the right is a view of the pole after erection. Below (left) is a "close-up" looking into the hole, showing the temporary baulks used to facilitate the sliding of the pole down the side of the cutting. The other picture shows the fitting of the main foundation and anchor baulks, together with the galvanised wrought iron ties. The undercutting of the earth for the anchor baulks is also shown.







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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given.

ADWICK-LE-STREET URBAN DISTRICT COUNCIL.—Wiring of houses to be erected at Skellow.

GRIMSBY CORPORATION, October 29th.—Installation of 15 H.P. slip-ring motor, rails and control panel and supply line at Isolation Hospital, Scartho. Specification (No. 189W) from Lt.-Col. W. A. Vignoles, borough electrical engineer, Grimsby.

INDIA STORE DEPARTMENT, October 29th.—Supply of 32 100 yards of paper insulated, lead sheathed and double steel tape armoured l.t. cable, and joint and house service boxes. Specifications (5s.) from the Director-General, Branch No. 10, Belvedere Road, London, S.E.1.

COLD FEET—A REMEDY.

CASES of cold feet amongst electrical people can easily be cured by simply arranging in a show window the electric heating display devised in connection with the "Wiring the Homes of Britain" Campaign. A view of the November Campaign window as constructed at 15, Savoy Street, London, is published on page 507.

TYNE IMPROVEMENT COMMISSIONERS, October 29th.—One 3-ton and one 5-ton portal electric, travelling, level luffing cranes, to be erected at Albert Edward Dock, North Shields. Specification from Mr. A. Blacklock, Tyne Improvement Commission Offices, Bewick Street, Newcastle-on-Tyne; deposit £1 1s.

GLASGOW CORPORATION, October 30th.—Electric light installation in connection with the Duke Street and Govanhill re-housing schemes. Specification from Mr. R. B. Mitchell, 75, Waterloo Street, Glasgow.

ALLOA CORPORATION, November 1st.—Electrical installation work of three and four roomed cottages at Tullibody Road, Fenton Street, Alloa. Schedules, etc., from the Burgh Surveyor.

ATHERTON URBAN DISTRICT COUNCIL, November 2nd.—Supply of 2 350 yards of 0·04 h.t. cable, made in accordance with B.E.S.A. specifications. Particulars from the Clerk, Town Hall, Atherton.

METROPOLITAN ASYLUMS BOARD, November 3rd.—(1) Automatic telephones and fire alarms; and (2) alterations to electric lighting installations at North-Eastern Fever Hospital, St. Anne's Road, Tottenham. Specifications from the Board's Office, Victoria Embankment, E.C.4; deposit £1 in respect of each work.

BELFAST EDUCATION COMMITTEE, November 5th.—Electrical machinery and apparatus for the Electrical Engineering Laboratory of the Municipal College of Technology. Specifications, etc., can be obtained at the General Office, Municipal School of Technology, Belfast.

EASTBOURNE CORPORATION, November 5th.—Supply and erection of one water-tube boiler, economiser, feed heaters, two steel chimneys with induced draught, pipework, etc. Specifications from Mr. J. K. Brydges, Electricity Works, Eastbourne; deposit £1

INDIA STORE DEPARTMENT, November 5th.—Two 50 kW oil engine driven generating sets and 5 000 yd. of dry core paper insulated, 40 wire armoured composite cable. Specifications (Nos. 2 and 3, respectively) from the Director-General, Branch No. 11, Belvedere Road, London, S.E.1; 5s. each.

SALFORD CORPORATION, November 5th.—One 5 000 kVA three-phase transformer unit. Forms of tender, etc., from the Borough Electrical Engineer, Electricity Works, Frederick Road, Pendleton, Salford.

SALFORD GUARDIANS, November 6th.—Electric wiring, fitting etc., of the new mortuary and converted laundry buildings at the Union Infirmary, Hope, Pendleton, Salford. Specification from Mr. E. H. Inchley, Clerk to the Guardians, Poor Law offices, Eccles New Road, Salford; deposit £2 2s.

DUBLIN UNITED TRAMWAYS CO. (1896), LTD., November 8th.—Twelve months' supply of stores, including cables, car fittings, electric lamps, electric fittings, trolley fittings, etc. Forms of tender (2s. 6d.) from the company's offices, 59, Upper Sackville Street, Dublin.

ADWICK-LE-STREET URBAN DISTRICT COUNCIL, November 10th.—Internal wiring of 264 Council houses, including supply of lamps, shades and switches. Specification (5s.) from the Surveyor, at the Council Offices, or from Mr. W. M. Selvey, consulting engineer, Independent Buildings, Sheffield.

STOKE-ON-TRENT CORPORATION, November 10th.—Supply of e.h.t. switchgear for central power station (contract 2 620); e.h.t. switchgear, etc., for Stoke sub-works (contract 2 625); and neutral earth resistance for central power station (contract 2 626). Specifications from the City Electrical Engineer, St. George's Chambers, Wolfe Street, Stoke-on-Trent, on payment of £2 in respect of each contract.

BRADFORD CORPORATION, November 13th.—Twelve months' supply of stores to the Tramways Department, including electrical fittings for tramcars, insulating material, etc. Schedules and forms of tender from Mr. R. H. Wilkinson, general manager, 7, Hall Ings, Bradford.

DUBLIN BOROUGH COMMISSIONERS, November 13th.—One year's (*a*) supply or (*b*) supply and erection of transformers, for the Electricity Departments. Specifications from the City Electrical Engineer, Fleet Street, Dublin; deposit £1 1s.

GREAT WESTERN RAILWAY, November 19th.—Supply of stores, including (Form 18) telegraph instruments; (Form 19) electrical apparatus (insulators), etc.; (Form 20) electrical wires and cables; (Form 21) telegraph ironwork and tools; and (Form 22) telegraph drysalteries. Specifications and forms of tender from the Stores Superintendent, Swindon. Form 20 will not be available until November 10th.

CARDIFF CORPORATION, November 22nd.—(1) Water tube boiler, mechanical stokers and forced draught plant; (2) steel chimney and grit collecting plant; (3) induced draught plant. Particulars and specification from the City Electrical Engineer, The Hayes, Cardiff. Only members of the King's National Roll are invited to tender.

DUBLIN PORT AND DOCKS BOARD, December 1st.—Supply and erection of a 4-ton level luffing electric portal crane. Specification from the Engineer of the Board (Mr. J. Mallagh), East Wall, Dublin.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

AUCKLAND (N.Z.) ELECTRIC POWER BOARD.—Galvanised bolts, washers, etc. (Reference B.X. 2 956.)

DIRECTOR-GENERAL OF EGYPTIAN MUNICIPALITIES AND LOCAL COMMISSIONERS, November 1st.—Supply of about 30 000 electric lamps. Tenders to the Director-General, Savoy House, Cairo.

SYDNEY ELECTRICITY DEPARTMENT, November 1st.—Supply, delivery, erection, setting to work, testing and maintenance at Bunnerong power station of boiler feed pumps. (Reference A.X. 3 470.*)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Supply of 110 000 V transformers for Waikaremoana power scheme (section 17). (Reference B.X. 2 744.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Electric generators and turbines for Waikaremoana electric power scheme (section 13). (Reference B.X. 2 622.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 2nd.—Indoor control gear and switchgear for Waikaremoana electric power development (section 14). (Reference B.X. 2 675.)

CAPE TOWN MUNICIPALITY, November 3rd.—Two automatically-controlled, electrically-driven sewage pumps, etc. (Reference A.X. 3 617.)

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VICTORIAN RAILWAY COMMISSIONERS, November 3rd.—Supply of 77 miles of seven-strand h.d. copper cable.

VICTORIA RAILWAY COMMISSIONERS, November 3rd.—Pole changing transformer (contract 39 822). (Reference B.X. 2 915.) Pole transformers (contract 39 823.) (Reference B.X. 2 914.)

POSTMASTER - GENERAL'S DEPARTMENT. MELBOURNE, November 4th.—Supply of primary battery material. (Reference B.X. 2 900.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, November 4th.—Supply of one electrically-operated 40-ton Goliath crane. (Reference A.X. 3 657.*)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, November 8th.—Diaphragms, cords, etc. (Reference B.X. 2 860.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone transformers. (Reference B.X. 2 797.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone protective apparatus. (Reference B.X. 840.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, November 10th.—Supply and erection of steam-turbine-driven centrifugal boiler-feed pump. (Contract No. 770.) (Reference A.X. 3 534.) Supply and erection of motor-driven centrifugal boiler-feed pump. (Contract No. 771.) (Reference A.X. 3 536.)

SYDNEY CITY COUNCIL, November 15th.—Supply of 33 000 V cable and pilot cable. Specification (No. 1 047) from the Constructional Engineer, Electricity Department, Town Hall, Sydney.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 16th.—Supply of timing clocks for indicating the duration of telephone trunk line calls. (Reference B.X. 2 827.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 23rd.—Lightning arresters and transformers. (Reference B.X. 2 792.)

PORT ELIZABETH MUNICIPALITY, November 25th.—Supply and erection of duplicate electrically-driven automatic float controlled centrifugal sewage pumps, etc. (contract 24, Mill Park). (Reference A.X. 3 680.*)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 26th.—Primary battery material.

SYDNEY CITY COUNCIL, November 29th.—High and low tension cables (contract 1 057). (Reference B.X. 2 959.)

SYDNEY CITY COUNCIL, November 29th.—Three-phase oil-immersed induction voltage regulator. (Reference B.X. 2 936.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 30th.—Supply of 110 kW transformers. (Reference B.X. 2 874.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, November 30th.—Two tons of galvanised building wire. (Reference A.X. 3 721.)

SOUTHLAND ELECTRIC POWER BOARD, INVERCARGILL, N.Z., December 1st.—Supply of a 3 000 H.P. horizontal Francis turbine and 2 350 kW generator. (Reference B.X. 2 822.)

VICTORIAN RAILWAY COMMISSIONERS, December 1st.—Rotary converter or rectifier set, with switching equipment for its automatic operation.

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, December 6th.—Key switches. (Reference B.X. 2962.)

STATE ELECTRICITY WORKS, MONTEVIDEO, December 6th.—Diesel-electric generating sets.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 7th.—Three-phase induction regulator for Waikato electric power scheme (section 206.) (Reference B.X. 2 935.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 10th.—Electric motors. (Reference B.X. 2 861.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 15th.—Switchgear, cable, motor-generator sets, junction boxes, etc., for Hutt Valley Locomotive Workshops. (Reference B.X. 2 949.)

VICTORIAN ELECTRICITY COMMISSION, December 15th.—Water tube boiler, with superheater, economiser, etc., for Yallourn power scheme. Specification (No. 28/82), from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.2; deposit £3 3s.

INDIA STORE DEPARTMENT, December 21st.—Supply and erection of overhead transmission line, 110 000 V, about 280 miles in length. Specification (5s.) from the Director-General, Branch 14, Belvedere Road, London, S.E.1.

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 1st.—Supply and erection at site of Seru pumping and power station, of four Diesel engine alternator groups, three pumps and accessories. Specification (10s. 6d.) from Chief Inspecting Engineer, 41, Tothill Street, S.W.1.

INDIA STORE DEPARTMENT, January 4th.—Supply and erection of track equipment, including overhead equipment and steel structures for about 140 miles of railway route, suitable for 1 500 V. Specification (£2) from the Director-General, Branch 14, Belvedere Road, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 4th.—Supply of switchgear and transformers for Waikaremoana electric power scheme. (Reference B.X. 2 872.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 18th.—Transmission line steel towers for Waikaremoana electric power scheme (section 31). (Reference A.X. 3 732.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 1st.—Storage battery and booster for Waikaremoana Electric Power Board (section 28). (Reference B.X. 2 937.)

Tenders Accepted.

LONDON COUNTY COUNCIL.—Anti-Attrition Metal Co., Ltd., machined bronze bearings, for the Tramways Department.

BERMONDSEY (LONDON) BOROUGH COUNCIL.—Lancashire Dynamo Co., 25 H.P. electric motor for Artillery Lane Laundry, £88 17s.

HEBDEN BRIDGE URBAN DISTRICT COUNCIL.—R. S. Blackburn and Co., wiring and fitting 12 houses at Eaves for electric lighting.

WINCHESTER CORPORATION.—Tudor Accumulator Co., two new batteries for electric dust carts, less £32 allowance for old batteries.

MANCHESTER CORPORATION.—W. Spreadborough (West Didsbury), electric light installations in 116 houses on the Withington estate.

WORTHING CORPORATION.—Callenders' Cable and Construction Co., Ltd., cables for supplying electricity to Goring-by-Sea and Rustington, £16 474.

DANISH TELEGRAPH ADMINISTRATION.—Standard Telephones and Cables, Ltd., equipment for 5 kW broadcasting station to be erected at Kallundborg.

British Industries Fair.

Advisory Committee Expects Record Electrical Show at Birmingham.

AT a meeting at the Birmingham Chamber of Commerce on October 20th, in connection with the Electrical Section of the British Industries Fair, Mr. T. R. Martin, chairman of the Fair Management Committee, visualised the time when they would have not merely one Fair each year, but two, or even three, at times specially calculated to suit overseas buyers in various trades and industries. For the forthcoming Birmingham Fair a considerable amount of extra space was available for exhibitors, and the Government was spending a large sum on publicity overseas with a view to attracting the largest possible attendance of buyers. The visits of electrical associations, which last year included the I.M.E.A., the E.W.F. and the E.C.A., would be repeated at the next Fair. Mr. Martin emphasised that participation in the Electrical Section of the Fair did not call for any large outlay on elaborate stands and display. It was a business show, and its success depended largely on enabling exhibitors to get their goods in and out of the Fair with the minimum of cost and disorganisation of their normal routine.

Mr. E. J. Jennings, in proposing the appointment of the Advisory Sub-Committee for the Electrical Section—the constitution of which was given in THE ELECTRICIAN last week—mentioned that the area available for electrical exhibits had been increased by 50 per cent., and bookings to date were extremely satisfactory.

Dr. A. H. Railing said he was certain that the electrical exhibitors at the last Fair reaped considerable benefit, as the result of their participation, and Mr. H. H. Berry, as an exhibitor in the Electrical Section, said he had been entirely satisfied with the results and very agreeably surprised at the way in which the show was managed. In spite of the fact that the date of the Fair was probably the most unsuitable that could be chosen for the electrical industry to stage an exhibition of this kind, and October would have been a much better time, he could still say that the hastily organised Electrical Section at the 1926 Fair was an unqualified success. He was backing this opinion by taking a much larger space at the forthcoming Fair.

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ELECTRICITY SUPPLY.

Weymouth to Develop Supply in Rural Areas—Plymouth Loan Sanctioned—Wayleave Difficulties in North Wales.

WREXHAM T.C. has decided to carry out mains extensions at a cost of £3 350.

Bromley (Kent) T.C. is adopting electric lighting in the new schools on the Downham Housing Estate.

Bushey U.D.C. is proceeding with the erection of 20 houses which are to be wired for electric lighting.

Adwick-le-Street U.D.C. is having plans prepared for a comprehensive scheme of electric street lighting.

Whitby U.D.C. has received sanction to loans of £495 and £505 for mains and services, and £100 for domestic apparatus for hire.

Aldbourne (Wilts) P.C. has discussed the desirability of an electric lighting scheme, and the matter has been referred to a parish meeting.

Appliance Hire at Hastings.

Hastings T.C. has decided to let on hire electric cookers and other domestic appliances, the hirer to bear the cost of wiring from the meter.

A loan of £450 for the provision of cables, lamp standards, etc., for public lighting at Moresby has been applied for by Whitehaven R.D.C.

Clutton R.D.C. has rescinded a resolution disapproving of the use of overhead cables in the district by the North Somerset Electric Supply Co.

Thurnscoe U.D.C. has decided to adopt electricity for 192 houses which are being erected and also to use electricity for lighting the streets on the estate.

Stafford T.C. has appointed a special committee to consider an application proposed to be made by the Power Development Co., Ltd., for an Order to supply electricity in the Rugeley and Uttoxeter districts.

Bicester U.D.C. has considered proposals laid before it by Mr. Cecil Cooper, of Kensington, in regard to an electric light installation in the district, and has asked Mr. Cooper to place his company's scheme before them.

A Leicester firm has proposed to Overton R.D.C. to supply electricity to the village of Overton, and has offered to erect a power station and overhead wires. The Council has decided to consult the Electricity Commissioners.

Littlehamptom U.D.C. declines to agree to an extension of the period of option for the purchase of the undertaking of the Sussex Electricity Supply Co., Ltd., in consideration of a reduction in the present lighting charges.

Honiton R.D.C. has acceded to an application by the Honiton and District Electric Supply Co. for support to a proposed special Order embracing the whole of the district, with the exception of Sidbury and Salcombe Regis.

The Boston and District Electric Supply Co., Ltd., proposes to charge for electricity in Kirton: Lighting, 8d. per kWh; power, 2½d.; heating and cooking, 1½d., reduced to 1¼d. for all over 200 kWh per quarter if a cooker is installed.

Mr. W. H. Cooke, the Luton borough electrical engineer, has informed Wing R.D.C. that it is hoped to connect up Eaton Bray, Eddlesborough and Northall for electricity supply before Christmas, and the mains would be extended to Wing as soon as possible.

Weymouth T.C. proposes to apply for an Order to supply electricity in Portland urban and Weymouth rural districts and certain parishes in Dorchester, Wareham and Purbeck rural districts. The T.C. in committee has already decided to make the application.

Swansea's Policy.

Swansea Corporation recently resolved that consideration of a scheme for the erection of a new power station should be deferred, that a deputation should wait upon the Electricity Commissioners to discuss the position of such a station and to obtain the Commissioner's advice as to future policy.

The Electricity Commissioners have sanctioned the borrowing of £37 835 by Plymouth Corporation for the purchase of a new turbo-alternator and switchgear for the Prince's Rock power station. The Electricity Committee has agreed to the laying of a cable, at a cost of £1 878, to the Higher Venn estate.

Estimates submitted by the borough electrical engineer (Mr. J. E. Starkie) for the lighting of the Domestic Subjects Centre and Junior Department of Lionel Street School, amounting to £224, and for the lighting of the Senior Department of the School, £220, have been approved by Burnley Education Committee.

The New Forest U.D.C. has approved the Power Development Co. for electricity supply in certain parts of the New Forest. Eling, Colbury and Lyndhurst are to be supplied within two years of the confirmation of the Order. It was stated at a recent Council meeting that the promoters would sell the concession to a local company, who would buy a bulk supply from Southampton.

Mr. R. A. Trail, electrical engineer to Lossiemouth T.C., suggests that additional plant should be installed at the generating station in readiness for the ensuing winter's load. He suggests that the Council should consider the question of replacing one of the original 25 kW sets by a modern crude oil engine and a dynamo of at least 60 kW. The matter has been remitted to the Electric Lighting Committee.

Mr. T. A. Reid, who has a plant at Heathfield (Sussex) for burning chalk for the manufacture of lime, has had an electricity generating set erected and drives it by means of a gas engine which consumes the gases given off by the burning of the chalk and the fuel required for the chalk burning. It is claimed that in the making of 5·2 tons of lime each week, power sufficient to generate 5 000 kWh of electricity is obtained—sufficient to light the whole of the Heathfield district.

The North Wales Electricity Authority recently discussed a report on the inspection of the North Wales Power Co.'s dams and the construction and reconstruction of lines. Delay in regard to the construction of the line from Legacy to Ruabon, due to difficulty in regard to wayleaves, was reported, and the authority passed a resolution that in cases where difficulty is being experienced in obtaining way-leaves the Electricity Commission be urged to put compulsory powers into operation at the earliest possible date.

The Dulverton Electric Lighting Co. is applying for an Order to supply electricity in the whole of the rural district of Dulverton, the urban district of Wiveliscombe and the town of Milverton. The secretary of the company has informed the Council that his company is looking forward to the possibility of getting a cheap supply of electricity from hydro-electric works deriving power from the watershed of Exmoor. Pending the establishment of these works it is proposed to improve the present plant for the supply of Dulverton.

Reduced Charges Beneficial.

Mr. John Christie, borough electrical engineer of Brighton, states in his report for the year ended March last that the reduction in charge to a flat rate, without restrictions, of 1d. per kWh for heating and cooking is having a most beneficial effect on the load factor. He is confident that as this service becomes better known the consumption will make rapid strides, and with this end in view, he hopes the day is not far distant when a new suite of central offices worthy of the department, with collecting office, demonstration showrooms and lecture hall, can be established.

Limerick Electric Lighting Committee recently considered a report on a conference between the Harbour Board and the Corporation regarding a wayleave over harbour property for the erection of h.t. transmission cables to carry a supplemental supply of current to the power station in the city from Ardnacrusha. A suggestion that the height of the steel lattice towers should be 70 ft. above high water mark did not meet with the approval of the Harbour Board, who were of opinion that the altitude should be 100 ft. The Board's suggestion has been agreed to.

The Minehead Electrical Supply Co. intends to apply for an Order extending its area to other parts of West Somerset, including Watchet and the whole of Williton rural district. Watchet U.D.C. seems, however, more disposed to encourage the development of a small plant already owned in the town by Mr. W. E. M. Chidgey. The Council has decided to ask the Electricity Commissioners' advice and to inquire whether Minehead is to become a distributing centre under the national electricity development scheme. Williton R.D.C. has passed a resolution declining to support any monopoly of electric lighting, and expressing its objection to the erection of overhead wires carrying electricity at high voltage.

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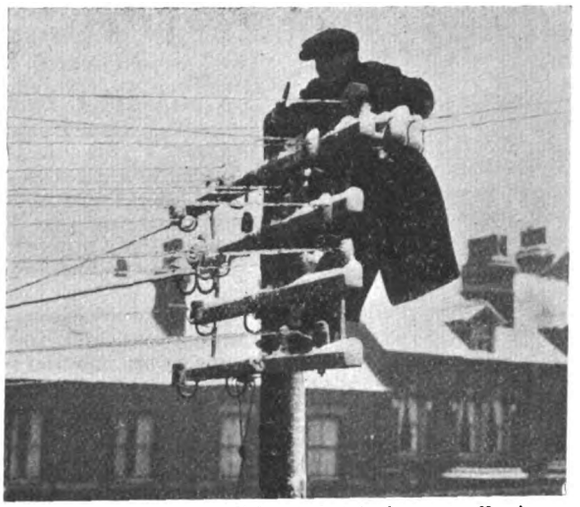
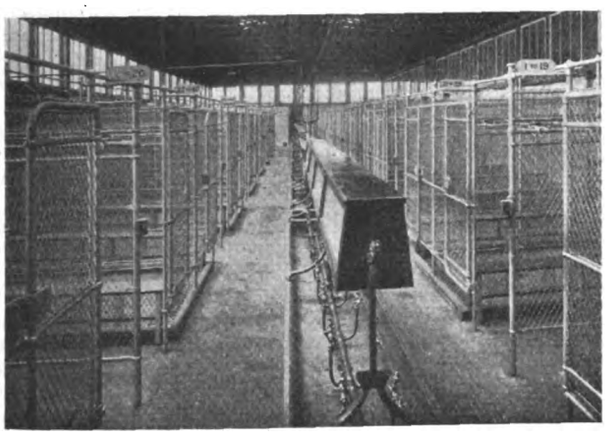
NEWS IN PICTURES

Mr. Allan Campbell, apprenticed with Reynolds and Bradwell, Birmingham, has been awarded the E.C.A. Gold Medal and £20 for obtaining highest marks in the First-Class Final of the City and Guilds Examination.



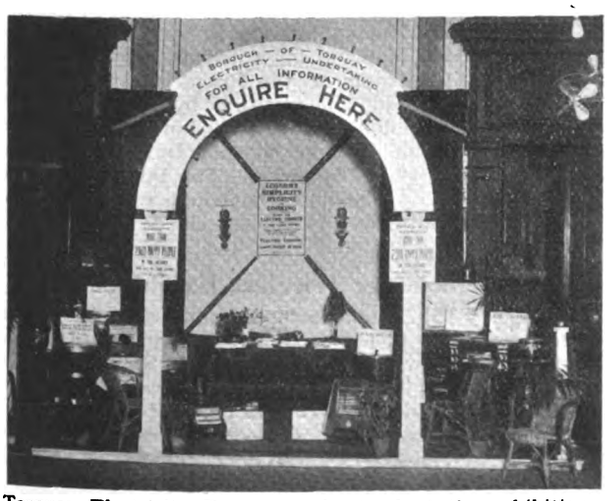
Tuesday's snowstorm dislocated telephone traffic in a number of places. The picture shows a line between Selby and Hull receiving attention after the storm.

Mr. S. C. Blackburn, who is apprenticed to Troup, Curtis and Co., London, obtained highest marks in Grade I of the City and Guilds Examinations and has been awarded the Electrical Contractors' Association's Silver Medal and £20.



Welfare developments at the Chloride Electrical Storage Co.'s works include new cloak and ablution rooms. In a large case in the foreground are toothbrush racks—each position numbered—and special water jets for dental cleansing.

This view of part of the window frontage of the new Birmingham showrooms of the British Thomson-Houston Co. illustrates the importance which some large manufacturers attach to the Wiring the Homes of Britain Campaign.



Torquay Electricity Department's stand at the exhibition organised at Newton Abbot by Mr. H. F. G. Woods, who reports splendid support from the local contractors, most of whom had stands.

Sending the first messages to Canada by the new high-speed "beam" wireless telegraph service which was inaugurated on Sunday. The system is said to be working very satisfactorily.

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W.O.B. PROGRESS.

Special "Electrician" Reports from the Districts.

(*Concluded from page* 508.)

joined with the building company, J. Riley and Sons, of Forge Lane, Bradford, Manchester, and is getting a demonstration house ready at Denton. The house will be fully equipped electrically, but the most pleasing feature of all is that Mr. Barratt, not content with this effort, is offering to give a three-valve wireless set with all equipment to any person, whether a customer or not, who resides within 20 miles of his premises, and who is lucky enough to win the competition house. This offer may be better appreciated when it is realised that there are nearly two and a half million people within 15 miles of Manchester and considerably more inside the 20 mile radius.

There has not been much activity in the way of additional advertising in this district, but our representative understands that Brown's advertisement in the "Manchester Guardian," which has been commented upon in THE ELECTRICIAN on previous occasions, is to be continued throughout the whole of the six months.

A Tale with a Moral.

Mr. R. C. Hawkins told THE ELECTRICIAN that matters are improving in the district, and that he hopes to see committees established on a firm basis at Chester, Blackpool and Llandudno in the course of the next week or so. On asking which Circle was running the electric house mentioned above, our representative was informed that the electrical trader and the builder had got together and put up the proposition to Mr. Hawkins, and were then going to get the Circle formed. There would appear to be a moral in this! Actions of this kind do more to help forward the work of the campaign than many days spent in trying to get up interest amongst a committee. It is thought that once the ball is moving the Circle will be formed round it, and further work involving its assistance may then be undertaken. The promoters are already planning for another house in the Manchester area.

Following a meeting of Nottingham electrical traders and contractors, presided over by Mr. H. J. Talbot, the city electrical engineer, last week, Nottingham residents are freely familiar with the ballot and the prize house, states an ELECTRICIAN representative. One firm, Hammond and King (formerly the Electric Elements Co.), of Arkwright Street, Nottingham, has sent out over a wide area a circular letter calling attention to the ballot and suggesting that the book, "Electric Lighting in the Home," makes fascinating as well as instructive reading, and "will be appreciated by everyone in the family circle."

Steady progress everywhere is reported by THE ELECTRICIAN's representative in the South Midlands area. It was, he states, found necessary to postpone the opening of the first demonstration house in Birmingham on Monday, but there is compensation in the fact that three will be opened next Monday, at Bournville, Erdington, and King's Norton.

During last week new Circles have been formed at Stratford-on-Avon, Bromsgrove, and Northampton. An enthusiastic meeting was held at Worcester, where it is hoped a demonstration house will soon be opened.

The Shropshire, Worcestershire and Staffordshire Electric Power Co. are advertising the campaign in local papers covering practically the whole of the area which they serve, and it is hoped that contractors will co-operate in this.

Italian Electricity Statistics.

Use of Thermal Stations for Emergency Supplies during Droughts.

IN the latest report of the British Commercial Secretaries at Rome it is stated that the aggregate capacity of the electricity generating stations in Italy was 3 200 000 H.P., and the consumption of electricity was 7 600 000 000 kWh. Almost all the generation is done by water power. The thermal stations have a joint capacity of about 580 000 H.P., but they are only used for a few hundred hours annually, when water is short. At the end of 1925 there were more than 45 000 km. of H.T. transmission lines apart from a much greater length of lines for local distribution.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

SOUTHAMPTON Tramways Committee has authorised the building of ten new tramcars in the Corporation's own works.

Portsmouth Corporation has decided to put in hand the reconstruction of the tramway track from the Circle to the Strand.

A majority of labour members on the Wigan Tramways Committee has defeated a motion to restore the early morning workmen's cars for the convenience of miners who have returned to work at Bryn, Ashton and Bamfurlong.

London County Council recommends that the through running of tramcars to Purley be continued, on condition that Croydon Corporation, which owns the Norbury to Purley portion of the line, orders 10 new cars this year and 15 next year.

Under an arrangement between the St. Helens and Wigan Corporations and the Lancashire United Tramways Co., tramcars are now run between the two boroughs *via* Ashton-in-Makerfield, where a connection has been made between the two municipal systems.

It is stated that an effort is to be made during 1927 to increase the output of and the demand for electric broughams. It is suggested that if more of these vehicles were used for theatre work they would, by reason of their small bulk compared with that of petrol cars, assist in solving the traffic problem.

New Underground Connection.

At King's Cross (London) a new Underground Railway tunnel, nearly 1 000 ft. long, is being driven to connect the Piccadilly and City Line tubes, and to enable the rolling stock of the latter line to get through to the general overhaul depot at Acton. The excavation of the new tunnel should be completed in about a month.

Camborne and Redruth Electric Tramways Co. has given notice of intention to apply to the Ministry of Transport to modify the statutory maximum charges on the tramways from January 1st. The charge at present authorised and which the company proposes should be renewed is, for all passengers, not exceeding twopence per mile or portion thereof.

Mr. R. H. Wilkinson, manager of the Bradford Corporation Tramways, states, in a report on the whole question of passenger transport, that at present the electric tramcar is the mainstay of all large transport undertakings. It is by no means obsolete, and, given a fair field, would be able to hold its own. The Bradford tramways have contributed surplus profits amounting to £205 800 to relief of rates.

WIRELESS NEWS.

Constitution of the New Broadcasting Corporation.

IT was announced by the Postmaster-General in the House of Commons on Monday that the Prime Minister proposed to recommend the following for appointment by the Crown as the original Governors of the Broadcasting Corporation, which it was intended to constitute by Royal Charter:—The Earl of Clarendon (chairman), Lord Gainford (vice-chairman), Sir John Gordon Nairne, Dr. Montague John Rendall, and Mrs. Philip Snowden. The Postmaster-General added, in reply to a question, that there would have to be a supplementary estimate to authorise the payment of salaries to this body.

Manchester Wireless Exhibition.

On Tuesday the "Manchester Evening Chronicle" annual wireless exhibition was opened in the City Hall, Deansgate, Manchester, by Sir William Noble, Dr. S. Z. de Ferranti being in the chair. The exhibition attracts wireless enthusiasts from a large area, and firms from all parts of the country have taken space. Amongst leading electrical firms who are showing there are J. J. Eastick and Sons, representing Mullard's Wireless Service; the Chloride Electrical Storage Co.; the Metropolitan-Vickers Electrical Co.; the Igranic Electric Co.; the Hart Accumulator Co.; Ferranti, Ltd., and Philips Lamps, Ltd. There is a completely furnished wireless house supplied by Lewis's, Ltd., of Manchester. In all about 80 firms are taking part. The exhibition remains open until November 6th.

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COMPANY NEWS.

Electrical Shares Generally Weak—Marconi's an Exception—London Supply Set-Back—Drake and Gorham's Improved Results.

WITH the exception of Marconi shares, which, on the success of the "beam" system, have jumped up from 13s. 9d. to 17s. 6d., electrical shares have been weak since our last issue. Cable descriptions have naturally given way, Eastern stock as much as 10 points. The upward movement in anticipation of share bonuses by London electricity supply companies appears to have been overdone, and the week's announcements proving below expectation, there has been a set-back in prices, Westminsters falling 6s. 3d. and Chelseas 2s. 6d., while Counties are down 3s. 9d. and Charing Cross and City of London 1s. 3d. each. Equipment shares have also weakened, Henleys and Siemens each to the extent of half-a-crown, and G.E.C.s 1s. 6d. Ferranti debentures are down to 90.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
	Electricity Supply.				
10	Brompton & Kensington Ord. ..	31/3	31/3	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	90	90	100	67
15	Charing Cross Elec. Ord. (£1) ..	47/6	48/9	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	42/6	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	49/4½	50/7½	52/6	20/3
6	,, ,, 6% C.P. ..	23/-	23/-	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	61/3	65/-	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	17	17	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	36/6	37/-	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	40/7½	40/7½	41/6	8/-
4½	,, ,, 4½% C.P. ..	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	22/6	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord. (£5) ..	18½	18½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	41/3	47/6	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
6	,, ,, 6% C.P. ..	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	140½	140½	123	24
6	,, ,, 6% Pf. Stk. ..	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69	69	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	78½	78½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	50½	50½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98¾	52
5	Lon. & Sub. Trac. A. Deb. ..	76½	76½	89	65
4	Lon. Un. Trams. 1st Deb. ..	41½	43½	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	65½	65½	101½	49
5	,, ,, 5% Deb. ..	66½	66½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	60	61	84½	19
3½	,, 3½ Pf. Stk.	63½	63½	88½	40½
3½	,, 3½% Deb.	69½	69½	92½	51
3½	Met. Dis. Ord. Rly. Stk. ..	54	54	58	12¾
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb. ..	68	68	73½	48½
¶5	Yorks. (W.R.) Trams. Ord. ..	11/6	11/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	70/-	70/-	62/-	26/6
6	,, ,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	22/6	22/6	23/4	19/7
7	,, ,, ,, 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	26/3	26/10½	29/-	10/-
‡15	Callender's Cable Ord.	66/3	66/3	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref.	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)	12/9	12/9	28/9½	1/1
7½	,, ,, 1st Pref. ..	22/6	22/6	26/-	5/-
10	Elec. Construction Ord. ..	31/10½	31/10½	30/4	6/7
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	14/-	14/6	29/3	7/3
6	,, ,, 6% C.P. ..	17/6	17/6	21/3	10/6
—	Ericsson Telephones 7% Pref.	21/10½	21/10½	21/-	12/7
6	Ferranti 6% Pref.	18/9	18/9	18/6	16/9
7	,, 7% 2nd Pref. ..	18/-	18/-	19/-	13/9
5	,, 1st Mort. Deb. Stock	90	95	96½	80½
7½	General Elec. Ord.	28/6	30/-	59/-	13/6
20	W. T. Henley's Ord.	80/-	82/6	86/6	23/3
17½	Johnson & Phillips Ord. ..	63/9	63/9	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	23/9	25/7½	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	17/6	47/6	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	27/6	30/-	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	30½	30½	56/2/6	19
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	74½	74½	87½	60
10	Eastern Ord. Stk.	180	189½	213½	113/2/6
3½	,, 3½% Pref. Stk. ..	66½	66½	84/17/6	49
4	,, 4% Deb.	79½	79½	103½	60
10	Eastern Extension Ord. (£10) ..	17½	19	21½	10/12/6
4	,, ,, 4% Deb. ..	78½	78½	97½	60
‖10	Gt. Northern Telegraph (£10) ..	27	27½	42/12/6	19
—	Indo-European (£25)	47½	47½	59½	25
7½	Marconi's Wireless T. Ord. ..	17/6	13/9	9/16/3	20/9
10	,, Int. Mar.	22/6	21/3	5/11/3	14/11
4	Western Tel. Ord. (£10) ..	17	18½	23	11/6/3
	,, ,, 4% Deb. Stk. ..	78½	78½	10	60/2/6

‡ Plus share bonus. ¶ Plus 3 p.c. in respect of 1921. ‖ Including bonus.

RIVER PLATE ELECTRICITY CO., LTD.—Div. 3 p.c. actual, less tax.

MANAOS TRAMWAYS AND LIGHT CO., LTD.—Int. pmt. of 3½ p.c. on 7 p.c. participating 1st debs. is announced.

ISLE OF WIGHT ELECTRIC LIGHT AND POWER CO., LTD.—Intm. div. 4 p.c., tax free, on ord. shs., payable November 1st.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Quartely div. 1¼ p.c. on issued ord. cap. stk., payable December 1st.

ARGENTINE LIGHT AND POWER CO., LTD.—It is proposed to change the name of the company to Atlas Light and Power Co., Ltd.

MONTREAL LIGHT, HEAT AND POWER CONSOLIDATED.—Div. of $1½ p. sh. on common shs. for quarter ending October 30th, payable November 15th.

AGAR, CROSS AND CO., LTD.—Pft. for year ended June 30th, 1926, £305 350, plus £36 369 brt. in. To gen. res. £115 000; fin. ord. div. 6 p.c., tax free, making 11 p.c. for year, plus bonus on ord. shs. for year of 5 p.c., tax free, fwd. £70 577.

"WHAT MANCHESTER DOES..."

ONCE more the Mancunians' boast is justified. Instead of waiting to form a Circle, a Manchester electrical trader is preparing a demonstration electric house in conjunction with a local builder. "Get the house going first and then form a Circle," seems to be his pushful motto. Is the rest of England too proud to complete the saying?

METROPOLITAN ELECTRIC SUPPLY CO., LTD. — At a mtg. on October 21st the 3½ p.c. deb. holders approved the proposed arrangement for redemption of stk. and transfer to stockholders of British Government conversion stk. in the proportion of £105 conversion stk. to £100 deb. stk.

STOTHERT AND PITT, LTD.—Directors state that notwithstanding continued depression in engineering trade there is a profit of £18 583 for past year, plus £196 brt. in. Div. on pref. shs. for year has been paid. It is proposed to place to res. £10 000, and to pay div. on ord. shares of 2½ p.c., less tax, for year; fwd., £1 756.

S. SMITH AND SONS (MOTOR ACCESSORIES), LTD.—A mtg. of the holders of the 8½ p.c. first mort. debs. will be held to-morrow (October 29th) to consider a resolution authorising further postponement of redemption of debs. The debs. are chiefly held by the company's bankers, who have intimated that they agree to the proposals.

HERBERT MORRIS, LTD.—Pft. for year to July 31st, 1926, £67 347, plus £9 100 divs. from investments, transfer fees, etc., and £33 141 brt. in. After providing for directors' fees, pref. divs. for year, ord. div. for first half-year and depreciation, bal. is £66 384. Further div. recommended on ord. shs., making 10 p.c., tax free, £10 000 placed to res., and £38 884 fwd.

DRAKE AND GORHAM, LTD.—Net pft. for year ended June last £8 920, agst. £2 903, plus £186 brt. in. Div. 5 p.c. for year, to gen. res. £1 000; fwd. £1 856. There has been a reduction in overhead expenses, and the company is in a position to take full advantage of the ever-widening scope for electricity and to compete for all classes of electrical work. Contracts for wireless work have been carried out in 79 hospitals and for numerous private users.

New Companies.

SMITH, EWEN AND STYLIC, LTD.—Cap., £7 000. Electricians and electrical instrument manufacturers, etc. Reg. office: 42, Frederick Street, Birmingham.

AUTOCHROME SIGNS (1926), LTD.—Cap., £2 050. Manufacturers of and dealers in advertising signs and devices of all kinds, etc. Reg. office: 12, Gerrard Street, London, W.1.

CHADNETLEY, LTD.—Cap., £150. Manufacturing agents of electric lamps and appliances, electrical engineers, etc. Reg. office: Vernon House, 40, Shaftesbury Avenue, London, W.1.

DEAN AND NOBLE, LTD.—Cap., £1 000. Electrical and mechanical engineers and dealers in electrical, mechanical and wireless goods and fittings. Reg. office: 41, Market Street, Hyde.

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TREVOR-ROPER, LTD.—Cap., £2 000. Electrical engineers and contractors and dealers in electrical and wireless apparatus. Reg. office: Arden House, Endwell Road, Bexhill-on-Sea.

POSTERGRAPH, LTD.—Cap., £5 500. Manufacturers of and dealers in mechanical and electrical advertising signs and machines. Reg. office: 48, Cranbourne Street, Leicester Square, London, W.C.

NATWIRCO, LTD.—Cap., £100. To increase the popularity of wireless within the range of broadcasting areas by means of advertisement and otherwise, to act as radio and general engineers, etc. Reg. office: 3, Pepys Road, Raynes Park, Surrey.

DEAL AND SANDWICH ELECTRICAL CO., LTD. Cap., £1 000. Electrical contractors, electricians, vendors and manufacturers of wireless apparatus, motors, dynamos, accumulators, lamps and lighting equipment, power distributors, etc. Secretary: F. Deverson, High Street, Eastry, Kent.

TRICITY RESTAURANTS, LTD.—Cap., £40 000. To acquire business of restaurant proprietors carried on in London by Modern Kitchens, Ltd., and known as the Tricity Restaurant, and to carry on the business of restaurant, hotel and club keepers in London and elsewhere. Reg. office: 125-130, Strand, London, W.C. (Public Company.)

SCOTT-TAGGART VALVE MANUFACTURING CO., LTD.—Cap., £1 000. Manufacturers of and dealers in, hirers and repairers, thermionic valves, apparatus, accessories and the like for radio telephony, radio telegraphy, submarine signalling, wireless broadcasting, telephony, telegraphy, etc. Solicitors: Bartlett and Gluckstein, 199, Piccadilly, London, W.

BUSINESS ITEMS.

Changes of Address, Representatives, and Other Developments.

THE accompanying illustration shows the exterior of the Chloride Electrical Storage Co.'s new distributing depot at 1 to 18, Bridge Street, Manchester. The new premises comprise showrooms, offices and storerooms, with a total floor space of over 400 sq. yd., and a window frontage of 74 ft. The storerooms are fitted with every modern equipment for the easy storage and rapid handling of batteries. This, together with the special transport facilities available, will be of great benefit to clients in securing quick delivery of their orders.

The Chloride Electrical Storage Co.'s new Manchester depot for batteries.

New showroom premises and a radio store have been opened at 126, High Street, Deal, by Mr. C. O. Clark, electrical contractor, of Mill Road, Deal.

The Igranic Electric Co., Ltd., is exhibiting a complete range of its radio products at the Manchester Wireless Exhibition, which opened on Tuesday.

The General Electric Co., Ltd., will exhibit a comprehensive range of Gecophone receiving sets, h.t. battery eliminators, loud speakers, variable condensers, transformers, chokes, etc., and Osram valves at the Irish Radio Exhibition, which is to be held at the Mansion House, Dublin, under the auspices of the Irish Association of Radio Traders, and will be opened on November 1st.

May and Padmore, Ltd., have transferred their London offices and showroom to 29-30, High Holborn, W.C.1, where the new telephone number is Chancery 7545 and the telegraphic address "Buildoware, Holb. London." The establishment will be under the personal supervision of the sales director, Mr. A. E. Wall. The firm's export office remains at 25 and 26, Redcross Street, London, E.C1.

Automatic and Electric Furnaces, Ltd., Elecfurn Works, 173-175, Farringdon Road, London, E.C1, have available for the use of technical societies a collection of lantern slides illustrating electric furnaces for hardening, tempering, carburising, and annealing, together with component parts, automatic temperature controls and wiring diagrams. Descriptions of the slides in the form of a lecture are supplied if required.

In a letter to the "Ilford Recorder," Mr. E. W. Ludlow states that in conjunction with Mr. A. P. Welch he has successfully negotiated for the purchase of the Fuller's United Electric Co.'s accumulator works at Chadwell Heath, and that there will be no break in the continuity of manufacture. He adds that the company's cable works have been sold to a separate group, and will continue to employ a considerable number of workpeople.

The General Electric Co., Ltd. have opened showrooms for the display of stage lighting apparatus at Central House, Kingsway (next door to Magnet House); telephone, Regent 7050; extension 183. These showrooms are available to architects, consulting engineers, contractors, and others interested in the stage lighting of theatres, cinemas, dance halls, cabarets, etc. Stage lighting engineers are available to advise on technical matters, or to prepare and submit stage lighting schemes.

Battery Business.

Manufacturers Reported Very Busy in Spite of Industrial Situation.

SPEAKING at the annual reunion luncheon of the Chloride Electrical Storage Co., Ltd., at the Clarendon Restaurant, Hammersmith, London, on October 21st, Mr. D. P. Dunne, director and sales manager, said that considering the upheaval of the general strike and the consequences in various classes of industry of the coal strike, he was glad to be able to say that battery business was good.

There was no new development of a major character in battery design—in fact there had been no such development for years. There had been cometary disturbances, which, however, all faded away without leaving a mark.

The Chloride Co. had been established thirty-five years, and from small and tender beginnings had built up the largest battery business in the British Empire, and had, he believed, a greater variety of batteries—each designed for its particular purpose—than anyone else.

They had, however, done something greater than make batteries and money. They had also built up a big industrial community with a rare spirit pervading it, and this governed the happiness of the workpeople and the success of the company.

In concluding our reference to this enjoyable annual event it may be added that we do not agree with the contemporary which states that the luncheon was opened by the Mayor on September 13th and continued until the following Saturday. Our recollection is that it was held, as previously stated, on October 21st and that it terminated the same day at an appropriate hour.

Metal and Chemical Prices.

TUESDAY, October 26th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£65 0 0	5s. 0d.	—
Electro Wirebars	,,	£67 0 0	—	—
H.C. Wire, basis	per lb.	9⅝d.	—	—
Sheet	,,	9⅞d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 0¼d.	—	—
Brass 60/40—				
Rod, basis	per lb.	7¼d.	—	—
Sheet, basis	,,	10¼d.	¼d.	—
Wire, basis	,,	10¼d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£6 5 0	2s. 6d.	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 0 0	—	—
Lead Pig—				
English	,,	£31 15 0	—	15s. 0d.
Foreign or Colonial	,,	£30 10 0	—	15s. 0d.
Tin—				
Ingot	,,	£310 15 0	—	£4 15 0
Wire, basis	per lb.	38. 11d.	—	¼d.
Aluminium Ingots	per ton	£112 0 0	—	—
Spelter	,,	£34 2 6	—	5s. 0d.
Mercury	per bottle	£16 15 0	—	—

Sulphur (Flowers)—Ton £11 10 0 *Sodium Chlorate*—Per lb. 2¼d.
,, (Roll-Brimstone)—,, £10 5 0 *Sulphuric Acid* (Pyrites, 168°)
Copper Sulphate— ,, £25 to £25 10s. per ton, £6 15 0
Boric Acid (Crystals) ,, £37 *Sodium Bichromate*—Per lb. 3½d.
Rubber—Para fine, 1s. 7¾d.; plantation 1st latex, 1s. 8¼d.

The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

HANCOCK, Mr. E. J., 8, Union Street, Torquay, electrical engineer. £35 os. 11d. September 24th, and £13 17s. 9d. September 2nd.

HAYES, HERBERT AND CO., North End Chambers, 78, North End, Croydon, electrical engineers. £11 6s. 6d. September 22nd.

SCIENTIFIC AND ELECTRICAL AND UTILITY CO., 30, Garrard Street, Halifax, wireless dealers. £17 18s. 9d. September 16th.

WATKINS, Mr. W. H., 38, Stacey Road, Cardiff, electrical contractor. £12 19s. 9d. September 23rd.

Bills of Sale.

DREWETT, Charles Ambrose, 67, Dagnan Road, Balham, wireless condenser manufacturer. Filed October 21st. £35.

GOODALL, Frank Leslie, 25, Victoria Road, Middlesbrough, electrical engineer. Filed October 19th. £40.

McMAHON, Albert James, 29, Park Mead Road, Wyke Regis, Weymouth, electrical contractor. Filed October 20th. £60.

Receiverships.

BRIJANE, LTD.—F. T. Shearcroft, of 76, Newgate Street, E.C.1, was appointed receiver and manager on October 8th, 1926, under powers contained in first mortgage debenture dated June 12th, 1924.

CLEAR HOOTERS, LTD. L. J. F. Austin, of Upper Priory, Birmingham, was appointed receiver on October 7th, 1926, under powers contained in 1st mortgage debentures dated July 16th, 1925.

HODGETTS BROS., LTD. A. H. Warriner, of 47, Temple Row, Birmingham, was appointed receiver on October 14th, 1926, under powers contained in debentures dated February 20th, 1920, and October 29th, 1923.

Mortgage.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BUILTH WELLS ELECTRIC SUPPLY CO., LTD.—Registered October 15th, £625 debentures, balance of £2 500; general charge. *——. December 17th, 1925.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Company Winding-up Voluntarily.

LUMINOR SIGNS (BRITISH), LTD.—J. Barlow, Astor House, Aldwych, W.C.2, company secretary, appointed liquidator, October 13th. Meeting of creditors at Astor House, Aldwych, W.C.2, on Tuesday, November 2nd, at 2.30 p.m.

Bankruptcy Information.

SEGAL, J., 2, Vine Street, Tooley Street, London, gas and electrical accessories merchant. First meeting, November 3rd, 12 noon, and public examination, December 7th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

SELLERS, Reginald Victor Greening, Town Hall Buildings, Banbury, trading as THE WIRELESS SUPPLIES AND INSTALLATIONS. Receiving order, October 19th. Debtor's petition.

WINTERSGILL, George, Hawnby Road, Linthorpe, Middlesbrough, Yorks, electrical engineer. Receiving order, October 19th. Creditor's petition. First meeting, November 5th, 2.45 p.m., Official Receiver's Offices, 80, High Street, Stockton-on-Tees. Public examination, November 19th, 10.30 a.m., Court House, Wilson Street West, Middlesbrough.

Notice of Dividend.

HUBBARD, Charles, 13, Magdalen Street, Norwich, electrician. First dividend, 7s. 6d. per £, payable November 3rd, Official Receiver's office, 9, Queen Street Chambers, Norwich.

Notices of Intended Dividends.

CHARNOCK, John Richard, lately 6, Stonegate Road, now Meanwood Road, Meanwood, Leeds, electrical engineer. Last day for receiving proofs, November 10th. Trustee, H. C. Bowling, 24, Lower Bond Street, Leeds, Official Receiver in Bankruptcy.

RENNIE, John George Fowler, electrical engineer, 19, Bridge Street, Andover. Last day for receiving proofs, October 26th. Trustee, T. Barton, City Chambers, Catherine Street, Salisbury, Official Receiver.

THOMPKINS, Benjamin George, Armstrong's Buildings, Stanley, county of Durham, radio engineer. Last day for receiving proofs, November 1st. Trustee, R. W. Cave, Official Receiver, 81, St. Mary's Place, Newcastle-upon-Tyne.

Partnerships Dissolved.

CENTRAL LIGHT AND POWER CO. (James ORTON and Thomas WRIGHT), electrical engineers, Friar Lane, and Southgate Street, Leicester, by mutual consent as from October 2nd.

RELIANCE ENGINEERING COMPANY (Thomas WHEELER, Arthur CHAPLIN and Edwin POBJOY), 339a, Richmond Park, Road, East Sheen, Surrey, electrical engineers, by mutual consent as from October 19th, 1926. Debts received and paid by E. Pobjoy.

SEABROOK (H.) AND CO. (Henry SEABROOK and Alexander Bell WAUGH), electrical engineers, 178, Katherine Road, East Ham, by mutual consent, as from September 30th, 1926. Debts received and paid by H. Seabrook.

Bankruptcy Proceedings.

COX, William Henry, and SANTOLINI, Julien Marius, 179, Old Street, London, E.C. The debtors, who have carried on business as electrical sign makers, attended in the London Bankruptcy Court on October 13th for their public examination before Mr. Registrar Warmington. The liabilities, according to their joint statement of affairs, amount to £465 and the assets to £10. It appeared that the debtors entered into partnership in February, 1925, and with a borrowed capital of £50 began business as electrical sign makers at the above address, where they traded under the style of Cox and Santolini. Last May, in consequence of a judgment having been obtained against them by their principal creditor, they discontinued the business. The debtors attributed their insolvency to lack of capital, to interest on borrowed money and to the profits from the business having been insufficient to meet their drawings in respect of household and personal expenses. The examination was concluded.

HALL, Frank Southern, 189, Gatley Road, Gatley, Cheshire, electrician. The public examination of this debtor was held recently at the Court House, Vernon Street, Stockport. The statement of affairs showed liabilities of £976, and there was a deficiency of £881. Debtor stated that in October, 1922, he purchased the plumbing and hardware business at his present address for £200. He reckoned that he paid £10 for the stock and fixtures and £190 for the goodwill. In 1921 he was given £300 by his father to purchase a house. Subsequently he sold the house for £250, but meanwhile his father had lent him £205 with which to purchase the business, and when debtor received payment for the house he repaid £150, and regarded the balance as a gift. In 1925 his father lent him a further £250 to assist him in the business. For the first 18 months he employed about five plumbers, but since then had carried on either alone or with one assistant. He estimated that he lost approximately £400 on contracts during the first 18 months owing to inexperience. He found that he had fixed the prices too low, with the result that when the contracts were completed he had to raise the price and lost custom in consequence. In regard to the jobbing business, debtor said it was a residential district and he had to allow his customers extended credit. He took contracts with builders and employed an apprentice and builder. Debtor said that during the last two years he had made a profit on all his contracts and had been able to pay his way and reduce his debts. The examination was closed.

The Lead Market.

IN their lead market report dated October 23rd, James Forster and Co. state that the world position is unchanged. Continental demand is slow, and there is no lack of prompt lead in Germany. In this country consumption is being held up by the difficulty of obtaining coal supplies, while in the U.S.A., owing to the reactionary tendency of Wall Street, consumers are holding off the market to await events. Should present conditions continue, it seems probable that surplus Mexican and American lead will find its way on to this market, and this, with the present rate of consumption in this country, would be bound to result in a lower range of values. Closing prices on October 22nd were £30 13s. 9d. for October and £30 12s. 6d. for January, against £31 16s. 3d. and £31 11s. 3d. respectively at the end of last week.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

244 683 J. A. Law (W. E. Hudson). Electrical liquid-heating apparatus. (14/8/24) (Divided application on 19 296/24.)
241 904 O. R. Jurgensen. Electric pulley tackle. (25/10/24.)
242 632 British Thomson-Houston Co., Ltd. Electrolytic cells. (10/11/24.)
244 803 F. B. Dehn (Neufeldt and Kuhnke). Quick acting electric voltage regulator for dynamo-electric generators. (11/6/24.)
218 276 Dr. E. F. Huth Ges. Electric discharge devices. (27/6/23.)
244 807 S. Z. De Ferranti. Electrical windings. (25/7/24.)
244 808 J. A. Law (W. E. Hudson). Electrical heating apparatus. (14/8/24.)
220 958 Soc. Francaise Radio-Electrique. Wireless signalling. (23/8/23.)
244 817 Igranic Electric Co., Ltd., A. H. Curtis, and G. F. Dandridge. Plug-and-socket members for use in connection with wireless apparatus. (18/9/24.)
227 792 F. Aldendorff. Selectors and telephone systems operating with selectors. (14/1/24.)
244 825 H. P. L. Higman. Electrical fuses. (23/9/24.)
244 833 British Thomson-Houston Co., Ltd., A. P. Young, and A. G. Salisbury. Mounted battery boxes. (25/9/24.)
222 858 A. C. J. Guenee. Electropneumatic hammer. (6/10/23.)

Applications for Patents.

September 27th.

23 835 A Borsing Ges. and G. O. Lehmann. Electric motors, etc.
23 823 V. T. Burchell, Callender's Cable and Construction Co., Ltd. Metal-sheathed electric conductors.
23 831 H. Golob. Electric irons. (25/9/25, Austria.)

"... PASSED BY YOUR WINDOW"

MANY people will pass by your window if you do not use it to attract inquiries for Competition Booklets. The special window displays (see p. 507) are best, but in any case there should be a poster or leaflet telling people that Competition Booklets are available inside.

23 769 Heyes and Co., Ltd., and B. E. Jones. Electric alternating current circuit-controllers.
23 812 Metropolitan-Vickers Co., Ltd. Electrical protective arrangements. (26/9/25, U.S.)
23 834 D. von Mihaly. Receiver for wireless telephony, etc.
23 793 G. Mombur. Electromagnetic speed indicator and distance counter. (26/9/25, France.)
23 786 S. C. W. Smith. Telephones.
23 778 Standard Telephones and Cables, Ltd., and Western Electric Co., Inc. Alternating current motors. (2/7/25.)
23 815 W. E. Stitching. Electric batteries.
23 801 J. Stone and Co., Ltd., and J. Bolton. Electric lighting, etc., installations for railway, etc., vehicles.

September 28th.

23 980 Akt.-Ges. Brown, Boveri et Cie. Mercury-vapour rectifiers. (17/10/25 Germany.)
23 878 W. Allen, M. Davis and W. Fallon. Conduits for electrical leads.
23 925 E. A. Ashcroft. Electrolytic separation, etc., of constituents of metallic salts.
23 937 British Electrical and Allied Industries Research Association and W. B. Whitney. Electric circuit-breakers.
23 912 British Thomson-Houston Co., Ltd. Regulating systems for dynamo-electric machines. (28/9/25, U.S.)
23 932 W. H. Day. Earthing devices for electrical apparatus.
23 913 E. A. Falconer. Electric switches.
23 883 H. V. Flinn and W. P. Kavanagh. Variable electric condensers.
23 968 F. W. Lanchester. Dynamo-electric machines.
23 894 R. Hornby and E. H. Wratten. Coin-freed apparatus for controlling electric supply.
23 911 International General Electric Co., Inc. Vapour condensers. (28/9/25, Germany.)
23 927 C. Pressland. Wireless receivers.
23 928 C. Pressland. Electric resistances.
23 941 Siemens-Schuckertwerke Ges. Hollow cables for electric overhead lines (4/2/26, Germany.)
23 908 R. F. Sweeney. Wireless receiving apparatus.

September 29th.

24 027 W. L. Barber and Midland Electric Manufacturing Co., Ltd. Electrical switches, etc.
24 099 H. Baron (Aldendorff). Electromechanically controlled systems, etc.
24 012 A. E. Crowdy. Variable electric condensers.
23 996 H. V. Flinn. Anti-capacity handles for wireless sets, etc.
24 093 P. Gedier and K. Schwade. Electrical tube-welding devices.
24 054 General Electric Co., Ltd., A. Kinnes and J. L. Rycroft. Electric resistances for heating elements, etc.
24 038 W. T. Gray and Metropolitan-Vickers Electrical Co., Ltd. Electric controllers.
24 087 J. A. Laird and M.-L. Magneto Syndicate, Ltd. High-tension voltage measuring apparatus.
24 000 F. Lewin. Photo-electric thermionic tube.
24 057 E. Maurich. Electric safety fuses. (8/10/25, Austria.)
24 090 Siemens und Halske Akt.-Ges. System for protecting weak current conductors. (27/2/26, Germany.)

September 30th.

24 138 Brookhirst Switchgear, Ltd., and A. C. Livesey. Controlling gear for electrically driven machines.
24 129 P. Burger. Galvanic cell. (30/9/25, Germany.)
24 126 G. J. Duckett and C. B. Leeming. Electrical control of window blinds.
24 200 F. C. Ham. Electric condensers.
24 144 C. Kratt. Wireless apparatus.
24 178 W. H. Lynch. Electrical heating apparatus for water-radiating.
24 130 MacGregor, M. E. Electrolytic rectifier.
24 221 Maschinenfabrik Oerlikon. Electric lead-in insulator. (2/10/25. Switzerland.)
24 175 Metropolitan-Vickers Electrical Co., Ltd. High-tension electrical devices. (1/10/25, U.S.)
24 121 W. Y. Newland. Electrical liquid-heating apparatus.
24 167 E. J. Piper. Telephone systems.
24 182 J. H. Reeves. Coupling of inductance coils.
24 215 Reiniger, Gebbert and Schall Akt.-Ges. Apparatus for producing high-frequency oscillations for medical purposes. (16/10/25, Germany.)
24 197 Siemens-Schuckertwerke Ges. Electric machines. (1/10/25, Germany.)
24 184 and 24 185 Telefunken Ges. fur Drahtlose Telegraphie. Radio transmitters.
24 186 Telefunken Ges. fur Drahtlose Telegraphie. Wireless telegraphy, etc. (1/10/25, Germany.)
24 202 F. Weissenfels. Miners', etc., electric lamps. (23/11/25, Germany.)
24 118 B. J. Axten. Apparatus for operating electrical circuits.

October 1st.

24 293 R. Amberton and R. H. Barbour. Electricity meters.
24 315 British Thomson-Houston Co., Ltd. Electric remote control systems. (1/10/25, U.S.)
24 317 British Thomson-Houston Co., Ltd., and E. B. Tuppen. Electric motor control systems.
24 275 M. R. Cahill. Anti-spilling devices for electric batteries.
24 302 D. C. Crowe. Selector switches. (12/10/25, Sweden.)
24 300 English Electric Co., Ltd., and A. M. Pooley. Mounting electric fuses.
24 277 T. W. Fairlie. Connectors for electric irons, etc.
24 316 International General Electric Co., Inc. Electric distribution systems. (1/10/25, Germany.)
24 296 Johnson and Phillips, Ltd., and P. M. Wood. Trucks for electric switchboards.
24 353 H. L. Kirke. Electrical oscillation generators.
24 237 and 24 238 H. S. Sanders and Santon, Ltd. Electric liquid-heaters. (1/10/26.)
24 266 T. F. Wall. Electromagnetically testing wire ropes.
24 280 T. Walmsley. Aerial for reception, etc., of radio energy.
24 340 Siemens und Halske Akt.-Ges. Thermionic-valve circuits. (2/10/25, Germany.)

October 2nd.

24 417 F. Barlow. Electric switch, etc.
24 426 D. E. Barnett. Terminals for electrical conductors.
24 427 D. E. Barnett. Thermionic-valve holders.
24 448 Brehmer Folding Box Co., Ltd., and S. W. Oglesby. Electrical cable reels.
24 398 L. G. Burton. Electric heat radiators.
24 363 E. J. D. Child Combined induction coils, distributor, and circuit-breaker.
24 387 J. E. Gaffney and J. H. Tucker and Co., Ltd. Means for mounting electric fuses, etc.
24 388 J. E. Gaffney and J. H. Tucker and Co., Ltd. Electric fuses.
24 432 General Electric Co., Ltd. Electric incandescent lamps for projection apparatus. (16/6/25, Germany.)
24 382 H. B. Jackson. Elements for electric appliances.
24 450 Lorenz Akt.-Ges., C. Alternating current rectifiers. (2/10/25, Germany.)
24 405 Naamlooze Vennootschap Phillips' Gloeilampenfabrieken. Device for rectifying alternating current. (7/10/25, Holland.)
24 406 Naamlooze Vennootschap Phillips' Gloeilampenfabrieken. Apparatus for converting electrical into mechanical vibrations. (21/10/25, Holland.)
24 437 Siemens-Schuckertwerke Ges. Electr odes for vacuum discharge vessels. (3 10/25, Germany.)
24 375 J. F. Smith. Electric light fittings.

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Friday, October 29th (To-day).

University of London.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Lecture IV. by Prof. J. A. Fleming on "The Electric Glow and Arc Discharge." 5.30 *p.m.*

Faraday House Old Students' Association.—Hotel Cecil, Strand, London. Dinner. 6.30 for 7 *p.m.*

Junior Institution of Engineers.—39, Victoria Street, Westminster. Lecturette on "Distortion in Wireless Reception." By A. V. Ballhatchet. 7.30 *p.m.*

Society of Technical Engineers.—Queen's Hotel, Birmingham. Address on "The Engineer's Bill." By Mr. R. Hazleton. 7.30 *p.m.*

Monday, November 1st.

Electrical Contractors' Association (Derby Branch).—Ordinary meeting.

Royal Institution of Great Britain.—Institution, 21, Albemarle Street, London. General meeting. 5 *p.m.*

Tuesday, November 2nd.

Royal Institution of Great Britain.—Institution, 21, Albemarle Street, London. Lecture by Dr. G. W. C. Kaye on "The Acoustics of Public Buildings." 5.15 *p.m.*

National Association of Supervising Electricians.—Junior Institution of Engineers, 39, Victoria Street, London. Paper by Mr. C. G. Nobbs, on "Hot Water Supply." 7.15 *p.m.*

Institution of Electrical Engineers (North-Western Centre).—Midland Hotel, Manchester. Chairman's address by Mr. W. J. Medlyn, followed by a Smoking Concert. 7.30 *p.m.*

Röntgen Society.—British Institute of Radiology, 32, Welbeck Street, London. General meeting. 8.15 p.m.

Wednesday, November 3rd.

Electrical Contractors' Association (London Branch).—Ordinary meeting.

Electrical Association for Women.—E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Lecture on "The A.B.C. of Electric Lighting." By Mr. W. C. Jeary. 3 *p.m.*

Institution of Electrical Engineers (Wireless Section).—Institution, Savoy Place, Victoria Embankment, London. Inaugural address by the Chairman, Prof. C. L. Fortescue. 6 *p.m.*

Institution of Heating and Ventilating Engineers.—Caxton Hall, Caxton Street, Broadway, Westminster. Paper by Mr. W. E. Fretwell on "Small Hot Water Supply Systems." 7 *p.m.*

Thursday, November 4th.

Electrical Contractors' Association (Newcastle Branch).—Ordinary meeting. 11 *a.m.*

Electrical Contractors' Association (Bristol Branch).—Ordinary meeting. 3.15 *p.m.*

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Ordinary meeting. Paper by Mr. J. R. Beard and Mr. T. G. N. Haldane on "The Design of City Distribution Systems, and the Problem of Standardisation." 6 *p.m.*

Friday, November 5th.

Electrical Power Engineers' Association (Southern Division).—Institution of Electrical Engineers, Victoria Embankment, London. Lecture on "Televisory Remote Control Sub-stations," by Mr. C. I. Shuttleworth. 7 *p.m.*

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THE ELECTRICIAN

ESTABLISHED 1861.

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The Electrician.

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THE BILL AND ITS CRITICS.

ON other pages of this week's issue of THE ELECTRICIAN we give descriptions of a new generating station at Norwich and of extensions to existing plant at Derby and St. Pancras. During the past few weeks we have also published descriptions of extensions to the stations at Liverpool, Glasgow and Wakefield. It is therefore evident that, in spite of the pessimists, and in spite of trade stagnation, progress is being made; and we have no doubt that under any circumstances that that progress will continue. Fortunate as this is in many important directions, it is unfortunate from one aspect. It gives rise to the idea that the electricity supply industry could, if left to itself and without Government assistance or interference, build up a system which before long, be correctly described as national, and free us from the stigma that we lag behind other countries in the use of electricity for most purposes. This idea is sedulously fostered by those who oppose the Electricity (Supply) Bill, and it is, therefore, desirable that once again these criticisms should be examined in detail. Criticism of that measure which is shortly to receive final treatment in the House of Commons and will, we hope, for reasons that will presently appear, pass through the remaining stages before the end of the year, may be conveniently divided into two groups. There are those who oppose it root and branch because they consider that the work of the Central Board will be wrought by the thinly gloved hands of nationalisation or because they feel it will interfere with their policy of developing highly paying loads and permitting the remainder to languish without attention. There are those too, who admit that the standardisation of system of supply, and the clearing of obstacles away from the path of future development are good, but who fear the rashness of the Central Board may, far from making electricity cheaper and more easily available, have the opposite result, and that though, therefore, benefits of centralisation are great, the risks accompanying its attainment are greater still. There is substance in both these criticisms. But, unfortunately, those who hold these views have not been content with supporting their case by arguments, but have launched out into rash statements and accusations, which fortunately for the cause of electrical progress can have nothing but a boomerang effect.

One of the main charges of the critics is that the country will be saddled with an expensive bureaucracy, the working capital of which is to be guaranteed by the State, that this body will be under no financial obligation to anyone, but that on the other hand existing undertakings will be saddled with additional administrative charges. Such a criticism is based either on a wilful misunderstanding of the measure or on ingenuousness. The Bill, as amended, provides that no undertaking need take electricity from the Board at a price less than that at which it can generate for itself, and if it owns a "selected" station, whose output must be sold to the Board, it may buy back what it requires for itself at a price not more than that at which it is now supplying itself. If the Board buying cheaply from large undertakings cannot sell to the smaller undertakings at a less price than that at which they can now supply themselves it will admittedly fail of its purpose. But every additional load which it secures, and it must secure many, will not only increase the national electrical consumption, but improve the conditions under which electricity is produced. It is wise, for economic reasons, that the electrical requirements of the country should be considered as a whole, and that can only be done by some body established on national lines. What can be done by interconnecting power stations and operating them as one unit, is shown by an American example, which should prove equally illuminating to both electrical engineers and financiers. In a typical case the extension of a large station by 30 000 kW has been postponed for three years as the direct result of connecting it to a trunk line. In the meantime, technical improvements have been made of which advantage can now be taken and obsolescence avoided. In other words, it has been possible to make each pound invested work harder. That is certainly worth some attempt to achieve at the present time.

The second class of critics regards the centralisation of generation and the development of interconnection as good things *per se*, but fears the rashness of the Central Board. We know that the Board is to be composed of business men. It is, however, assumed that they will be rash, and all sorts of arguments are put forward against the erection of trunk transmission lines on the ground that the enormous capital involved will not be able to earn its keep. The Board may, however, be allowed to find this out for themselves. This they will undoubtedly do and in so doing will realise that the correct policy must be the gradual pushing out of the supply into existing electrified areas and postponing the erection of national trunk lines until

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conditions allow it. There are plenty of gaps to be filled in existing networks, and much good work can be performed in filling them.

An argument that is often advanced is that we should be allowed to go on as we are; the reason being that development is taking place at a satisfactory rate. This ignores the fact that development is only taking place in some areas and in some directions, while in the remainder there is stagnation. It is rather curious that this argument should be supported by an account of what has recently taken place in the London area. There, it is argued, reorganisation has taken place without State intervention or subsidies. The truth is that the Commissioners' scheme for the unification of the electricity supply of the metropolis was so strenuously opposed, that instead of one there are now three authorities, and it is doubtful whether even that amount of concentration would have occurred without the moral suasion which the 1919 Act provided.

Experience in both America and Germany, as Sir PHILIP DAWSON has pointed out, supports the view that reorganisation on the lines laid down in the Bill will be for the good, not only of the electrical industry, but of the other industries of the country, not excepting agriculture, and of the people at large. A national electrical organisation is necessary for that purpose, and a national electrical organisation which gives plenty of scope for private enterprise is the best type of organisation of its kind. Unless electricity supply is to continue to develop on parochial lines some Bill is necessary. It is also necessary that the electrical industry should be relieved of the uncertainty which now hangs over it. Suppose the Bill is thrown out, we should be no better off. Indeed, essential changes would be postponed, and could later only be undertaken at an increased cost. They might also be effected on lines which would be less palatable to the critics than those now suggested. For the good of the industry and of the country it is well that this Bill should pass, and we hope that that will now be generally realised.

Current Topics.

Electrical Benevolence.

ON the opposite page we publish an appeal from Sir HUGO HIRST which speaks for itself. The facts are simple. Next Wednesday the Annual Festival and Dinner of the Electrical Trades Benevolent Institution will be held, and the funds of this deserving body are not being added to at a sufficiently high rate. The reason is a little difficult to discover. The electrical industry is not doing badly, yet its benevolent fund languishes. Other industries are not doing so well, yet their benevolent funds are much better supported. Even if the prosperity of the industry continues, as we hope it will, there will always be "hard cases," and these are likely to increase in number and severity as the ages of those engaged in the electrical work becomes more mature. This is a good argument for contributing to the fund now, yet it remains without adequate support. We have another theory which we have propounded more than once. We believe that the efforts made to increase the income of the Benevolent Fund are over-concentrated in two ways. Firstly, they centre round the Annual Festival and similar entertainments, which only take place occasionally, and secondly, appeals are made to firms rather than to individuals. We believe that if an effort were made to collect money regularly throughout the year from those who are most likely to benefit from the fund a great improvement would be noticed. We propose to put that theory to the test. We are willing to provide collecting boxes for use in factories, power stations and other places where electrical men work, so that small sums may be garnered weekly from those who will potentially benefit from the fund. These boxes will be placed in charge of a responsible official in each works, and we hope he will rattle it regularly and loudly. We shall be pleased to receive applications from those who are willing to undertake this task. For the time being, however, the slogan is "Send your contribution in before next Wednesday."

Developments in Illuminating Engineering.

THE opening meeting of the Illuminating Engineering Society this session was so arranged as to give a good all-round survey of developments in the lighting field. A very comprehensive report, read by Mr. J. Y. FLETCHER, was one of the chief items on the programme. In many fields, for example in shop lighting and in the lighting of trains, trams and buses, there has been a material improvement during the past year, partly as a result of advances in lamps and lighting appliances, but also due in a large measure to educational propaganda. The coal strike has naturally been a great hindrance to progress, but nevertheless efforts to impress the public with the benefits of good lighting are not being wasted. Their full effect will probably only become apparent when the strike is over and when a quick rebound to normal conditions will be generally desired. Technical progress was also well illustrated by the varied series of exhibits at this meeting. Mr. GASTER'S report was chiefly interesting for the glimpse it afforded of developments in the lighting field abroad. Since the termination of the war a very strong tendency towards international treatment of many technical problems has revealed itself. The fact that there are now Illuminating Engineering Societies in the United States, Germany, Austria-Hungary, Holland and Japan shows how this movement is developing, and it is of the utmost importance that the work of these bodies should be closely watched. We gather that the functions of such bodies have been the subject of some discussion. The general feeling abroad is still strongly in favour of the maintenance of the present wide and representative constitution. We think those concerned would be wise to continue on the present lines, rather than to attempt to form a purely professional "Society of Illuminating Engineers"—for which the time does not appear ripe as yet.

Electricity Supply in Liverpool.

MR. P. J. ROBINSON devoted the greater part of the address which he delivered to the Mersey and North Wales Centre of the Institution of Electrical Engineers last week to a description of the Lister Drive No. 3 station at Liverpool, full particulars of which we gave in a recent issue of THE ELECTRICIAN. In so doing, he answered a question which has been asked by a good many people: Why, in a city like Liverpool, lying on one of the country's widest rivers, it should have been necessary to build a cooling tower station. Politicians and other ignoramuses look forward to the time when power houses will be established at the pit-head, but electrical engineers know that cooling water facilities are more important than savings in coal transport charges. The position at Liverpool, however, is, according to Mr. ROBINSON, not so simple as would appear at first sight. The cost of land is high and the fouling of the condenser tubes with silt and débris and the possibilities of corrosion gave the designers pause. In this particular case, moreover, extensions on the existing site were possible and enabled a very much larger amount of plant to be run with the same staff. The latter reason may well be the determining factor, for foulness in the circulating water is met with and has been successfully overcome elsewhere. It will be interesting to see how the choice that has been made works out on an economic basis.

The Woolwich Case.

AS readers of THE ELECTRICIAN are well aware, there has been considerable discussion regarding the supply of electricity to the "all-electric" houses on the Eltham Housing Estate of the Woolwich Borough Council. This

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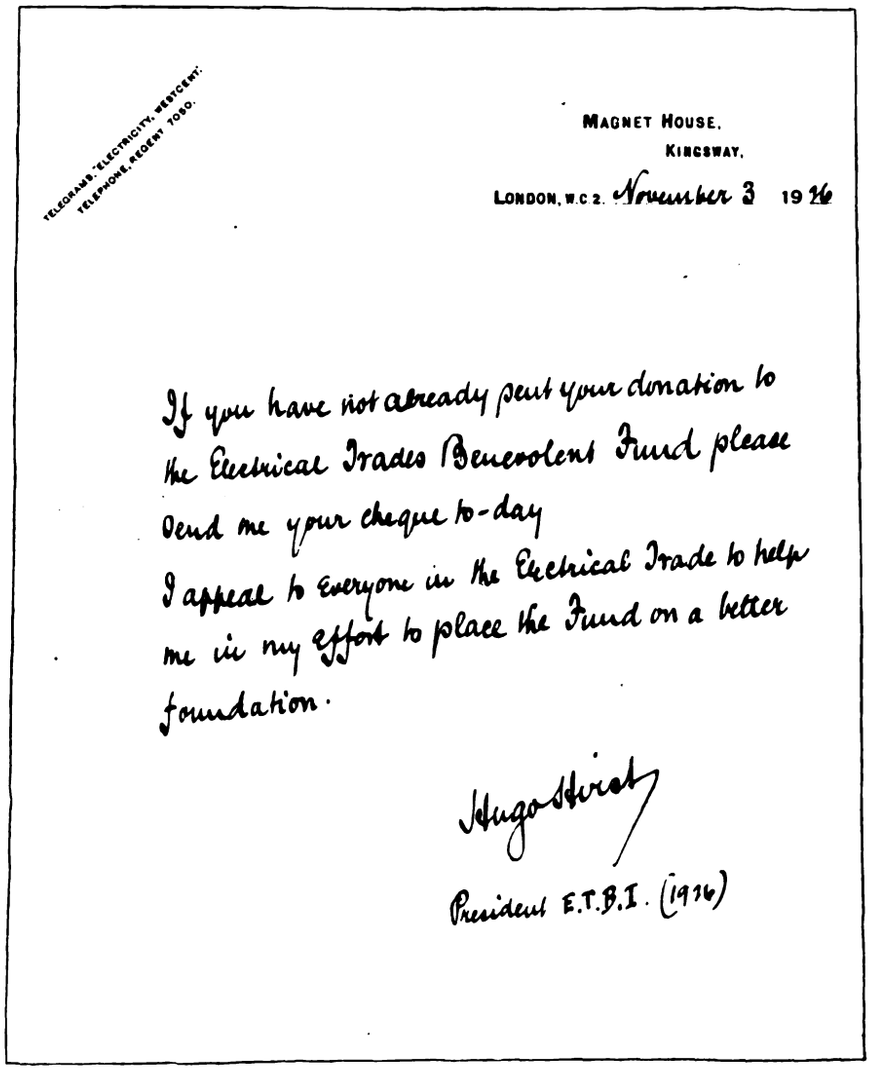
discussion has centred round two points: The ethics of tenants being forced to use electricity for all purposes and the price charged for the commodity which they are obliged to employ. As regards the first point, it may be mentioned that the tenants go into these houses with their eyes open, and that no one is obliged to live on the estate unless they want to. In the second point there is more substance. For some years these houses have been supplied with electricity for *all* purposes at a flat rate of 2d. per kWh. This is much too low for lighting and on the high side for heating and cooking. We do not wonder, therefore, that complaints have been made or that the Borough Council has wisely decided to make a change. The Council has now, in fact, arranged that the rate shall be £16 per kW of lighting demand per annum, plus 0·5d. per kWh consumed, less 5 per cent. discount for cash. The hiring rate for the cooker is to be reduced from 15s. to 7s. 6d. per quarter, and the tenants will have the option of using a prepayment meter or paying weekly. These rates will work out at an inclusive fixed charge of 2s. per week, plus 0·5d. per kWh, less 5 per cent., which should result in an average of not more than 1d. per kWh. Calm, therefore, is likely to descend upon the troubled waters.


TELEGRAMS: "ELECTRICITY, WESTCENT." TELEPHONE, REGENT 7050.

MAGNET HOUSE, KINGSWAY, LONDON, W.C.2. November 3 1926

If you have not already sent your donation to the Electrical Trades Benevolent Fund please send me your cheque to-day

I appeal to everyone in the Electrical Trade to help me in my effort to place the Fund on a better foundation.

Hugo Hirst

President E.T.B.I. (1926)

The Suburban Traffic Problem.

MR. R. BELL, assistant to the chief general manager London and North Eastern Railway, recently remarked that the improvements that have been made in working suburban trains into and out of Liverpool Street station allowed twenty trains to be dealt with per hour over each track and made it doubtful whether any former steam-worked railway now electrically worked could show the same figures. He also argued that an eight-coach electric train could only find accommodation for 640 passengers, while a similar steam train would seat 950. An electric train required five minutes "to change ends," which was less than the time needed to deal similarly with a steam train. It must not be forgotten that these arguments emanate from a railway official whose desire is to maintain the *status quo*, and on examination it will be found that they are not so impeccable as at first sight appears. In the first place, the length of an electric train is only limited by the length of the station platform which it serves, and as it is lengthened so its driving power is increased. With the steam train it is not easy to increase the driving power, and to do so increases the amount of personnel required for its operation. Again, an electric train accelerates more rapidly, so that not only is the journey accomplished more quickly but the track is better utilised, and though the difference per train may be small, the aggregate time thus saved per annum is very large. It may be possible for the traffic, even from Liverpool Street, to be dealt with by the present methods for a time, but that time is limited and electrification must come. We do not wonder that for the moment the railway companies are reluctant to embark on further capital expenditure, but, before long, circumstances will force them to do so.

Smoke Abatement.

A VERY interesting correspondence has taken place between Dr. C. W. SALEEBY (on behalf of the Sunlight League) and the Minister of Health with regard to smoke abatement. The League object to the temporary exemption of metalliferous processes from the scope of the Bill now before Parliament, and still more to the soft-hearted way in which the domestic smoke problem is dealt with. They point out that it is unreasonable for pressure to be applied to industry and for the domestic user to be allowed to go scot free. In his reply, the MINISTER OF HEALTH states that there is no doubt that the domestic chimney is responsible for most of the smoke evil, and it is not practicable to deal with the matter in the way suggested until means have been found for reducing smoke from existing grates. The proper line of progress is therefore to discover such a fuel, in combination with developing the use of electricity and gas, which can be retailed at a low price and used in the ordinary grate. Dr. SALEEBY'S reply to this is that if clause 5 of the Bill stands as at present it will give the impression that not even a partial solution of the domestic smoke problem is at hand and that progress will therefore be retarded. If, on the other hand, the Government were to show its belief in the efficiency of existing smokeless methods public interest would be aroused and a considerable stimulus given to householders to investigate the available methods with a view to adopting them in their own homes. With that argument we heartily agree. The coal stoppage is at least teaching the householder that there are alternative ways of heating and cooking whose efficiency and convenience are worth close consideration.

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PHASE ADVANCER PROGRESS.

Their Installation and Operation—Application of Different Apparatus to Particular Cases—Relative Sizes for the Same Work.

By D. B. HOSEASON, A.M.I.E.E.

THE subject of power factor correction has received so much consideration recently by electrical manufacturers that consumers have an extremely wide range of apparatus to examine when dealing with a problem of low power factor. Each device has certain characteristic advantages over the remainder and the selection of the best proposition for any particular installation is by no means as simple as it would at first appear.

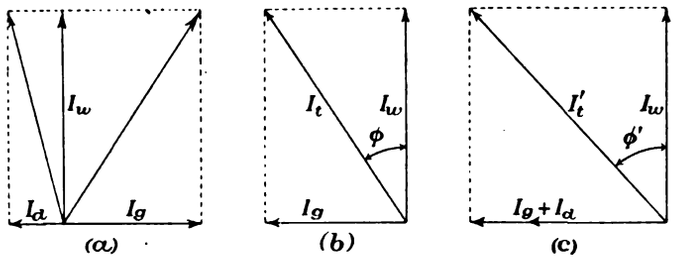

Fig. 1.

The static condenser is now well out of the laboratory stage, and although its initial cost is high, it already has a definite commercial field of application. The use of salient pole synchronous motors has been extended by the development of clutches both of the hand operated type and of the magnetic type, while almost every manufacturer in the country is now prepared to build synchronous induction motors for those applications where they are suitable. The self-excited and the self-compensated motors have not been developed here to anything like the same extent as on the Continent, and in the United States; probably because they call for quite appreciable sacrifices in reliability and in running cost when compared with the ordinary induction motor. The phase advancer also has not been adopted to the extent that might have been expected, but since its performance combines a number of desirable features it will undoubtedly supersede, in time, many types of apparatus now being installed.

Like the static condenser, the phase advancer has the advantage that it is an independent piece of apparatus and any fault in the power factor correcting appliance does not interrupt the actual production of the factory which can still continue, the load on the supply mains having the usual induction motor load characteristics. The synchronous induction motor will not usually operate for any length of time without its exciter in the event of a breakdown of the latter, and then only at an excessively low power factor, while a fault in the auxiliary winding of any of the self-compensated or self-excited machines almost invariably affects the whole motor. The normal operating voltage of the phase advancer rarely exceeds 25 V and the insulation problem is consequently a very simple one and much easier to deal with than that of a static condenser operating at 400 V or 600 V. Furthermore, the phase advancer is unaffected by harmonics in the wave form of the supply voltage and is much less liable to draw current transients when switching in than the static condenser. Since a phase advancer merely compensates the power factor of the machine to which it is connected it is usually of a smaller capacity than the exciter of the corresponding synchronous induction motor which both compensates the power factor and holds the machine in step against its load. The phase advancer has generally a smaller current to deal with because the ampere turns of the synchronous induction motor necessary to hold the machine in step are usually more than are required to obtain the desired power factor. The commutator and brush-gear of the phase advancer are less cumbersome than those of the synchronous induction motor exciter and less liable to give trouble. All the known types of self-compensated and self-excited motors have sliprings, brushgear and a rotor winding operating at full line voltage; a very undesirable feature where continuity of service is the most important characteristic.

The general operation of all phase advancers in so far as the main motor is concerned is the same. A leading voltage is injected into the rotor circuit so as to cause a current to circulate with sufficient leading component to give the desired power factor.

Fig. 1 shows vector diagrams of the stator and rotor currents of a slipring motor, the rotor currents being expressed in terms of the stator windings. If the motor is operating with the wattful current I_w and drawing the lagging wattless current I_g, shown in Fig. 1 (a), and is to be compensated to unity power factor the phase advancer must inject such a voltage into the rotor circuit that the current I_t flows in the rotor leading the original current I_w by the angle φ shown in Fig. 1 (b). If a leading power factor is desired then the resultant rotor current necessary now leads the wattful current by a still greater amount as shown in Fig. 1 (c).

The principal types of phase advancer in existence are the Leblanc, the Kapp vibrator and the Miles Walker phase advancer. In operating characteristics the first two are similar in that they generate an e.m.f. leading the current by 90 deg. and will not give any compensation with the main motor on light load. The Miles Walker phase advancer on the other hand generates a voltage leading the current by 30 deg. and can be made to give considerable power factor correction with the main motor on no-load.

The voltage vector diagrams in Fig. 2 indicate the different characteristics of the two types; E_p is the phase advancer generated voltage, E_{s2} the e.m.f. of slip in the rotor circuit and E_t the resultant e.m.f., while E_{s1} is the e.m.f. of slip when the machine is uncompensated. The diagrams show that the "90 deg." phase advancers usually have to generate a larger voltage than the "30 deg." type. This larger voltage means a proportionately greater kVA output for the phase advancer, as the resultant current which must circulate in the rotor of the main motor is the same in each case for the same degree of compensation. It should also be noted that

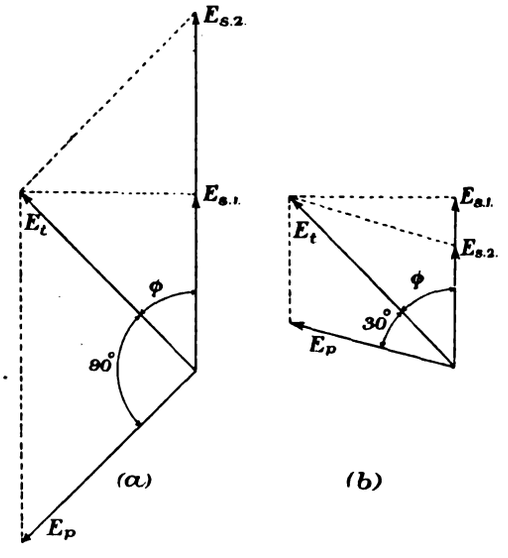

Fig. 2.

the e.m.f. of slip is greater in diagram (a) than in diagram (b) and hence the slip at which the main motor operates is greater in the case of the "90 deg." phase advancer than in that of the "30 deg." machine. It will be seen from diagram (a) that the angle φ cannot be allowed to become too great or excessive slip will occur in the main motor. This means that compensation to any appreciable leading power factor is not permissible, as such would necessitate a considerable value for the angle φ. It also explains why the "90 deg." phase advancer cannot give compensation on no-load since under these conditions the angle φ would be nearly 90 deg.

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It is interesting to determine the relative sizes of the "90 deg." and the "30 deg." phase advancers and in order to do this it is convenient to obtain expressions for the capacity of each type of machine. The current to be carried in each case will be the same and if the amount of compensation is such as to necessitate a resultant current leading the wattful current by the angle φ, the phase advancer current will be $I_w/\cos\varphi$. The quantity E_{s1} shown in Fig. 2 is the e.m.f. of slip when uncompensated, and corresponds to the rotor slip when uncompensated, multiplied by the open circuit rotor voltage. These two quantities are always measured on test, or easily measured on a machine already installed, and so form very convenient data for the installation of the phase advancer. The quantity E_{s1} will, of course, be the same for each type of phase advancer; E_{s2} in each case is the e.m.f. of slip when compensated.

In the case of the Miles Walker phase advancer

$$E_p = \frac{E_t \sin\varphi}{\sin(150-\varphi)}$$

and as

$$E_t = \frac{E_{s1}}{\cos\varphi}$$

$$E_p = \frac{E_{s1}\sin\varphi}{\cos\varphi \sin(150-\varphi)}$$

$$= \frac{E_{s1}\tan\varphi}{\sin(30+\varphi)};$$

and the "30 deg." phase advancer kVA is:

$$I_t E_p = \frac{I_w E_{s1}\tan\varphi}{\cos\varphi \sin(30+\varphi)}.$$

In the "90 deg." phase advancers

$$E_p = E_t \tan\varphi$$

but

$$E_t = \frac{E_{s1}}{\cos\varphi}$$

hence

$$E_p = \frac{E_{s1}\tan\varphi}{\cos\varphi}$$

and the "90 deg." phase advancer kVA is

$$I_t E_p = \frac{I_w E_{s1}\tan\varphi}{\cos^2\varphi}$$

The ratio of the kVA outputs required from the two-phase advancers then is:

$$\frac{\sin(30+\varphi)}{\cos\varphi}$$

or

$$0.50 + 0.866\tan\varphi\,;\ 1$$

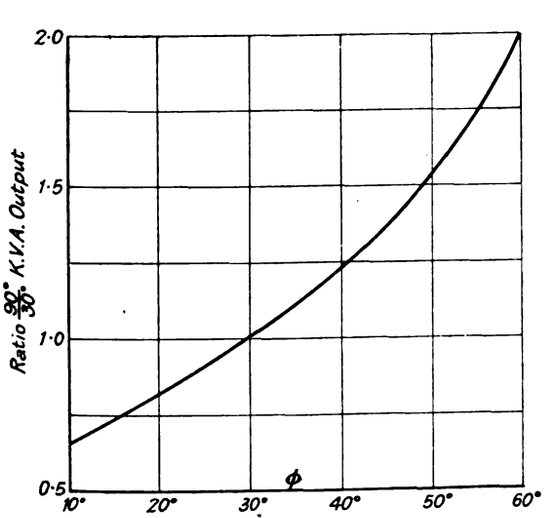

Fig. 3.

This means that the two types of phase advancer are the same size when $\varphi = 30$ deg., which would correspond to compensating a motor from 0·87 p.f. to unity. In most cases, however, the conditions are much worse than this, and the curve in Fig. 3 shows the relative sizes of the machines for various values of the angle φ. It will be observed that with the angle φ equal to 45 deg., which would correspond to an improvement from 0·7 p.f. up to unity, the "90 deg." phase advancer is 36 per cent. larger than the "30 deg." type; while with an angle of 60 deg. corresponding to a correction of from 0·7 lagging to 0·96 leading the "90 deg." type is just twice as large as the other machine.

It will be seen then that the Miles Walker phase advancer has very great advantages over the other type in size, in its effect on the main motor slip and in being able to give compensation on light loads. The comparisons given here with other types of power factor correcting apparatus are therefore made with reference to this type of phase advancer.

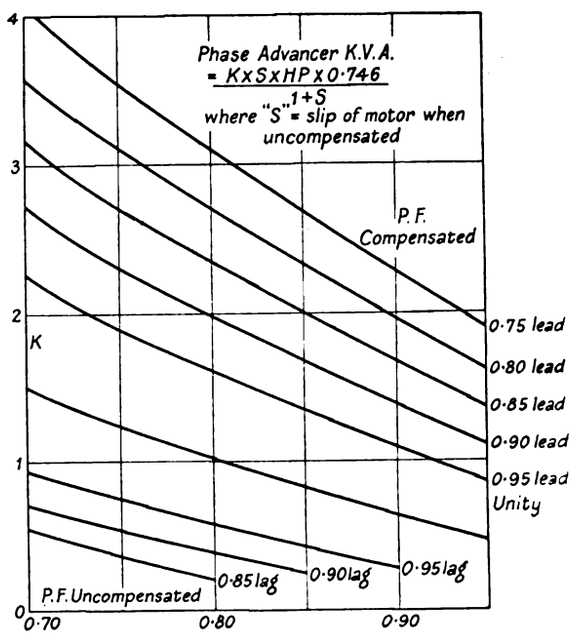

Fig. 4.

If the full load slip of any motor is known it is possible to determine the kVA of the Miles Walker phase advancer to give any desired power factor from the curves in Fig. 4 which are based on the expression given above. The constant K given by the curves is the term:—

$$\frac{\tan\varphi}{\cos\varphi \sin(30+\varphi)}$$

(To be continued.)

REVIEW.

Loud Speakers—Their Construction, Performance and Maintenance. By C. M. R. Balbi. London: Sir Isaac Pitman and Sons. Pp. xv+96. 3s. 6d. net.

After reviewing its very scanty history, dating back to 10 years ago, when experiments were made by fitting a horn to a telephone receiver, the author very shortly defines the essential features of a loud speaker as intensity of reproduction and accuracy. The first of these must necessarily vary to suit the requirements of any special case, and the second is a matter of degree, a certain amount of distortion being always present due to the conditions under which the reproduced sounds are heard.

The various types of loud speaker are described in some detail, including electro-magnetic systems, semi-conductor and friction types and miscellaneous types, and the opinion is expressed that progress will be made by developing one of the lesser known types rather than in minor improvements on standardised lines.

Following chapters devoted to diaphragms and horns, the testing of loud speakers is dealt with.

Although primarily intended to apply to loud speakers for the reception of broadcasting, the Western Electric Co.'s public address system, whereby a speaker's voice is magnified many times, is described, and diagrams are given showing the equipment used both for large and small amplification ratios.

The different factors to be considered when choosing a loud speaker for the reception of wireless signals and the methods of dealing with varying conditions are discussed, and a table giving a short description of various loud speakers at present on the market should prove useful in selecting an instrument in any given circumstances.

The book is well illustrated and contains much information of interest to the experimenter.

H. Chapman.

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NEW STATION AT NORWICH.

Modern Planning on an Excellent Site to Serve East Anglia—Ultimate Capacity 50 000 kW.

A NEW generating station, which marks the beginning of the movement on the part of the city of Norwich to supply a wide area in East Anglia with electricity, was opened on Thursday in last week. Its erection and equipment have cost about £300 000, but the income of the electricity undertaking last year showed a balance over all charges of £27 500, and the bigger scheme is not expected to be less profitable. Incidentally Norwich is one of those places where electricity is cheap and consumption is encouraged by the use of the well-known "Norwich" system. There are now 16 000 consumers and the domestic consumption equals that for power.

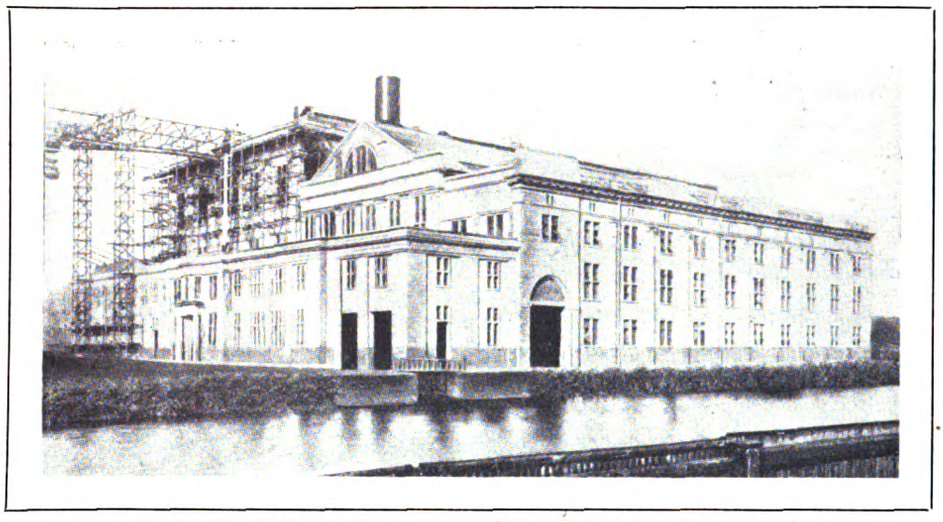

Fig. 1.—View of the new Thorpe power station at Norwich from the south-west.

A supply was first given in the city by a company, operations starting in 1893 from a station which was built near the river on a site which allowed for considerable extension. The original plant has, of course, been long superseded but some of the original copper strip mains are still in use. Supply was at first on the direct current three-wire system, but alternating current generation was started in 1913, and now a large portion of the supply, especially in the outlying districts, has been changed over. It may be added that the Corporation took over the undertaking in 1902.

The full capacity of the old site having been reached, it was decided in 1922 to erect a new station, and a site of eleven acres between the river and railway sides was secured so that both ample coal and water facilities were available. The new station, of which details are given below, was designed by Mr. J. H. Rider, of Messrs. Preece, Cardew and Rider.

The general design follows the usual parallel lay-out with a switchgear bay 25 ft. wide on the south side, a turbine house 65 ft. wide in the central position, and a boiler house 90 ft. wide on the north side. An office block of two floors extends across the whole of the west or permanent end.

Coal can be brought in by rail or delivered by river, either in small sea-going boats or in lighters. A telpher track running at a height of 80 ft. from the ground is provided for handling the coal. This forms a large loop, with the ends in the boiler house, and covers all the essential points without any switches being necessary. Two telpher carriages with grabs of 50 cub. ft. capacity are provided, and coal can be transported from a large hopper, into which the railway wagons are discharged, or from the river, and delivered into the bunkers or on to the storage ground.

The boiler house is laid out for two rows of boilers with a central firing floor and coal bunkers overhead. At present four Stirling boilers, each of 6 016 sq. ft. heating surface and evaporating normally 40 000 lb. per hr., have been provided, two of them being equipped with Underfeed Type A stokers and two with Erith-Roe stokers. The working pressure is 250 lb. per sq. in., and the steam temperature is raised by integral superheaters to 650 deg. F.

The ashes are removed by two lines of water trough conveyors which deliver to bunkers outside the building, from which they are disposed on to low-lying land or for other purposes.

Each boiler has its own economiser and induced draught

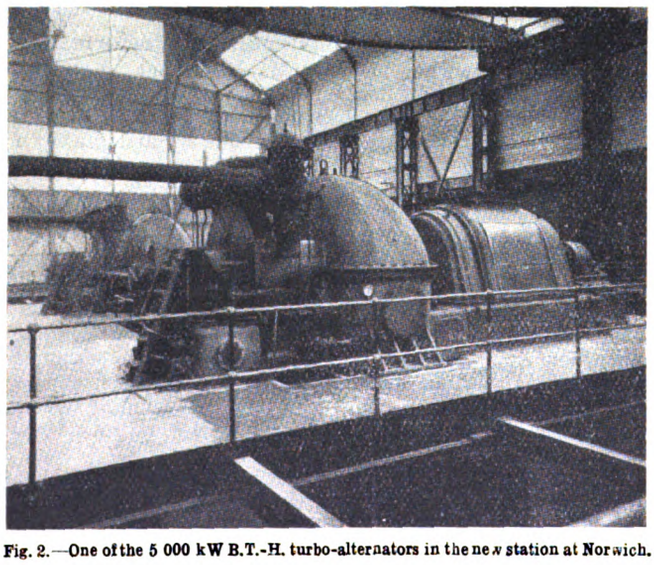

Fig. 2.—One of the 5 000 kW B.T.-H. turbo-alternators in the new station at Norwich.

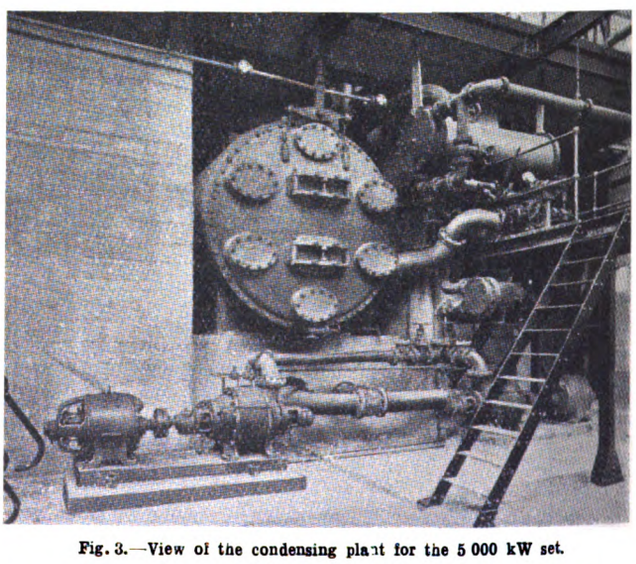

Fig. 3.—View of the condensing plant for the 5 000 kW set.

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fan which is installed on a floor 33 ft. above the firing floor, there being one chimney, 9 ft. diameter, for each pair of boilers. Forced draught fans for the supply of air to the grates are also provided, those for the Erith-Roe stokers being in the basement and those for the Underfeed stokers on the stokers themselves.

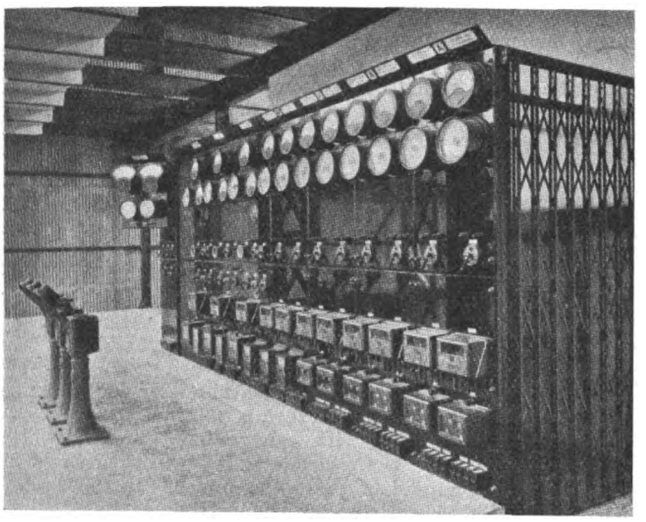

Fig. 4.—View of high tension switchgear control panels.

The boilers are fitted with steam jet soot blowers, and the economisers with scrapers for removing dust from the tubes which, by means of a vacuum pump, is conveyed to a container near the north entrance to the boiler house.

The same system has been adopted here as at the North Wilford Station at Nottingham, which has proved to be eminently successful in the elimination of air, free oxygen and CO_2. The condensate from the turbines is heated by steam bled from the turbines to about 150 deg. F., and further to approximately 212 deg. F. in the hotwell by exhaust steam from the feed pumps. The make-up water is freed from air as well as impurities in a Prache and Bouillon evaporator, and contact with air in the hotwell and make-up tanks is prevented by keeping the spaces above the water charged with exhaust steam.

The make-up water is pumped from the river to an open storage tank on the economiser floor, and, after treatment in the evaporator, passes to a closed tank of the same size also situated on the same floor. From here it flows to the hotwell tank which is placed immediately below and at a height of 15 ft. above the firing floor, the flow being controlled by a ball cock. The feed pumps are of the rotary type, two being steam driven and one motor driven. They are placed on the boiler firing floor under the hotwell tank.

The first instalment of generating plant consists of two 5 000 kW B.T.-H. turbo alternators running at 3 000 revs. per min., and supplying three-phase current at 6 600 V, 50 cycles. A similar set now at Duke Street will be transferred early in 1927. Each set has a condenser of 9 000 sq. ft. tube surface. The turbine house, as now built, will accommodate a fourth set, which will probably be one of 10 000 kW. The ultimate installed capacity will be about 50 000 kW.

The whole of the auxiliary plant with the exception of the two steam feed pumps is driven by direct current motors. Current is supplied by two 500 kW rotary converters on a floor between the basement and the turbine floor. These will also be used for distribution in the neighbourhood. A battery 458 Ah capacity is provided for emergency use.

The switchgear was also supplied by the B.T.-H. Co., and is divided into three sections: (*a*) High tension main switchgear, 6 600 V; (*b*) high tension auxiliary switchgear, 6 600 V; (*c*) low tension direct current switchgear for lighting and auxiliaries at 220 and 440 V. The control panels for the high tension switchgear, the auxiliary switchgear, and the low tension panels are placed in line facing the turbine house and on the same level as the turbine floor. The cubicles for the main high tension gear, which are constructed of stoneware with sheet steel doors, are erected partly on the same floor as and behind the control board, and partly on a floor above, the former containing the isolating switches and instrument transformers, and the latter the oil switches, duplicate busbars, etc. Reactors are provided between the main busbars and the auxiliary switchgear. Other reactors will be installed later between the present switchgear and that for future extensions which will form a separate section. The oil switches for the alternators are designed for a continuous load of 1 200 A per phase and those for the feeders of 300 A per phase. They are all operated by direct current solenoids actuated from the control board. Provision is made for earthing the star point of one or either of the alternators through a grid resistance of 6·5 Ω, with a carrying capacity of 500 A, with special arrangements to prevent more than one alternator at a time being earthed. Protection for both the alternators and, feeders is secured by opposed e.m.f. protective gear with biasing transformers.

ST. PANCRAS EXTENSIONS.

A Pioneer Among Undertakings.

ST. PANCRAS has the distinction of being the first public authority in the metropolis to obtain an Act of Parliament to supply electricity. This they did in 1883, nevertheless it was not until 1890 that the erection of a generating station was begun at Regent's Park. This station was opened in the following year and had an initial capcity of 820 kW. In 1894 a second station with a capacity of 390 kW was erected in King's Road and at the same time the three wire system of supply was adopted for the first time in Great Britain. In 1898 a supply was given at the then low rate of 2d. per kWh, and it is not surprising that more and more extensions to the generating plant were required or that in 1903 St. Pancras made the further pioneering step of adopting three-phase high tension generation. In 1914 the first Ljungström turbine was erected, and in recent years further sets of the same pattern, including one with an output of 10 000 kW, has been put to work. These extensions to the generating plant have naturally compelled consequential additions to the steam raising equipment and owing to the small space available Mr. Sydney W. Baynes, who, incidentally, has been in charge of the undertaking from the start, recommended the use of pulverised fuel firing on the "Lopulco" system. This plant, which is to be employed in connection with Babcock and Wilcox water tube boilers and with two Vickers boilers, which are now in course of erection, was formally opened by Sir Alfred Mond on Monday.

Details of the Lopulco system of pulverised fuel firing are given on p. 530 of this issue in connection with our description of the extensions at Derby. At St. Pancras the raw coal is taken from the storage dump to the coal bunkers, which run the whole length of the boiler house by a grab and telpher system. Thence it passes on to two screw conveyors, which deliver the coal over a magnetic separator to an automatic weighing machine. It next passes via an elevator to two Lopulco waste gas louvre type driers, and then to Raymond pulverising mills. Exhauster fans draw the coal dust from these mills through a duct system to a cyclone separator on the roof of the boiler house, where the fuel is separated from the air and is fed to the boiler, burning by screw feeders. There are five burners to each combustion chamber. The combustion chambers are of the standard "Lopulco" pattern with a water screen and water cooled rear wall elements.

The boiler has an evaporative capacity of 40 000 lb. per hour and are fitted with integral superheaters and superposed economiser. They supply steam at a final temperature of 655 deg. F. and at pressure of 220 lb. per sq. in.

Vesuvius Electrified.

A description of the electrical equipment of the railway, forty-five miles long, which encircles the base of Vesuvius is given in the "Brown Boveri Review." Power is supplied from three central stations as three-phase, 42-cycle current at 2 000, 9 000 and 12 000 V, which is converted in four motor-generator sub-stations into 1 000-V direct current. A single suspension catenary trolley line zigzags over the single-track road. Storage batteries in the sub-stations provide emergency operation. The large motor cars are rated at 515 h.p., and pull trains of ten trailers. One high-voltage controller is provided under the car, and is operated by gear drive from either end. A motor-driven compressor supplies the airbrakes, while the illumination of all cars is derived directly from the trolley voltage by a suitable series connection of lamps. The popularity of the road is shown by the fact that a total of six million passengers were carried in 1925.

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ELECTRICITY SUPPLY IN DERBY.

Thirty-six Years' Progress Culminates in New Extensions—The Use of Pulverised Fuel Firing.

IT is just thirty-six years ago since the Derby Corporation obtained a provisional order to supply electricity. In those days power stations were always small, but the one at Derby was even smaller than usual, as when it opened in 1894 it contained six 100 H.P. sets generating single phase alternating current. Sub-division was further practised to

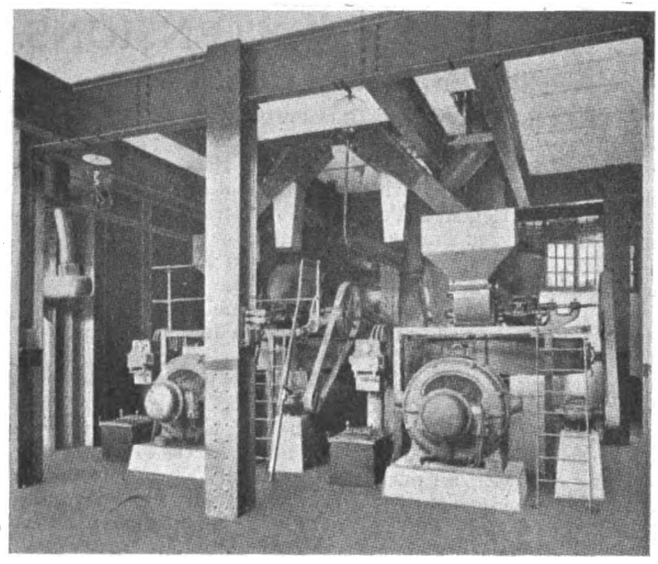

Fig. 1.—View of the Raymond pulverisers at Derby.

the extent that three of these sets were used for street lighting and three for private lighting. In 1896 the plant was extended by the installation of two 250 H.P. sets, while shortly afterwards a 1 000 H.P. Ferranti engine and alternator were erected. As time went on the tramway service was inaugurated, and the demand for electrical energy grew so that further extensions became necessary, but it is interesting to note that these were always on the same or adjacent sites as the original station. In 1908 the first turbine plant was installed, two sets of 750 kW capacity each being erected, while a 4 000 kW unit was added during the war

The latest extension, which was opened on Tuesday in last week, consists of a 10 000 kW Parsons turbo alternator, together with Babcock and Wilcox marine cross-type boilers, each of 8 851 sq. ft. heating surface, working at a pressure of 300 lb. per sq. in., and evaporating 60 000 lb. of water per hour at normal load.

Interdeck superheaters are placed between the upper and lower bank of tube sections, and having a heating surface of 2 690 sq. ft. raise the steam temperature to 700 to 750 deg. F. These boilers are fitted with Lopulco pulverised fuel firing equipment, Derby being one of the first municipal undertakings in the country to adopt this system of firing.

The coal is received in electric lorries which are tipped into a hopper, the top of which is covered with a grid to intercept large lumps. The supply from the hopper to the elevator is regulated by a sliding door, the elevator having a capacity of 30 tons of coal per hour, at a speed of about 120 ft. per min. The coal is discharged from the elevator into a short scraper conveyor which carries the coal to the raw coal bunker, whence it is fed through a chute into the dryer. This portion of the contract was carried out by the Ewart Chainbelt Co. The dryer, of which one at present is fitted, is of the rotary steam heated type, in which air is employed to carry off the vapour formed in the process of drying. It comprises a stationary outer casing and an internal rotating cylinder, the latter carrying a number of cast iron tables arranged in series circumferentially and longitudinally. The raw coal enters the dryer and is projected on to a series of perforated tipping trays which rotate with the inner cylinder. At the end of one revolution these trays discharge the coal on to the first set of tables where it is distributed into a uniform layer by means of a spreader. On the completion of a second revolution the coal is transferred to the next lower set of tables, and finally drops into a hopper whence it is conveyed to the pulverising mills.

These mills are of the Raymond type (Fig. 1), and pulverisation is effected by rollers running in a circular steel track. The rollers are mounted pendulum fashion, and are maintained against the track by centrifugal force, the coal being fed between the fixed and rolling surfaces.

The base of the pulveriser is substantially built of cast iron and embodies a series of tangential air ports fitted with renewable manganese steel liners which connect the air box with the inside of the mill. Attached to the bottom of the base is the completely enclosed gear box which is coupled by a flexible coupling to an 80 H.P. motor. A sheet steel air box surrounds the base of the mill, and the air separator is formed of sheet steel flanged at the bottom to make a dust tight joint with the base.

In operation air is drawn into the mill through the tangential ports in the base, picks up the pulverised coal in passing and circulates in the separator before entering the suction line of the exhauster fan. In this way the larger particles of coal are dropped out and undergo further pulverisation. The raw coal is fed into the mill by an automatic feeder which can be adjusted so that a wide range of feed is obtainable.

Each mill is fitted with an exhauster fan which conveys the coal dust to the cyclone separators situated at the top and to one end of the boiler house. In these separators the fuel is separated from the air by centrifugal action and gravity, and is discharged through flap valves into a screw conveyor.

The units in each set are so connected to form a completely closed circuit through which air is continuously circulated by the exhauster fan. The screw conveyor carries the pulverised coal from the cyclone to the storage bins, of which there are two each with a capacity of 35 tons.

In the Lopulco system each burner is supplied by a separate screw feeder which consists essentially of a cast iron screw of varying pitch rotating in a trough into which the pulverised coal flows by gravity. At the outlet of the feeder the fuel meets the primary air, which is introduced under pressure, whose function is to ensure a uniform and uninterrupted flow of fuel to the burner. At Derby there are six burners to each

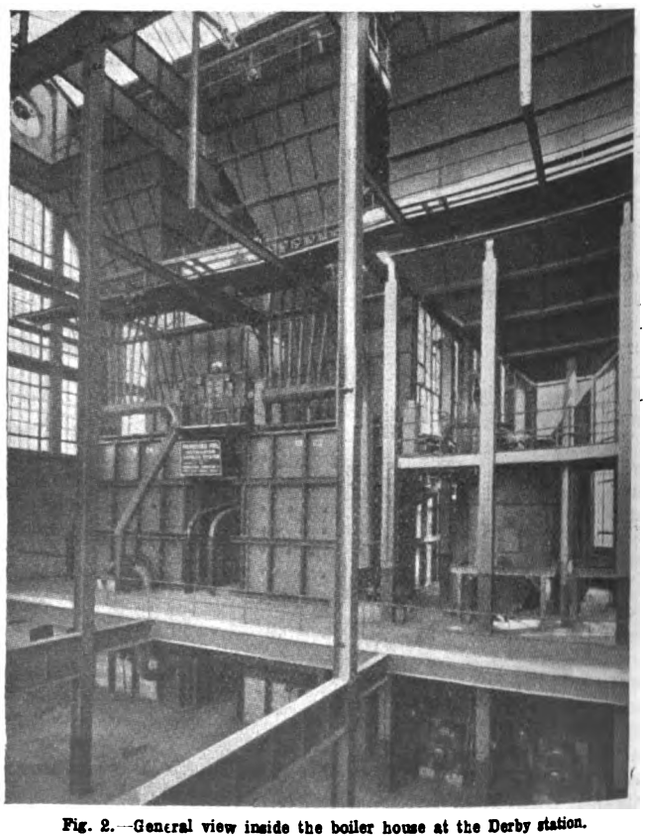

Fig. 2.—General view inside the boiler house at the Derby station.

combustion chamber, and the corresponding feeders are arranged in one group which is driven by a 9 H.P. variable speed motor at speeds varying between 35 and 140 revs. per min.

The Lopulco burner is designed with a view to providing the maximum amount of contacting surface between the fuel and

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the combustion air. The combustion chamber is of the ordinary Lopulco standard, being provided with the usual water screen and water cooled rear wall elements. The coal is discharged downwards from the burners so that the long flame travel which is necessary to ensure complete combustion before the hot-gases come into contact with the boiler tubes is obtained. The secondary air is passed into the combustion chamber through 16 damper controlled doors, and enters through a large number of ports distributed throughout the length and breadth of the inner front wall. In this way the air is advantageously pre-heated and the temperature of the brick-work is considerably reduced. Each furnace is fitted with a water screen across the bottom of the combustion chamber.

The new turbine has been constructed by C. A. Parsons and Co. and is designed to give an economical output of 8 000 kW and a maximum continuous output of 10 000 kW at a speed of 3 000 revs. per min. with a power factor of 0·8. It supplies three-phase current at 6 600 V and 50 cycles.

The standard station steam conditions are 290 lb. pressure, 700 deg. F. total temperature and an exhaust vacuum at full load of 29 in. Arrangements are made to extract steam from the turbine at a pressure of 10¾ lb. per sq. in. to heat the feed water to a temperature of 180 deg. F. before entering the economisers. The turbine is of the single-cylinder pure reaction type. Mild steel is used throughout the blading, and with the exception of the last four rows, " end tightened " blading is adopted. Owing to the large diameter of the turbine rotor in the last expansion stages and the consequent difficulty in forging the rotor in one piece, discs are used. These are butted together so that vibration is impossible. An axial hole is also trepanned through the centre of all shafts to enable the centre to be examined for soundness. The alternator is of the revolving field and stationary armature type, excitation being provided by a direct-coupled exciter. The voltage regulation of the alternator is carried out entirely in the exciter shunt field circuit.

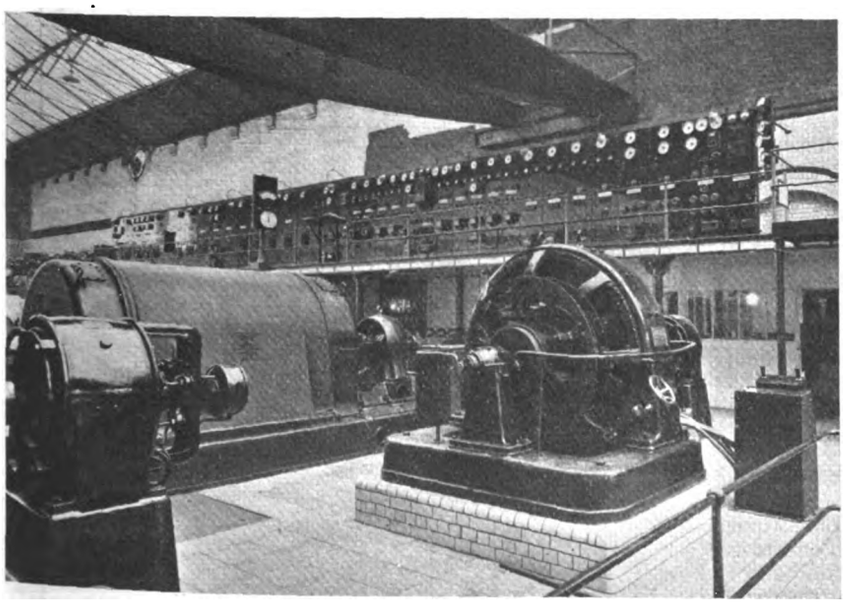

Fig. 3.—The control board in the turbine room.

For the alternator ventilation the Parsons' closed circuit system using surface air coolers is employed. In the stator a patented system of ventilation is applied in which the cooling air enters the stator along its whole length and circumference, giving a highly efficient and uniform cooling.

The surface condenser is also of Parsons' manufacture, and the external cooling surface is 12 500 sq. ft. The water surface is arranged two flow and the quantity of cooling water circulated per minute is 9 500 gals.

In order to control the output from the new 12 500 kVA turbo-alternator, additional 6 600 V switchgear has been provided. This e.h.t. switchgear, which is situated in an annexe to the main station, is of the cellular type manufactured by The British Thomson-Houston Co., and the cells are of moulded stone slabs built about a steel supporting framework, phase barriers and duplicate busbars being provided.

The oil circuit-breakers are of the solenoid operated pattern,

Fig. 4.—General view of turbine room at the Derby station.

the control board (Fig. 3) being in the main station and forming an extension of the control board for the existing switchgear. The old and new banks of switchgear are connected by duplicate busbars in a stone and steel crossover; current transformers and a protective relay ensure that the interconnector circuit-breakers deal with fault currents which are too heavy to be broken satisfactorily by the smaller circuit-breakers on the existing equipment and the four new feeders. As the fault setting on the interconnector circuit-breakers is slightly below the rupturing capacity of the larger of the breakers in the existing bank, the interconnector circuit-breakers will not operate on a fault if this is within the capacity of the existing switchgear. The 2 500 kVA generator is provided with balanced current protective gear, in which the B.T.-H. biasing transformer is used, and automatic field suppression switches.

Besides the above mentioned, there is also a 9 400 kVA generator and station transformer equipment, a special feature of all the new switchgear being the interlocking system. This not only prevents access to an oil circuit-breaker cell, unless the conductors in this cell are dead, but also makes it impossible for the air-break bus isolating switches to be opened or closed on load.

Connected solidly to the 12 500 kVA generator is a unit transformer for supplying power to the station auxiliaries at 400 V, and the leads from the secondary of the transformer, as well as those from the station transformer, are taken to a l.t. switchboard of the B.T.-H. back-of-panel type with hand-operated oil circuit-breakers, provided with overload and earth leakage protection, and two sets of busbars, one across both panels and the other confined to the unit transformer panel only. Each unit transformer has its own set of stub busbars, and the auxiliaries for each generator take their supply from their own unit transformer. For starting up and in case of emergency, an alternative supply is taken from the station transformer. The switchgear is so arranged that it is impossible to parallel the station transformer and the unit transformers.

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IMPULSE STEAM TURBINES.*

The Prediction of Heat-Drop and Pressure—Application to Existing Types of Machine—Effect of Throttling Factor—Distribution at Varying Loads.

By W. J. KEARTON.

THE distribution of pressure, and hence of heat-drop in a multi-stage turbine, is of considerable importance. In general it is arranged by suitable adjustment of the nozzle areas so as to bring the ratio of blade velocity to steam velocity

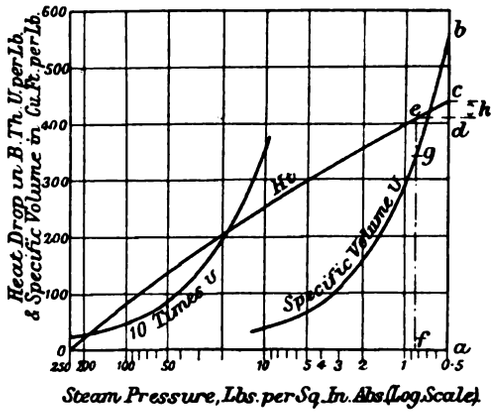

Fig. 1.

at exit as near as possible to the optimum conditions with the turbine operating at "economical load." The ratio is about 0·47 for single-row impulse wheels and about 0·24 for two-row velocity-compounded impulse turbines and about 0·94 for reaction turbines. In some designs the blade rings are made relatively small in the high pressure stages, so as to reduce disc-friction losses. In such cases the heat drops are quite small at the high pressure end and increase towards the low pressure end, varying as the square of the mean diameters.

When the conditions of operation differ from those characteristic of the "economical load" the steam weight passing through the turbine may vary, rendering the nozzle areas incorrect. As a rule the weight of steam is diminished, causing a decrease in the velocity at exit. The ratio blade velocity/steam velocity is increased. Further, the steam flows into the blade with a different relative velocity and in a different direction, resulting in increased shock losses at entry, which may be serious. Also the exit areas of the blades will in general be too large, causing a loss due to imperfect direction of the steam jet.

In this paper a method is outlined whereby the pressure and heat-drop distribution may be approximately predicted for operating conditions differing from the designed conditions.

Fig. 2 shows the total-heat (enthalpy)-entropy diagram for a steam turbine having seven stages of the same mean diameter. The heat drop in all stages is assumed to be the same. A is the initial state point and the isentropic line AB' represents the ideal adiabatic expansion in the nozzles of the first stage. Actually, losses occur in the nozzles during expansion, and the energy utilised in overcoming the friction and other losses is returned to the steam in the form of heat, causing an increase of entropy. Thus the actual expansion is represented by the curved line AB, the ratio

$$\frac{I_A - I_B}{I_A - I_{B'}}$$

being the nozzle efficiency. When the steam passes through the blades, there are further losses which cause reheating, and, in addition, there is reheating due to disc friction, windage and gland leakage. The result of these combined effects is to increase the entropy at a sensibly constant pressure, and the state point of the steam entering the next stage of the turbine is indicated by the point C. Similar remarks may be made about each of the succeeding stages. The locus of the state point for the whole turbine is the discontinuous line $ABCD \ldots MNO$. If the efficiencies of each stage, represented by the fraction

$$\frac{I_A - I_C}{I_A - I_B}, \frac{I_C - I_E}{I_C - I_D}, \text{ etc.},$$

be assumed to be fairly constant, then the line $ACEGIKMO$ is a "flat" curve convex downwards.

The total available heat drop per pound of steam in the actual turbine is equal to $(AB' + CD' + EF' \ldots MN')$. Let this be represented by H_t. Owing to the gradual divergence of the constant pressure lines on the $\varphi - I$ chart in a direction from the water line to the dry vapour line, H_t is always somewhat greater than H_r, and the ratio

$$\frac{H_t}{H_r} = R.$$

R is the well-known "reheat factor."

Assuming a constant efficiency η, the total available heat H_t from the initial pressure down to any lower pressure may be calculated in the following manner. Suppose it is desired to determine the heat actually available by the discontinuous expansion p_1 to p_8. Take the point I where the state point locus intersects the p_8 line, and draw the constant total heat line TI to intersect AQ in T. Then

$$\Sigma(h) = \frac{AT}{\eta}.$$

Such values may be calculated for a convenient number of pressures and set down in a diagram against the absolute pressure, as shown in Fig. 1. It is preferable to use a log scale for the pressure.

The state point locus demands a little consideration. If the expected efficiency η and the reheat factor R are known, then the point O may be obtained immediately. For accurate work, the stage heat drops may be quickly set down and the whole locus determined. An approximate locus may be obtained simply by joining A and O by a straight line.

The only other curve required is one showing the specific volume of the steam at exit from the nozzles in the various stages. The quality of the steam in the respective stages when the turbine is operating at its designed load is represented by the points B, D, F, H, etc., and may be determined

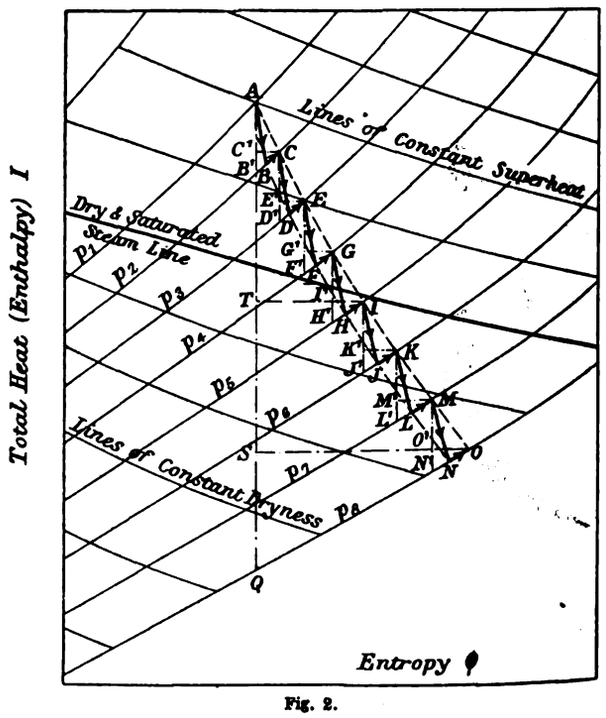

Fig. 2.

for any given pressure at other loads, for a first approximation, from the points of intersection of a curve drawn through the points B, D, F, H, J, L, N and the respective constant-pressure line. A knowledge of these qualities enables one to calculate the approximate specific volumes at exit from the nozzles at any pressure. Such values are then graphed against the absolute steam pressure as shown in Fig. 1.

(*Concluded on page* 536.)

* Abstract of a paper read before Section G of the British Association.

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ELECTRICITY SUPPLY IN IRELAND.*

Some Notes on its Future—Consumption Lower than in any Other Country—Rapid Development Likely in Belfast.

By LAURENCE J. KETTLE.

THE author predicted some years ago that ultimately Ireland would require 2 000 million kWh of electricity. Switzerland, which is smaller than Ireland, and has only three-quarters of her population, now uses more than 3 000 million kWh. It is true that Switzerland is highly industrialised and has abundant supplies of water power. But Swiss authorities believe that when electricity has fully displaced imported fuel Switzerland will not use 3 000 million but 8 000 million kWh.

In the matter of electricity Ireland is practically a virgin country. The use of electricity is practically non-existent outside a few of the principal towns. There are 151 electricity works, of which 104 are in the Free State and 47 in Northern Ireland. Except for those in Belfast and Dublin, all the works are small. Only 28 work under any statutory authority. The total output does not exceed 97 million kWh per annum, including tramway supplies. Ireland only uses about 23 units per head of population (16 units per head in the Free State and 43 kWh per head in Northern Ireland). If we leave out of account the two capital cities, the consumption per head is only 6 kWh. This compares with 2 500 kWh per head in Norway, 900 in Switzerland, and 140 in Great Britain. Ireland's electricity consumption is easily the lowest in Europe, with the possible exception of Portugal.

The almost complete absence of electricity in Ireland is, nevertheless, not without advantages. In the older industrial and coal-producing countries a very chaotic condition of affairs has developed, and the task of bringing order out of chaos is a gigantic one. Even in water power countries, such as Switzerland, unification has been found to present difficulties, though the situation is less complicated. In Ireland the connecting and standardisation problems are simple. The City of Dublin system, designed 26 years ago, has now been adopted as the world standard. The City of Belfast originally adopted d.c., but the new works started some years ago also conform to the world standard. All the smaller works started in the Free State during recent years are also on the three-phase 50 cycle system. With the d.c. works there will be some difficulty, but as these are mostly small, the cost of the necessary alterations will not be great. The chief distinction from the other countries mentioned is that in Ireland connecting works will be called into existence for feeding a distribution network which does not yet exist.

The Shannon Scheme.

It is somewhat of a misnomer to term the Shannon scheme a "power" scheme. It is rather to be regarded as a transmission scheme, comparable to the new scheme proposed for Great Britain. The plans include a supertension transmission network at 100 000 V, feeding a 35 000 V net, which in turn feeds a 10 000 V system. This resembles the arrangement adopted by the Swedish Government for the State supply scheme. The Irish network is to cover the entire Free State, and the linking up with Northern Ireland will present no great difficulty. The idea of supplying from one power station has been criticised, but this is only a nucleus plan, and not to be accepted as the ultimate development. In the first stage 48 000 to 52 500 kW, and in the final form 87 000 to 115 000 kW will be developed. This will meet the requirements of the Free State for some time to come, but ultimately other available water power and no doubt also fuel-consuming power stations will be utilised. A powdered coal station on the Irish anthracite coalfield is also a possibility.

A transmission scheme has also been outlined for Northern Ireland. This is based on a network fed by several stations, of which the principal will be the Belfast Electricity Works. This may be supplemented by a coal station on the bituminous coalfield at Coalisland and possibly by a waterpower station on the Bann, and also by Derry City Works. Northern Ireland appears to be disposed to proceed more gradually than the Free State. Agricultural electrification is not regarded as attractive at the moment and proposals for the near future relate chiefly to the joining up of industrial centres round Belfast.

There is no great difference between the Northern and Southern Ireland power proposals, except that the main station will be a coal-fired station in one case and a water-power station in the other. Both networks should be so designed that they can be combined into an all-Ireland net at a future date. The necessity for a common supply is indicated by the fact that the second largest waterpower in Ireland, the Erne, is on the border, the falls being in one State and the storage lake in the other.

The Free State has not yet provided for the distribution network, and if provision for distribution is to be left to the general public the increase in consumption cannot be very great or very sudden. The load may be expected to come from (*a*) Possible electro-chemical industries, (*b*) Possible new factories, (*c*) existing electricity supply undertakings, (*d*) existing towns and villages which have no supply, (*e*) existing agricultural demand, and (*f*) electrification of railways and canals.

National Network Essential.

It may be assumed that a more rapid development will take place in the Belfast area than in any other district, and that the Dublin area, for some time at least, will constitute the chief outlet for electricity in the Free State. Dublin is by no means backward in the use of electricity. The figures of 100 kWh per head of population may appear modest, but Dublin is not an industrial city, nor yet a residential one. It is largely a city of shops, warehouses, offices and slums, which mean short-hour consumers or non-consumers of electricity. Consumers are scattered over a wide area and the cost of distribution is high. Electric street traction has been developed in a better and more comprehensive way than in probably any city in Europe. Great industrial development can scarcely be expected. Increase in consumption must therefore depend largely on domestic supply.

It is clear that it is from the national network rather than the few cities that the ultimate large increase in Free State electricity must come. There are many towns and villages which at present have no electricity supply. Ireland is an agricultural country and figures presented at the World Power Conference suggest that eventually considerable developments in this field might be expected. It is rather too optimistic to assume that the Free State supply scheme will prove a commercial success from the commencement. The State has anticipated the ordinary course of events by perhaps a dozen years, and it should likewise anticipate events by providing the distribution network in districts where immediate results would seem not to justify private enterprise. Whether the State will engage in the business of electricity retailers or whether it will elect to work through local organisations is not yet known. State ownership and State control of power are not new ideas. If there is any business in which nationalisation is justified it is certainly that of electricity supply, which is not, properly, an industry, but is the life-blood of many industries. Nationalisation is only an extended form of municipalisation, and experience shows that municipalities who have undertaken electrical supply have at least held their own in point of efficiency.

The utilisation of Irish water power will undoubtedly be a national gain, as it will render the country to some extent independent of imported fuel.

A second Shannon Power Bill is expected in the near future, and in this Bill the detailed project will no doubt be set out.

* Abstract of Chairman's address before the Irish Section of the Institution of Electrical Engineers.

Television.

THE system of the television invented by Mr. L. Baird was described by Col. Jelf in a paper read before the Radio Society of London last week. Television began with the discovery of the light-sensitive properties of selenium; but progress was slow, until about four years ago, when Mr. Baird decided to focus his efforts on the transmission of shadows. The difference between shadow transmission and true television was immense, and it was only after twelve months' continuous experimenting that he had succeeded in sending outlines of simple objects in black and white. True television, the transmission of image of an object with all gradations of light, shade and detail, was still a long way off. Quite recently, however, the equipment had been much improved.

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ELECTRICAL COMMUNICATIONS.*

The Spirit of Service and the Part They Play in its Apotheosis—The Dependence of the World's Commerce on Science.

By W. J. MEDLYN.

THE electrical industry may be divided into two main classes—electrical communications and the heavy current services. The former include telegraphs, telephones, railway signalling, etc., and form the subject of this address. Applications of electricity are now very varied. Originally it was possible for an electrical engineer to be fully conversant with all these aspects, but to-day this is quite beyond the capacity of any individual.

The first important application of electricity was the introduction of the telegraph in 1837. The Society of Telegraph Engineers was formed in 1871, and in 1883 became the Institution of Electrical Engineers. Examination of the presidential address of Lord Kelvin (then Sir William Thomson) in 1889 shows how prominent was the position then assigned to telegraphy, when electric lighting was in its infancy.

Jubilee of the Telephone.

The present year is the Jubilee of the invention of the telephone, and it is therefore appropriate to deal with developments in this field. The telephone was patented by Graham Bell in 1876, and the following year saw the invention of the carbon transmitter in association with a battery and induction coil, whereby the energy transmitted was greatly increased. These two inventions cover the essential features of the telephone system of to-day. The first public telephone exchange was working in Boston in 1877, and an exchange was opened in New York in 1878. The first exchange in this country was established in London in August, 1879, and exchanges followed in Manchester, Liverpool, Glasgow, Paris and Berlin during the next two years. The first switchboard of the multiple type, giving each operator access to every line in the exchange, came into use in 1884. The maximum capacity of a modern manual exchange is usually fixed at about 10 000 subscribers' lines, and in a busy exchange there may be over 100 000 calls daily. Calls can usually be dealt with at the average rate of three a minute. Another step forward in 1900 was the introduction of the common battery system. The first practicable automatic telephone, enabling subscribers to make their own connections, was invented by Strowger, in Kansas City, in 1889. Ten years later the first automatic switch was brought to this country.

By 1889 there were seven companies operating in the British Isles with a total of 30 000 telephones. Germany had 31 000 and the United States (Bell system only) 159 000. Subsequently the seven British companies were merged into the National Telephone Co.

Trunk System Developments.

In 1896 telephone trunk lines for long distance communication were taken over by the Post Office, who also established a number of exchanges. In 1902 the Post Office inaugurated its London telephone system, and in 1912 the National Telephone Co.'s undertaking was transferred to the State. In 1912 the Post Office telephones in Great Britain and Ireland numbered about 693 000. At the end of March, 1926, there were 1 421 160 telephones, and the increase in the last year was 116 353, or about 9 per cent. In the middle of 1913 the number was ¾ million, so that in 13½ years, despite the retarding influence of the war, the number had doubled. At the present rate the number will again be double in 8½ years. At the end of March, 1925, there were 1 267 800 telephones connected, the capital value of the plant and buildings was approximately £66 millions, and the gross revenue £15 millions. In the United States at December 31st, 1925, the Bell system comprised approximately 12 million telephones with a capital value of over £600 millions and a gross revenue of £157 millions. The net increase in telephones in the United States is at the rate of about 7 or 8 per cent. per annum. The average cost per telephone and the average operating and maintenance costs are about the same in the two countries. On January 1st, 1924, there were about 24½ million telephones in the world, of which 62 per cent. were in the United States.

With the growth of the industry the range of speech transmission has been vastly extended. In 1880 the limit in America was about 45 miles; in 1884 conversations were possible over 250 miles, in 1892 over 900 miles, and in 1911 over 2 000 miles. In 1915 communication over 3 600 miles was found possible. For long distance speech transmission submarine cables are in general necessary. For many years our Continental communications were limited to the London-Paris service, opened in 1891. The first Anglo-Belgian telephone cable was laid in 1903, and the first Anglo-Dutch cable in 1922. In March this year regular communication was established between London and Berlin via Holland. With the development of telephone repeaters the limiting distances for speech have been largely extended. The scheme for long distance services between this country and other countries in Europe, outlined by Mr. Gill in his presidential address in 1922, is now in process of being realised.

This year has seen the 30th anniversary of the granting of the first Marconi patent in 1896. Signalling over a distance of some two or three miles on Salisbury Plain was rightly regarded as an achievement of epoch-making importance. Since then signalling between this country and Australia, a distance of over 12 500 miles, has been accomplished. Experiments are being made with a view to exploring the possibilities of establishing regular communication on a commercial basis between this country and America.

The extent to which broadcasting has entered into the life of the nation is indicated by the fact that there are now over two million receiving licences in this country. The success achieved by the British Broadcasting Co. in the short period of four years is a striking tribute to their methods of organisation and the technical abilities of their engineering staff, but it should be recorded that the assistance resulting from the general policy of the Post Office administration has been by no means the least notable factor in attaining the achievement.

Applied Science and Capital.

It is perhaps difficult to realise the extent to which the world's business of commerce and industry is dependent on the progress of science. So recently as 25 years ago electric tramways had only just been introduced in Manchester. Twenty-four years later the capital invested in electric tramways and light railways in this country was nearly £96 millions, about four-fifths of which is represented by municipal undertakings. To-day the capital invested in the electricity supply industry is about £195 millions, of which two-thirds has been spent by local authorities. The total investment in the electricity supply industry of the United States is about £1 500 millions, and the gross revenue for 1925 was about £36 millions. It is interesting to note the relationship between capital expenditure and gross income in the various cases mentioned:—

Service.	(*a*) Capital.	(*b*) Gross Revenue.	Proportion (*a*) to (*b*).
	£	£	
British telephones	66 000 000	15 000 000	4·4
U.S.A. (Bell) telephones ..	600 000 000	157 000 000	3·8
British tramways, etc. ..	96 000 000	29 000 000	3·3
,, electricity supply ..	162 000 000	36 000 000	4·5
U.S.A. ,, ,, ..	1 500 000 000	300 000 000	5·0

The pecuniary advantages resulting from the cumulative services of the applied scientists are not capable of exact estimation, but the figures must be stupendous. It has been calculated that in the telephone field alone in the U.S.A.—during the period 1900 to 1920, and choosing only ten items concerning which definite data could readily be obtained—the specific savings amounted to roughly £100 000 000. As a further instance of progress the author gave some figures relating to the London-Manchester underground telephone cable, completed and brought into use in April, 1922. Had overhead routes been necessary the cost would have been at least £1 500 000 more, quite apart from the probability that a section of land might have had to be purchased and fenced in for the conveyance of the cable over a great part of the distance of 200 miles. The cost of the London-Liverpool cable, brought into use in 1916, was nearly as much as that of the London-Manchester cable, though the latter has double the capacity. The saving effected represented the financial results of the advance of science during this short period of six years, and what has been said about the telephone service applies to the electrical industry generally.

* Abstract of address delivered before the North-Western Centre of the Institution of Electrical Engineers at Manchester on November 2nd, 1926.

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KRUPP'S NEW SINGLE PHASE MOTOR.*

A Design without Commutator and with an Exciting Winding in the Magnetic Circuit—Its Properties Discussed—Starting Arrangements.

IN order to create a starting torque in the single phase induction motor, Dr. Schön proposed connecting an exciting winding in the magnetic circuit, as shown in the diagram. A number of soft-iron bars uniformly spaced over the periphery and held by non-magnetic caps are made to rotate between stator and rotor. Between the several bars are accommodated a d.c. exciting winding with as many poles as the stator winding, and also a cage winding. It has proved possible to make this intermediate rotor mechanically sound and to eliminate the large losses in the soft-iron bars. A great improvement was introduced in the second experimental rotor by using semi-closed slots and cutting grooves in the surface of the bars. This has been in use for experimental purposes for 1½ years. The next improvement consisted in the use of shrink rings, which protruded into the stator ventilating ducts by suitable construction. For this purpose the stator must be split. To reduce the surface losses, small packets of laminations are used.

The diagram shows an intermediate rotor for a 200 H.P. traction motor, most of the soft-iron bars being replaced by laminations.

As regards the properties of the new motor, assume for the moment that the stator is wound for three-phase current and a three-phase current is sent through the winding. The exciting winding on the intermediate rotor enables the phase displacement to be compensated and a leading current to be produced, if desired. Since no mechanical work is done by the intermediate rotor, the latter will adjust itself so that the axis of the flux coincides with the axis of the winding, and a purely reactive leading current will be produced in the stator winding. This leading current can be varied at will and improves the overload capacity of the motor. If x_1 denotes the reactance of the stator winding, I_e the leading current produced by the exciting winding, and E the normal voltage to neutral of the motor, then the pull-out torque will be approximately proportional to $(E+x_1 I_e)^2$. Thus by varying the excitation (i.e. I_e), the overload capacity can be varied over a wide range limited only by heating. Without excitation we should have a very poor motor on account of the high leakage and magnetising current. The phase compensation is obtainable from standstill up to synchronous speed.

Fluctuations in the supply voltage are now unimportant since they can be compensated or eliminated by varying the excitation.

Coming now to the single phase stator, the inverse field is practically eliminated by the exciting winding (arranged as a three-phase winding) and the cage winding, so that the field transmitted to the rotor is practically a pure three-phase field. Consequently the rotor now behaves like the rotor of a three-phase motor and the speed can be regulated by the insertion of resistance in the rotor circuit. Also cascade connection is possible.

It was found on test that the short-circuit current was much below the value found from the circle diagram of the motor—when the excitation was adjusted for maximum torque, the short-circuit current was even less than full-load current.

To start the intermediate rotor, there is an auxiliary winding on the stator. By combination of resistance and choking coil, an elliptical field is produced which brings the intermediate rotor up to full speed in a few seconds. On switching on the d.c. excitation, the intermediate rotor then pulls into synchronism.

When the locomotive is reversed, the direction of rotation of the intermediate rotor has to be reversed—a short operation. When the train is at rest, the intermediate rotor continues to run and exerts a powerful ventilating action. There is no question of the intermediate rotor falling out of step, as it has no mechanical work to perform. It is necessary, however, to keep the phase resistances in the rotor equal, care being therefore needed when these are of water.

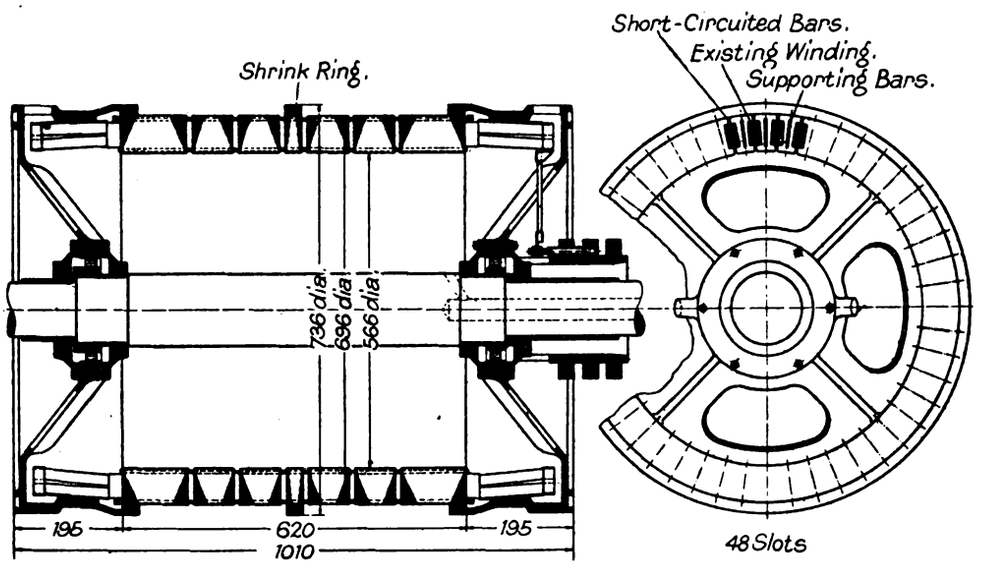

Diagram of new Krupp Motor, showing intermediate rotor and bearings on rotor shaft.

The new motor can be built for any frequency, but it is considered best to fix this at the standard frequency of 50 cycles for traction purposes, because both transformers and motors are cheaper.

As with the three-phase induction motor, both regenerative and rheostatic braking are obtainable with the new motor, but with the advantage of unity power factor.

Numerous characteristic curves and oscillograms are reproduced in the original article. The new motor is intended to combine the advantages of high-voltage single phase traction with the commutatorless induction motor.

* Abstract of an article in the "Elektrotechnische Zeitschrift."

Enforcing Public Economy.

Mr. F. W. Hirst, honorary secretary of the League to Enforce Public Economy, has issued a memorandum showing that the appalling extravagance which has marked the conduct of public finance since the war still continues, in spite of the hope which was evident two years ago that a real attempt was being made to return to something like the pre-war level of expenditure. The King's Speech in December 1924 stated that economy in every sphere was imperative; nevertheless both budgets since that time have shown an increase in expenditure, while the new taxes impose a burden on the consumer which is greater than the yield to the revenue. There is a real danger in the situation, which, if it is fairly faced, provides only one answer, that economy in national expenditure is even more imperative than it was in 1924. Copies of the pamphlet, price 3d., post free, or 50 copies for 5s., post free, may be obtained at the offices of the League, 20, Essex Street, London, W.C.2.

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(*Concluded from page* 532.)

Let A = known nozzle area in any stage, sq. ft.
,, w = weight of steam flowing through the turbine in lbs. per second under any assumed condition of operation.
,, v = specific volume of steam at nozzle outlet, cub. ft. per lb.
,, V = actual exit velocity from nozzles, ft. per sec.
,, h = heat drop in nozzle, B.Th.U. per lb.
,, V_t = theoretical exit velocity from nozzles with frictionless flow.
,, η_v = velocity coefficient for nozzles = $\frac{V}{V_t}$.

By the equation of continuity, $V = \frac{wv}{A}$.

Commencing at the exhaust end of the turbine, we have the known nozzle area and the specific volume v (determined from the curve and represented by *ab*, Fig. 1). Thus V may be calculated and also the theoretical velocity V_t by means of the expression $V_t = \frac{V}{\eta_v}$.

The heat drop h necessary to produce this velocity is readily calculated by means of the expression

$$h = \left[\frac{V_t}{223 \cdot 8}\right]^2 \text{ B.Th.U. per lb.}$$

By setting down *cd* equal to the above value of h, we obtain the point *e*, and thus the initial pressure at inlet to the last stage. But the ordinate *fg* of the specific volume curve intercepted by the perpendicular *ef* is the specific volume of the steam at exit from the nozzles of the preceding stage, and by inserting v, w, and the appropriate value of A, in the equation of continuity, we obtain V, V, and h for the last stage but one. In this manner the pressures at inlet to all the stages may be calculated by a simple step-by-step process.

The method of calculation is such that possible errors are not cumulative.

Heat Extraction Turbine.

In the next section of the paper the application of the method to several examples is illustrated. The first case taken is that of a high pressure impulse turbine with nozzle control governing in the first stage. In the original paper the assumed data are set out in detail. From the figures derived it is shown that there is excessive under-expansion in the first stage nozzles, that the t ratio of blade velocity to steam velocity diminishes in the first stage and increases in the stages near the exhaust end, and that the largest changes in heat drop occur at the low pressure end of the turbine. It is remarked that the customary increases in inlet angle have no advantage in the first stages of turbines equipped with the "nozzle-control" system of governing. The effect of the "throttling factor" is next considered, after which the author deals with a second case—the mixed-pressure steam turbine. In both cases the results are assembled in numerous tables and diagrams.

Finally, there is a short analysis of conditions applying to the heat-extraction turbine. The conditions of operation in this case are very variable, because in addition to the possible variation in power demand there may be a variation from zero to the full amount of the extraction steam. The relative claims of this turbine and its rival the heat-extraction steam engine are of considerable interest. The regulation is again affected by two governors, a speed governor and a pressure governor, and there is no loss due to throttling in the l.p. cylinder. (In fact, over a certain range the earlier cut-off leads to an improvement in efficiency.) The question of choice is, however, affected by other considerations, such as (1) size (i.e., power) of plant; (2) initial cost; (3) space occupied; (4) cleanliness of heating steam; and (5) steadiness of speed. Except for relatively small powers, most of these considerations weigh in favour of the turbine.

8 000 H.P. D.C. Motor.

THE "Electrical World" states that a 8 000 H.P. direct current motor has recently been completed by the Westinghouse Electric and Manufacturing Co. This motor weighs 625 000 lbs. The over-all length of the shaft is 26 ft. 8in. and the frame has an outside diameter of 20ft. It is capable of developing 2 400 000 ft.-lb., which at 40 revs. per. min. is equivalent to 18 300 H.P. The motor obtains its power from a flywheel set which consists of two 3 500 kW, 700 V generators operating at 375 revs. per min. Three 50 000 lb. flywheels are used to equalise peak loads. The set is driven by a 5 000 H.P. induction motor, of which the over-all length is 48 ft. 8 in.

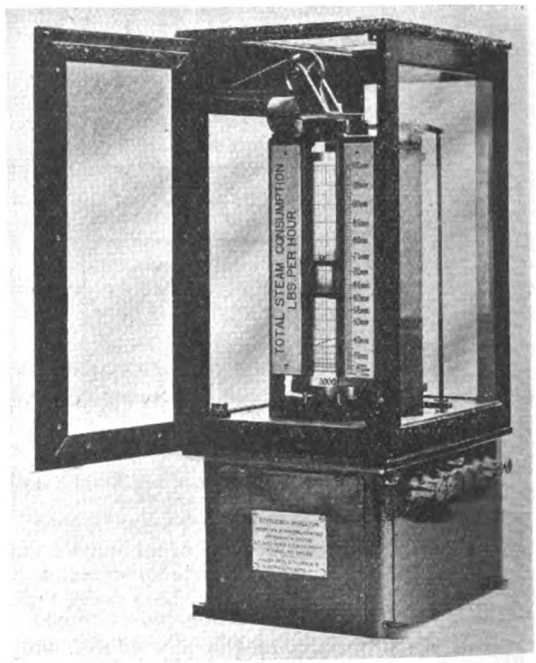
STEAM TURBO-ALTERNATOR EFFICIENCY INDICATOR.

The steam turbo-alternator efficiency indicator made by Nalder Bros. and Thompson may be considered as a combination of two pieces of apparatus—(1) An indicating wattmeter operating the "Willans line" drum; (2) A Venturi or other water meter indicating the steam consumption of the machine.

The wattmeter instead of being fitted with a pointer, the scale of kilowatts is delineated on the lower periphery of a drum. The drum, which is of large dimensions, is constructed with a view to making it as light as possible consistent with strength and rigidity. On it is delineated the "Willans line" of the particular machine in connection with which the instrument is to be used, as well as lines above and below this showing definite percentage variations therefrom.

The wattmeter has been designed to give large working forces so that the drum may rotate freely and with certainty. It is of the unbalanced load induction type with a double movement which necessitates two current transformers. These should be of ample output (not less than 40 VA).

With a view to reducing friction to a minimum, the drum is supported on one jewelled bearing above and merely guided below, and in order to avoid undue wear the drum and its



The Nalder steam turbo-alternator efficiency indicator.

pivot are lowered on to the jewel when it is desired to take readings similarly to the method employed in a chemical balance. The action of lowering the drum on to its jewel simultaneously switches on the pressure coils of the wattmeter. This arrangement, it is claimed, has the advantage that the controlling spring of the instrument is only in restraint when readings are being taken, and in consequence the fatigue of the spring is avoided.

As the drum rotates, the portion of the "Willans line" corresponding with the load on the machine is visible and the guaranteed steam consumption at this load is read on a vertical scale which is parallel with the axis of the drum and at right angles to the wattmeter scale. On the opposite side of the same vertical scale a pointer moves up and down which is actuated by the water or steam flow measuring apparatus dealing with the condensate or steam. This indicates the actual steam consumption against the kilowatt output, and it can be seen immediately whether the consumption is according to or is better or worse than the guarantee without the necessity of having to make a number of carefully organised simultaneous readings on the different instruments situated usually in different places, and a subsequent reference to the guaranteed steam consumption figures of the machine.

It is claimed that this instrument combined with a Venturi meter which gives readings on the efficiency indicator is of very material use in ensuring that the general conditions of working of the machine are properly maintained.

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CORRESPONDENCE.

ELECTRICITY SUPPLY AND THE CONSUMER.

[To the Editor.]

Sir,—Mr. Sayers's letter in the current issue of The Electrician referring to the above article, appears to be chiefly concerned with the use of *words* such as "orthodox," "converse" and "————." To my mind the use of such words is a minor consideration, though I confess to having given a certain amount of thought and time in making this selection of words.

Having regard to the main points of the article, viz., the possibility of forming converse conclusions from the same set of statistics or curve, and the value or reliability of each, I should have appreciated more extended comments on these points and possibly the suggestion of more appropriate *words*.

However, since Mr. Sayers raises the question I will endeavour to reply as briefly as possible.

The position is as follows:—

1. The Weir Committee view is that the sales increase as the price falls. See paragraph 13.

This is a matter of general knowledge, common sense, or an economic "law." But economic "laws" have no resemblance to physical laws—you cannot measure the results. If you reduce the price by so much you cannot say what the increase of the sales is likely to be. You can only say that it is likely to be greater, and to produce a curve of this description, purporting to show the relationship between the price and the sales is ridiculous.

2. The view that the cost of supply is related to the output, under certain conditions, is now very well known, and since Dr. John Hopkinson laid down the principle that the price should bear some sort of relationship to the cost of supply, this principle has become general practice. From modern statistics of prices obtained we can arrive roughly at the costs.

Dr. Hopkinson showed that the cost was related to the number of kilowatt hours per kilowatt demand per annum. This was broadly similar to a physical law such as the law of friction, the Willans line, the Parsons line, etc., etc. Intermediate results or extensions could be determined and measured with reasonable certainty.

In the first of these articles, "Electricity Supply and the Consumer," see The Electrician, February 26th, 1926, it was shown that a similar law existed under modern conditions relating the cost of supply to the number of kWh per consumer per annum.

It now appears that another variation can be obtained under modern conditions, showing a definite relationship between the cost of supply and the number of kWh consumed per head of population per annum. I suggest that this relationship is really much the same as the average number of kWh per consumer per annum, that is to say, that where the kWh per capita is high, it will generally be found that the kWh per consumer is high.

So it comes about that Mr. J. M. Kennedy, the author of the curve in the Weir Report, sent a copy to The Electrician, which was published on March 5th, 1926, with a new title. The curve appears with two titles, the one on the block itself reading:—

Curve showing the relationship between average price of electricity supplied to consumers and number of units sold per head of population in any district.

Companies, Provincial.

Local authorities, Metropolitan and Provincial.

The other title, printed underneath, reads:

Fig. 1.—The relation of output and generation cost.

With reference to the second title there is the following descriptive note:—

The curve on this page (Fig. 1) shows the relation between the output of the station and the average price obtained. It is based on actual facts obtained from statistics available and shows that as a rule the higher the output the lower the cost. There are, of course, exceptions, but the way in which the points fall on the curve is in general a striking proof of this contention.

Note.—It is obvious that the title and description are not quite accurate—"generation" should read "units supplied," and "output of the station" should read "units sold for private supply per head." It is this application of, search for, and reliance on laws in electric supply economics that are broadly similar to physical laws, as originated by Dr. Hopkinson, that I have ventured to call the orthodox school.

The other point of view is, therefore, the converse.

I am afraid that it is not possible to deal adequately with the other points raised by Mr. Sayers within the space of a letter. I will, therefore, confine myself to calling attention to a few points in the Weir Report, and leave Mr. Sayers to form his own opinion as to whether the amount of £399·5 millions as given in Table 4 of the Weir Report really does represent the whole capital of the scheme or not.

Generation.

Table 4, Weir Report, kW installed 10,000,000
Value £127,000,000

The estimates are based on £15 per kW. Why is this amount not £150,000,000 at least, and why not a great deal more by taking over some of the existing plant?

Exhibit No. 4, Weir Report, page 32, Scotland:

The total capital, therefore, is very much the same under the scheme or under individual growth, but the cost of energy under the former must obviously be less. The pooling system is safer and much new territory is opened up by the scheme.

Distribution.

Table 4, present position. M.D. 1 844 000 kW value
mains £88 070 000
1940 M.D. 8 135 000 kW value
mains £243 500 000

Why should not the value of the distributing mains in 1940 be £386,000,000? There may be some satisfactory explanation, but I submit that it is nonsense to publish figures such as these without showing how they are obtained. But this question as to the capital value does not affect my chief point. If there is too much charged against capital in my rough analysis, more would have to be added to the other items in order to make up the penny.

In conclusion I suggest that the all-important point is the accuracy or otherwise of the estimate of 1·5 to 1·75d. as the price per kWh in the Weir Report, for future development by to-day's methods. I submit that the Weir Committee has incidentally supplied evidence, in the form of this curve, that it is likely to be 1·05d. or thereabouts, including a profit to the undertakers.

As shown above, Mr. Kennedy appears to have one foot in either camp, so perhaps, at the moment, I am entitled to claim the evidence of half an expert in support of my contention.—I am, etc.,

J. Rutherford Blaikie.

Bedford,
October 29th.

[To the Editor.]

"ORTHODOX"—"CONVERSE"—AND "————"

Sir,—Mr. Blaikie has been good enough to send me a copy of his reply to my letter under the above heading which appeared in The Electrician of October 29th.

In reference to that reply, I have only to observe that I called attention to some points in which Mr. Blaikie's article might have led a reader into supposing that certain arguments and figures appear in the Weir Report which are not to be found there. Mr. Blaikie's reply does not dispute my corrections.—I am, etc.,

Henry M. Sayers.

London, S.W.16.
November 1st.

Trade Publications.

Amongst the many attractive advertising devices issued by the Hart Accumulator Co., Ltd., Stratford, London, are a small but effective showcard relating to the Enduro wireless accumulator; a larger card bearing a picture of a 75 Ah Hart battery and recommending it for motor-car starting and lighting; a card with twin pictures illustrating the use of Hart batteries for motor-car and wireless reception purposes; and another with a picture of the 75 Ah battery in which the relation of the battery to automobilism is suggested by the presence of part of a large tyre and mudguard at one side of the illustration. There is also available for dealers a small cutout hanging or standing card, consisting mainly of a portrait of the famous violinist, De Groot, with a testimonial by him to the merits of Hart h.t. accumulators. Leaflets issued recently by the company deal with tanks for acid or water storage (No. 188), and Hart batteries suitable for replacement purposes on specified makes of British motor-cars (No. 194).

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NEWS IN BRIEF.

Brisk Sale of Electrical Appliances at Burnley—Rural Supplies at Chester—Extensions of Hull Municipal Telephone Undertaking.

A NEW central-battery telephone exchange has been opened to serve the Upton portion of the Wirral district.

Money is being raised in St. Andrew's Parish, Blackburn, for electric lighting in the church and parochial buildings.

An assistant lecturer in electrical engineering is required for the Government Technical Institute, Insein, Burma.

Epsom U.D.C. has let a contract amounting to £2 519 for the extension of the electricity works at Bromley Hurst.

Hull Corporation has placed a contract for the erection of two "electric" houses at Cottingham Road for the sum of £1 010.

Since 1900 the electrical horse-power available for American workers has increased from 168 to 425 H.P. per 1 000 of the population.

The total value of electrical appliances sold by Burnley Corporation from January 1st to October 15th this year is £4 338 4s. 1d.

In Berlin telephone calls with other countries can now be made between 9 p.m. and 8 a.m. Central European time) at three-fifths of the ordinary charges.

Even with the exercise of considerable economy, the 18 000 electric signs in Broadway, New York, consume 17 800 kWh every night, according to the New York Edison Co.

A private company proposes to establish in the Anfield district of Liverpool an electric greyhound racing track with seating accommodation for 50 000 persons under cover.

The Home Secretary announces a vacancy for an inspector of factories, to undertake electrical inspection under the direction of the Senior Electrical Inspector of Factories.

The London and North Eastern Railway Co. has reconstructed two bridges, electrically controlled swing spans, between Beccles and Aldeby and between Haddiscoe and St. Olaves.

Stepney (London) Borough Council is recommended to accept an offer to pay £10 per lamp per annum for illuminated advertisement signs on the Council's electric street lamp standards.

At last week's meeting of Liverpool City Council a motion for the acceptance of the tender of Standard Telephones and Cables, Ltd., for the erection of 200 fire alarms and telephone boxes, at £21 063, was withdrawn.

An agent in Amsterdam desires to secure the representation of British makers of small electrical apparatus (motors, dynamos, etc.). Particulars from the Department of Overseas Trade. (Reference No. 508.)

An agent in Auckland (N.Z.) wished to represent British manufacturers of household electrical appliances, etc., for the whole Dominion. Details from the Department of Overseas Trade. (Reference No. 472.)

Mr. Harry Moss, registered contractor, is opening a discussion before the Bradford Publicity Club next Tuesday on "My Idea of Advertising." Mr. Moss is a member of the executive committee of the Publicity Club.

To distinguish artificial pearls from real, two Vienna scientists have devised an electrical instrument containing two electro-magnets. In this device the real pearl gives no reaction and the artificial pearl gives an easily visible reaction.

Aeroplanes are finding increasing use for making surveys for hydro-electric developments, as they permit the quick and accurate mapping out of the drainage area. From one to two hundred miles of river can be mapped out in one day.

The St. Helen's Cable Co., Slough, football team defeated Eton Victoria 4–2 in the first round of the Slough Town Cup competition. The Slough Rheostatic Co. lost at home to Chippenham 5–1 in the Windsor, Slough and District Junior League.

Anglo Continental telephone calls, for which a minimum charge is made for the first three minutes, can now be extended at a charge per minute, so that the caller concerned is not necessarily involved in a second charge equal to that for the first three minutes.

The first Batti-Wallah Ball will be held at the Westminster Palace Rooms, Victoria Street, London, on November 29th. Tickets can be had from members of the Batti-Wallah's Society or from the hon. secretary, Mr. M. Whitgift, 7, Coulter Road, London, W.6.

Chester Electricity Committee recommends the T.C. to enter into an arrangement with the Institution of Agricultural Engineering and the Development Commission for a scheme to be carried out in the area, the Corporation offering a special tariff for three years of 1d. per kWh to six farms.

In connection with the University College, London, appeal for support for the Fleming Portrait fund, intending contributors are asked to send their donations as early as possible to the hon. secretary, Mr. W. C. Clinton. The portrait of Professor Fleming is to be painted by Sir William Orpen.

The Dutch system of electric bidding, similar to that which was recently described and illustrated in THE ELECTRICIAN, is to be introduced shortly at Spitalfields (London) market. The bidders occupy numbered seats, and their bids are communicated electrically to the auctioneer upon the pressure of a button.

It is stated that a satisfactory understanding has been arrived at between the Pacific Cable Board and the representatives of the Governments who are partners in the ownership of the Board's cables (viz., Great Britain, Canada, Australia and New Zealand) as to the constitution of the Board, the relations between the Board and the partner Governments, etc.

The manager of the Hull municipal telephone service (Mr. Thos. Holme) has reported that the extension of the system by the addition of 1 000 instruments is now almost complete, and a further extension of another 1 000 is necessary, involving an expenditure of £38 700, including £10 000 for automatic equipment. The Telephone Committee has decided to borrow the money.

At last week's meeting of Salford Corporation the recommendation of the Electricity Committee that the tender of a Dutch firm for the supply of l.t. cable was rejected in favour of the next lowest tender from British manufacturers. The amount of the Dutch tender (that of the N.V. Nederlandsche Kabelfabriek, Delft) for 7 000 yd. of cable is £1 835 8s. 4d., and that of the British tender is £2 397.

Plymouth Chamber of Commerce has issued a questionnaire the recipients of which are asked to state whether they consider that the recent carnival in Plymouth benefited the trade of the town generally and whether the carnival benefited their particular trades. The carnival will not be allowed to drop. The intention is to so arrange the programme as to attract visitors to Plymouth and thus benefit the trade of the town.

The Electrical Power Engineers' Association calls the attention of members of the Association and other engineers to the decision of the National Joint Board, given in June, 1924, to recommend that all undertakings over 1 000 kW capacity should, when advertising vacancies on their technical staffs, state the grade and minimum salary. The Association urges engineers to refrain from applying for such positions unless the appropriate grade and minimum salary is agreed with the prospective employers.

Mr. A. E. Kitson, director of the Gold Coast Geological Survey, stated, in an address on the water power resources of the Gold Coast, that the rivers Volta and Black Volta could be made to supply a large quantity of electrical energy, and the water could be impounded by means of comparatively short dams. A power station on the Volta river could supply all the power required at present in the Gold Coast colony and Ashanti, and similar works on the Black Volta could supply power to the railway system when extended through the Northern Territories.

At last week's meeting of the West Midlands Industrial Council for the Electricity Supply Industry it was agreed that in future there shall be no stoppage of work, either sectionally or nationally, until the cause of difference has been referred to the District and/or National Councils. It was also agreed that all electricity supply undertakings which are represented through the employers' organisations shall be entitled to require that each employee now or hereafter employed by them shall sign an agreement that his contract of service is in accordance with the terms and conditions agreed or approved from time to time by the National Council and the District Councils.

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"WIRING THE HOMES OF BRITAIN."—X.

More Electrical Circles Being Formed—Numerous Demonstration Houses to be Opened —Attractive New Poster Issued by the E.D.A.

THE sales of Competition Booklets up to Wednesday evening amounted to a little over 800 000. Even this total, however, must be multiplied several times over before it can be truly said that the elaborate campaign machinery has been utilised to the fullest possible advantage. So much depends on the widespread circulation of these booklets that no apology is needed for further insistence upon it here. Reports from various districts indicate that many assistants in electric shops and showrooms are reluctant to hand over the book to applicants who do not produce the coupons from the newspaper advertisements. Now, this coupon is only provided as a spur to the reader of the advertisement, and as a time-saving device in obtaining the competitor's name and address. It is not essential that an actual coupon should be obtained in exchange for every competition booklet, so long as the name and address of the applicant is obtained.

One particularly pleasing aspect of the campaign is the remarkable way in which it is getting together the various electrical interests in areas where co-operation has been slight in the past, and it may well be that when the campaign is over the present Electrical Circles will continue to function as a kind of electrical " rotary " organisation.

A New Branch of the E.C.A.

Of the immediate results of the new " get together " spirit, it may be mentioned that Bedford contractors, following a campaign meeting, decided to form a branch of the Electrical Contractors' Association in that centre, and similar possibilities are indicated in two other towns in the London and Home Counties area.

Special attention should be paid to No. 4 of the " Home Lighting News "—the trade's campaign newspaper—which will be published in a few days. The issue in question will deal extensively with means of increasing campaign contact with the public and for securing a regular flow of applications for booklets throughout the duration of the campaign. As previously stated, the " Home Lighting News " is provided by the E.D.A. free of charge to any member of the trade, and supplies should be ordered not only for the heads of businesses, but also for members of their staffs. The paper should not, of course, be shown or presented to the public.

Further Electrical Circles are being formed, and last week a dozen more of these organisations were brought into being. They are at Bedford, Dudley, Hackney, Hampstead, Keighley, Kingston-on-Thames, Norwich, Rhondda, Swansea, Tunbridge Wells, Twickenham and Worcester.

Demonstration electric homes are being opened in a number of places. Two were opened in Birmingham and details of these houses are given below. On November 15th a demonstration house will be opened at Denton, Manchester; a demonstration electric home will open at the Town Hall, Chester, on November 8th. To-day (Friday) is fixed for the opening of a house in Edinburgh, and Lincoln's home opens next Wednesday. Several towns are making arrangements for similar displays, and Dundee hopes to open one shortly.

Mass meetings of electrical traders are being held in various parts of the country. A big attendance was expected for a campaign meeting at Evesham Town Hall yesterday (Thursday), and there will be further meetings at Walsall on November 8th, and at Kidderminster on November 10th.

Demonstration Houses in Birmingham District.

Birmingham's first demonstration houses, to which brief reference is made above, will, it is hoped, do much to stimulate public interest in the campaign in the Birmingham district. The houses are at 43, Hannon Road, King's Heath, and 6, Innage Road, King's Norton, two well populated and progressive suburbs in which a large number of houses are being erected, most of them wired for electric lighting.

Both houses (writes a representative of THE ELECTRICIAN) are typical small dwelling houses, one of five rooms and kitchen, the other of six rooms and kitchen, and each is fully equipped with apparatus, supplied by a number of contractors and manufacturing firms in the Birmingham area, for lighting, heating, cooking, washing and ironing, carpet sweeping, etc. The houses are staffed by employees of the firms who have supplied the equipment, and there is at each house a competent lady who supervises the demonstrations in cooking, washing and ironing. The lighting and heating demonstrations are under the supervision of a man, and an abundance of trade literature is provided for visitors. The houses are to remain open from 2 p.m. till 9 p.m. each day, and demonstrations will

Reproducing the new 30 in. x 20 in. poster which the E.D.A. is now supplying at the rate of 25s. per hundred.

be given daily. They were visited on the evening of the opening day by members of the local committee, Mr. W. E. Bush, and other members of the E.D.A.

A comprehensive effort is being made to induce the public to visit the houses. The Birmingham Corporation Electric Supply Department has circulated all its consumers in the area and invited them to the houses, and a good deal of advertising is being done by large display posters on the hoardings. The medium of the cinema is also being used and slides descriptive of the houses, and conveying an invitation to the audiences, are being shown several times each day at the chief cinemas in the district. At the King's Norton house a very effective piece of advertising is accomplished by the use of flood lighting, which throws the whole of the house into prominence at night. At the King's Heath house one very large lamp is used to illuminate the front of the house and the large notice-board which is adjacent to it.

Elsewhere in the South Midland area (our correspondent finds) the campaign is progressing favourably. The Worcester local committee has two demonstration houses in view, which it is hoped will be ready shortly, while Leicester also hopes to open one soon, and the Shropshire, Worcestershire and Staffordshire Electric Power Co. are likely to open one at Bromsgrove within a week or so. Under the auspices of this company, meetings have been held at Evesham and Kidderminster, and an enthusiastic response is reported. The response in the rural areas has, in fact, been one of the brightest features of the campaign in the Midlands; the traders in these areas are showing great initiative.

There are now 14 local circles at work in the area, and a pleasing feature in some towns is the ready response to the invitation to raise a fund for advertising purposes. A monthly general meeting is to be held in Birmingham to keep

(*Concluded on next page.*)

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

ALD. P. W. Petter, managing director to Petters, Ltd., has been invited to continue in office as Mayor of Yeovil for the ensuing year.

Mr. Mark Miller, electrical contractor and radio engineer, of 146, Hereson Road, Ramsgate, has been elected a member of the Town Council.

At Haslingden municipal elections this week, Mr. Thomas Smith, electrical engineer, the retiring Liberal member for Helmshore Ward, had a walk-over.

Mr. Archibald Robertson, manager of the Rothesay Tramways, has been presented by his former staff at Greenock with a chiming clock and a coffee service for Mrs. Robertson.

Mr. H. Young, manager of the Cable and Wire and Wireless Departments of the Edison Swan Electric Co., Ltd., has resigned to take up a position with a manufacturing firm.

At St. Andrew's Church, Burnley, on October 28th, Mr. Norman Moore, electrical engineer, of Padiham, was married to Miss May G. Kay, only daughter of Mr. John Kay, of Burnley.

Mr. D. Cleghorn Thomas, hitherto headquarters representative of the British Broadcasting Co. in the Scottish area, has been appointed northern area director.

It is proposed temporarily to appoint Miss M. Cole, well known as one of the E.D.A. demonstration staff at the British Empire Exhibition, as demonstrator in the Dublin Electricity Sales Department at an inclusive salary of £4 per week retrospective from May 17th last.

Mr. W. H. Wiggans, who, as previously announced, is relinquishing his position as district engineer of the Consumers' Department of the Newcastle-upon-Tyne Electric Supply Co. to become consumers' engineer at Worthing, was last week presented with a silver cigarette box by Mr. W. F. T. Pinkney on behalf of the staff of the Lighting and Heating Departments.

Mr. J. W. J. Townley, whose appointment as electrical engineer to the London County Council Tramways Department was announced in THE ELECTRICIAN last week, is at present deputy city electrical engineer of Bradford. A native of Paisley, Mr. Townley went to Bradford in 1922 from Sunderland, where he was chief assistant electrical engineer. Other electricity supply undertakings in which he has held appointments include Paisley, Manchester, Ashton and Barnsley. He is a vice-chairman of the North Midland Centre, I.E.E.

Obituary.

The following deaths have been announced :—

MR. THOMAS A. CARTER, electrical engineer, of Fairfield House, Brookside, Uttoxeter, aged 62 years.

Mr. J. H. Winter.

MR. J. H. WINTER, at Bristol, aged 62 years. Until about two years ago Mr. Winter was head of J. H. Winter and Co., the well-known Bristol electrical contractors. He was one of the pioneers of electricity in Bristol, where he introduced the electric broughams many years ago. He carried out a number of important decorative illumination schemes, and in 1896 spent seventeen weeks in Russia arranging electrical illuminations for the Czar's Coronation celebrations. The business which Mr. Winter built up is continuing under the same name, and all the old employees are being retained.

MR. WILLIAM EDMONDSTONE PENDER, on October 31st, aged 66 years. Mr. Pender was formerly the Eastern Telegraph Co.'s superintendent at Cairo and Alexandria.

SIR JAMES W. SZLUMPER, aged 92 years. A well-known consulting engineer, he was one of the engineers of the original Brompton and Piccadilly Tube Railway and of the Great Northern, Piccadilly and Brompton Railway until its incorporation in the London Electric Railway.

MR. T. ATKINSON, of Northumberland Road, Newcastle-upon-Tyne, after a long illness. He was ex-chairman of the Newcastle Branch of the Electrical Contractors' Association, and had carried on business as an electrical contractor at Newcastle for some years.

BUSINESS ITEMS.

Changes of Address, Representatives, and other Developments.

AN old-established firm in Berlin wishes to secure the representation of British exporters of raw materials used in the manufacture of electric cables. Details from the Department of Overseas Trade. (Reference No. 422.)

Manufacturers' agents in Melbourne desire to obtain the sole representation of British manufacturers of engineering lines, wireless materials, etc. Particulars from the Department of Overseas Trade. (Reference 433.)

The Deal and Sandwich Electrical Co., Ltd., has opened showrooms and offices at 2, Park Street, Deal, and High Street, Eastry, and will be pleased to receive trade catalogues of electrical and wireless apparatus of all kinds.

The United States Board of General Appraisers (Customs Court) has decided that the import duty on loud-speakers and the units and movements therefor, being designed for and exclusively employed as parts of radio receiving sets, are properly classifiable for tariff purposes at the rate of 30 per cent. *ad val.* under the provision in paragraph 372 of the Tariff Act for "machines or parts thereof."

The Sterling Telephone and Electric Co., Ltd., Sterling Works, Dagenham, Essex, having recently acquired the "Phonophore" business of the Radio Phonophore and Electricals, Ltd. (in liquidation) will welcome inquiries for complete telephones and spare parts, and have arranged to give a special spare parts service to present users. Samples should be sent with all inquiries for spare parts.

A memorandum issued by the Canadian Customs Department announces that the reduced duties of 20 p.c. (general tariff), 17½ p.c. (intermediate tariff), and 15 p.c. (British preferential tariff) apply to magnetos, starting motors, electric generators and other equipment, all of a kind not made in Canada, when imported for use in the manufacture of motor trucks (not for railways or tramways), for carrying goods only.

Following the announcement in THE ELECTRICIAN last week regarding the continuation of the accumulator works of Fuller's United Electric Works, Ltd., we understand that a company is shortly being registered under the name of "Fuller Accumulator Co. (1926), Ltd." and that there will be no break in the continuity of the manufacture of this well-known accumulator. It is also understood that the wire and cable department of the old company has been sold, and will in future be run on a larger scale than in the past. Sir John Mann will continue to act for the present as receiver and manager in connection with the Ebonite and Carbon Black Departments of the late company.

Wiring the Homes of Britain.

(*Concluded from preceding page.*)

traders and manufacturers acquainted with the progress of the campaign.

The North-Western District is continuing to take a more active part in the campaign (states our Manchester correspondent), and Southport, under the leadership of Mr. Moxon, the borough electricity engineer, is reported to be getting a demonstration electric house ready. In last Saturday's edition of the "Southport Visiter" a full page was devoted to electricity in particular connection with the campaign, and the Corporation advertisement occupied a central position.

In Manchester city the British Thomson-Houston Co. have been running a well-worded competition advertisement in the "Manchester Guardian." Shop window displays are becoming more usual and the Corporation showrooms are giving a good lead to the traders, who still need some encouragement to launch out a little further. The displays at Brown's, Metro-Vick Supplies, and British Thomson-Houston Co.'s premises were all noticeable, but there is room for improvement in the general type of display in a number of other cases.

It has now been decided to advertise the campaign in the Irish Free State, employing the following journals :—"Dublin Evening Mail" (6 in. by two columns ; 13 insertions), October 26th, November 2nd, 9th, 16th, 23rd, 30th ; December 14th; January 4th, 18th ; February 1st, 15th ; March 1st, 15th. "Dublin Evening Herald" (6 in. by two columns ; 13 insertions), October 28th, November 4th, 11th, 18th, 25th ; December 2nd, 16th ; January 6th, 20th ; February 3rd, 17th ; March 3rd, 17th.

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AN INTERESTING WIRING INSTALLATION.

Novel Electrical Devices in Palatial Men's-Wear Shop—Details of the Equipment —Striking Lighting Effects.

BESIDES being the most complete men's outfitting shop in London, the new Regent Street premises of Austin Reed, Ltd., which were opened last week, also have an electrical installation which justifies some description here.

The electricity supply is taken from the mains of the St. James' and Pall Mall Supply Co. The installation was designed originally for the use of direct current throughout, but it was found that the lighting load would be more than the existing d.c. street mains could supply. The recent rebuilding of Regent Street, involving, as it has, large increases in the size of the buildings and also in the illumination required, has placed a very heavy demand on these cables, and for Austin Reed's building, in common with a number of others in the neighbourhood, it has been found necessary to utilise the high pressure mains for the lighting supply. The power equipment and a duplicate emergency lighting system for the staircases, etc., are taken from the d.c. mains.

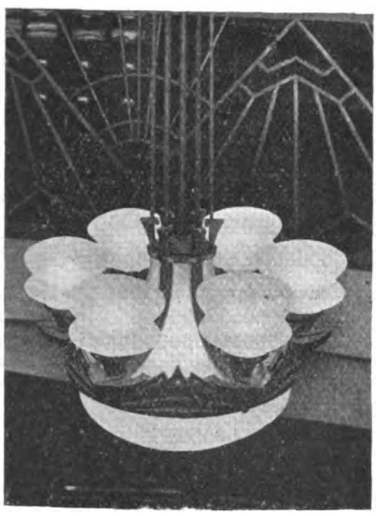
The high tension supply is brought in to a transformer chamber in the sub-basement at the south end of the building. Duplicate services are provided, and transformers arranged on each, to convert the 6 600 V three-phase supply to a two-phase three-wire 220 V system. The secondaries of the two services are taken to a triple pole change-over switch, so that in the event of a failure on one the lighting can be changed over to the other with a minimum of delay. From the centre terminals of the change-over switch the two sides of the three-wire supply are taken to two main 500 A circuit breakers for lighting, from which connections are made to the main fuse boards. The whole of this main distribution system, together with similar control gear for the d.c. lighting; d.c. power and a.c. heating and small power is all assembled in the main switch room adjacent to the transformer room.

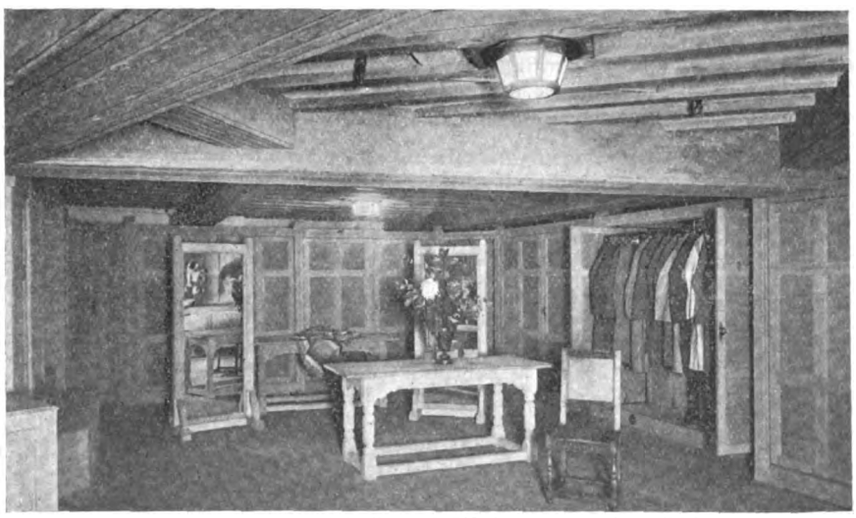
Distributing cables are run on standard lines with two separate lighting mains and two separate heating mains (for the north and south ends, respectively) to every floor and also for the window lighting, decorative lighting, etc. These cables are run in heavy gauge screwed tube up the special pipe ducts and are of ample size for future requirements.

Adjacent to the switch room is the engineering department in which is housed the whole of the machinery for the building, including the oil-fired central heating plant, the passenger and service lift gears, the artesian well and electrically-driven pump, the ventilating plant, the vacuum cleaning plant, the Lamson tube compressors, etc. The remainder of the sub-basement is given over to storage and is full of special racks and bins with a heavy goods lift for in-coming supplies, and a special lift for collars to the Collar Department on the ground floor. From the basement up to the fifth storey the floors are all arranged for the supply of every possible article of men's wear, from boots to hats. Each department is fully equipped with the latest apparatus for the convenience of the customers. The boot department has provision for X-ray examination, to ensure proper fitting, and the hat department has electrically operated polishing pads; heating irons and shaping pads; similar equipment is provided where necessary in other departments. The toilet saloon has its electrically heated dryers; towel cabinets, etc. The various changing rooms and dressing rooms have electric radiators; special reflectors for the mirrors and, in a proportion of them, daylight lamps for colour matching. Daylight lamp standards are also provided for the counters in certain departments for colour matching.

The lighting schemes for the various floors are very effective. The fittings on the five lower floors, made by the General Electric Co., to the special designs of the architects, Messrs. Westwood and Emberton, embody the G.E.C. "Verilux" glassware. The fittings are designed to include the Austin Reed "Summit" trade mark and the A.R. monogram.

On the other selling floors the fittings have been supplied by Messrs. Louis Dernier and Hamlyn, of character to suit the Tudor design of the upper floors, which are panelled in oak throughout. The same firm has also supplied the entrance lighting fittings and those in the changing rooms, the dress suit department and elsewhere. A special fitting in four tiers, passing through the large well, which runs from the second floor to the ground floor, was supplied by Messrs. Singers of Frome, to the architects' design, the same firm also supplying the staircase brackets modelled in plaster, the lift grille and other items.





Two views of lighting fittings in the new Regent Street, London, premises of Austin Reed, Ltd. (see accompanying article).

Window lighting on both the ground and mezzanine floors has been carried out with British Thomson-Houston reflectors of their well-known "Jill" type, spaced 12 in. apart, with additional provision for lighting signs; spot light fittings and other special effects. Power plugs are also provided in each window for possible moving exhibits. B.T.-H. reflectors of "Scoopette," "Hood Junior" and "Hood" types, have also been used for the counters and for numerous show-cases and other special lighting. A unique feature will be the decorative lighting scheme, but, unfortunately, the lighting restrictions prevent its use at present.

Window and decorative lighting is all controlled by Venner time switches, so that part or all of the lighting can be left on for fixed periods after the shop is shut. Various other electrical systems are also provided, including a system of "Magneta" electric clocks on all floors; night watchman's clocks; various bells and telephones, and other items that make the electrical equipment as complete as it could well be.

The contractors for the principal sections of the engineering equipment are:—LIFTS—Smith Major and Stevens; HEATING AND VENTILATING—Rosser and Russell; VACUUM CLEANING PLANT—The Plenum Heating Co.; LAMSON TUBES—The Lamson Pneumatic Tube Co.; ARTESIAN WELL—C. Isler and Co.; SPRINKLER SYSTEM—The Automatic Sprinkler Co.

The whole of the lighting installation and of all other sections of the electrical equipment has been carried out by Messrs. Tyler and Freeman, registered contractors, who were also responsible for the design of the electrical scheme in all its details.

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IN LIGHTER VEIN.

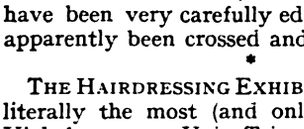
Combined Report on Motor Show and Hairdressing and Inventions Exhibitions.

OUR extra-special correspondent has been visiting several exhibitions of late, and his notes are given below. They have been very carefully edited, but even so the phases have apparently been crossed and the polarity reversed :—

* * *

THE HAIRDRESSING EXHIBITION.—The most outstanding and literally the most (and only !) hair-raising exhibit was the High-frequency Hair Trimmer and Crinkler.

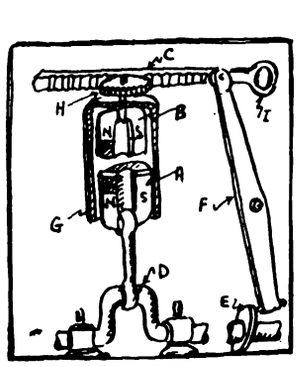
This is a remarkable example of one of the first discovered properties of electricity which, as far as can be ascertained, has not before been utilised for any practical purpose. The subject sits in the usual chair when a high frequency current is passed until the sitter is fully charged (our experience is that we are always fully charged without this device.—ED.), when the hair stands on end. The barber can now perform under ideal conditions. A number of gauges is made, and every hair can be cut exactly to specification. Eton crop, shingle, semi-shingle, bingle or bob, all to the latest gauge or pattern.



The high frequency hair trimmer.

Another special feature is that by superimposing an alternating current of known frequency, the hair can be permanently waved or crinkled. By varying the frequency the number of crinkles per cm. can be varied at will. A pitch of $\frac{20 \cdot 1}{A}$ x a hair's breadth in m.m., where A is the age in years, is considered fashionable.

THE MOTOR SHOW AND THE INVENTIONS EXHIBITION.—Easily the most striking exhibit, if striking means a refusal to work, is the Magnetic Motor. It was shown at both the Motor Show and the Inventions Exhibition and proved a great attraction. It is rumoured that it is the combined work of Mr. Heath Robinson, Mr. Winston Churchill, and another who has since left the country. The combined sketch plan, elevation and isochronous view shows how the device should work.



The Too Magnetic Motor.

Referring to the diagram, A is a powerful magnet fitted into a brass piston sliding in the cylinder G, and connected by the usual piston rod to the crankshaft D.

Above this is another equally powerful magnet B, which can be rotated about its axis by the rack mechanism C. This is operated by a rocker F, moved by the cam E.

* * *

The action is (or should be) as follows :—At the top of the stroke the magnets are facing each other peacably, but the moving of the rack to start the machine turns the top magnet, and similar poles face each other, so that the magnets repel and the piston magnet is forced down the cylinder. As it reaches the end of the stroke, the upper magnet will have been turned by the rack through an angle of 180 deg., and will attract the piston up again, and before it reaches the top the magnet will turn again so that the action will go on, once started. There are, of course, a number of cylinders to maintain a smooth action.

The advantages are too numerous to mention in detail. No petrol or current is required, as the movement is perpetual, once started. It is easily started by pulling the rack handle, the crankshaft and all moving parts are easily accessible. The action is smooth, and the speed is easily varied by moving the point of contact on the cam by a small lever.

* * *

Several offers have been received, including one from the Asylums Board and from several museums.

LEGAL INTELLIGENCE.

Egyptian Telephone Exchange Contract Appeal Dismissed.

THE Court of Appeal, consisting of the Master of the Rolls and Lords Justices Sargant and Lawrence, on October 29th dismissed an appeal by Siemens Bros., Ltd., from the judgment of Mr. Justice Russell in the Chancery Division granting to the plaintiff in the action, Mr. Henry Rose, a declaration that he was entitled to an account of the commission he alleged to be due to him from Siemens Bros. under an agreement dated February 9th, 1924, in connection with telephone exchange equipment supplied to the Egyptian Government after that date, the contract for which Mr. Rose alleged had been obtained through his instrumentality.

The defence of Siemens Bros. was a denial that Mr. Rose had anything to do with the procuring of the orders, and they alleged that they had been induced to enter into the agreement by a false representation that Mr. Rose could render them material assistance in the development of their telephone business in Egypt, and that in those circumstances they were entitled to repudiate the agreement which they did in April, 1924.

As fully reported in THE ELECTRICIAN at the time, Mr. Justice Russell stated that there had been no misrepresentation by Mr. Rose and gave judgment for him with costs.

Mr. Jowitt, K.C., for Siemens Bros., stated that he had fully considered the evidence, and had advised his clients that there was no ground for the appeal.

Electrical Manufacturers.

Nearly Three Hundred Firms in Newly Formed American Association.

AN important trade organisation development has matured in New York with the formation of a new association for electrical manufacturers, the National Electric Manufacturers' Association. The new body, of which Mr. Gerard M. Swope, president of the American G.E.C., is president, has 270 members, with a gross annual turnover of over one and a half billion dollars.

The objects of the organisation are to further the interests of the makers of electric supplies and apparatus in manufacturing, engineering, safety, transportation, and other industrial branches ; to promote the standardisation of electrical appliances ; and to promote a spirit of co-operation among its members.

Points of View.

Interesting Pronouncements on a Variety of Topical Electrical Subjects.

WE have got to woo the world's markets to-day ; we cannot coerce them.—*Sir Philip Cunliffe Lister.*

* * *

The use of electric power and track circuiting has placed railway signalling on a new basis.—*Mr. R. Bell.*

* * *

The availability of power supply on the "gridiron" must increase the possibilities of electrification of railways in Great Britain.—*Mr. G. H. Nelson.*

* * *

Electrical generating stations are probably amongst the most efficient factories of any description in the world.—*Mr. T. Hornbuckle.*

* * *

The method of leaving the supply of what is now a national necessity to individual owners of electricity supply systems cannot be continued if this country is to regain its former position in the world of industry.—*Mr. J. A. Robertson.*

* * *

If all the power-driven machinery in the country were driven by electric motors supplied by current generated in what has been described as super-power stations 18 million tons of coal per annum could be saved.—*Sir Benjamin Longbottom.*

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THE NATIONAL REGISTER.

Further Instalment of the Latest List of Electrical Installation Contractors on the Register on October 1st, 1926.

AS a guide to those who wish to place electrical installation work with registered contractors we continue below the publication of the latest list, compiled by the National Register up to October 1st, 1926. The first instalment was given in THE ELECTRICIAN last week :—

Boscombe.—Edwards and Co.

Bournemouth.—Aish and Co.; J. and H. Gould ; Harrington Brothers ; S. T. Meggitt (late Allan and Meggitt) ; Rogers and Kirkby ; Geo. Shears and Sons, Ltd.; A. R. Wilson.

Bradford.—Thomas Ackroyd ; Collinson Bros.; Fred. Draycott ; A. R. Farrar and Co.; Jackson Electrical Co.; Jessop and Boydell, Ltd.; J. H. Marshall ; Harry Moss ; Christopher Pratt and Sons, Ltd.; A. Ridgeway and Co.; Smith and Croft ; W. D. Wilson.

Braintree.—East Anglian Electric Supply Co., Ltd.

Bridgend.—G. H. Burgess.

Bridlington.—W. G. Padgett and Sons.

Brighouse.—The W. R. Bottomley Private Telephone Co.; Stillingfleet and Harper.

Brighton.—Bailey's ; H. J. Galliers ; W. A. Gooding and Sons ; Page and Miles, Ltd.; J. Smith and Son.

Bristol.—Brookfield Electrical Engineering Co.; Buchanan and Curwen ; Colston Electrical Co.; Gough Bros.; King and Co.; E. R. Linton ; Edmund S. Osgood ; A. E. Pendock ; Philip Price and Co.; Rouch and Penny ; R. Whipp and Co.

Broadstairs.—Edmund Dunn ; C. H. Roberts.

Bromley.—Bromley (Kent) Electric Light and Power Co., Ltd.

Burnley.—J. D. Bannister ; John Rawlinson.

Burton-on-Trent.—Barnett and Soans ; John F. Hall ; Logie, Ashmole and Co., Ltd.; John Richards and Co. (Electrical Engineers), Ltd.

Bury.—Armature Winding Co.; Barrow and Co., Ltd.; Direct Electric Service (Bury), Ltd.

Bury St. Edmunds.—C. C. Pudney and Co.

Buxton.—Frank Raworth.

Camberley.—Arthur Cozens.

Cambridge.—Baily, Grundy and Barrett, Ltd.

Canterbury.—Philpot and Son.

Cardiff.—Alger and Sons, Ltd.; Booth and Bomford, Ltd.; Brewer Brothers and Co.; Electra Contracting Co.; Lloyd Oswald and Co.; Frank Madge ; Ralph V. Nance ; Page and Stibbs.

Carlisle.—Electrical Illuminating Co.; Smith and Co.

Carnbrea.—Urban Electric Supply Co.

Castleford.—E. Mercer.

Caterham.—Urban Electric Supply Co., Ltd.

Chadwell Heath.—Charles W. Bailey.

Cheltenham.—F. H. Bastin and Son ; Reginald Coombs ; Wm. P. Honeysett ; Jacobs and Drane, Ltd.; R. E. and C. Marshall, Ltd.; C. Stevens ; Walter H. Tanby.

Chester.—F. J. Jones and Sons, Ltd.; E. Nuttall ; Williams, Gamon and Co. (Kaleyards), Ltd.; Thos. Wood and Son (Chester), Ltd.

Chesterfield.—Chesterfield Engineering Co.; Edgar R. Morris.

Chester-le-Street.—James Bewick and Co., Ltd.

Choppington.—J. W. F. Sherriff.

Clacton-on-Sea.—Arthur D. Cozens.

Colwyn Bay.—W. Anderton and Co., Ltd.

Coventry.—F. C. Brown (Electricity), Ltd.; H. W. Burbury, Ltd.; Coventry Electrical and Engineering Co.; Lee Beesley and Co.; G. R. Marson, Ltd.

Crewe.—Carrington and Button ; G. J. Scragg.

Cromer.—Cromer Electricity Supply.

(To be continued).

MUNICIPAL FINANCE.

Leading Points from Accounts of Municipal Electricity Departments for the Year ended March 31st, 1926.

THE total revenue for the year 1925-6, of the 24 undertakings included in the following table, plus the 24 dealt with in the table published in our issue of September 24th, was £12 266 706; the gross profit on the year's working of the 48 undertakings was £5 552 629 ; and their aggregate sales of electricity amounted to 1 079 897 553 kWh, while 24 undertakings out of the total number have contributed an aggregate of £356 481 to the relief of rates out of the year's profits. As it is desired to make this series of tables as useful as possible, the Editor will be pleased to receive from the engineers or managers of other municipal electricity undertakings particulars, if available, for each of the columns.

Supply Authority.	Total Revenue. £	Gross Profit. £	Net Profit (+) or deficit (−) £	(a) Working Costs per kWh sold.	Total Cost per kWh (inc. capital charges).	Electricity sold (kWh)	Increase (+ or Decrease) (−) in kWh sold.	Maximum Load. kW.	Load Factor.	Radiators and Cookers Connected (total) in kW except where otherwise stated.	Other Domestic Appliances connected (total) kW.	Contributed in Aid of Rates. £
Accrington T.C. ..	79 412	33 516	+10 185	0·716d.	1·081d.	15 386 817	+1 479 234	8 150	26·00	—	—	2 000
Barnsley T.C.	62 609	29 048	+10 331	1·261d.	1·770d.	6 616 012	+ 989 522	3 094	32·00	—	—	3 000
Brighton T.C.	219 623	77 922	25 272	1·510d.	2·130d.	20 544 390	+2 421 723	12 900	24·00	—	—	20 000
Bristol C.C.	466 221	209 639	+95 570	0·810d.	1·240d.	64 183 737	+8 100 846	30 893	27·56	(3) (No.) 628	—	16 000
Cardiff C.C.	242 721	124 851	+50 176	0·710d.	1·420.	32 500 954	+6 829 923	15 636	23·73	(3) 3 372	(4) 11 043	33 366
East Ham T.C.	95 780	32 657	+6 114	2·015d.	2·863d.	8 385 680	+ 937 780	3 930	24·40	—	—	—
(b) Glasgow C.C. ..	1 195 003	593 710	−29 329	0·507d.	1·573	186 742 044	+74 788 845	91 700	28·69	(2) 76 062	See footnote (2)	—
Grimsby T.C.	85 507	37 503	+9 665	0·921d.	1·520d.	11 911 717	+2 158 723	4 868	36·54	(2) 4 658	See footnote (2)	—
King's Lynn T.C. ..	19 366	8 320	+3 076	1·510d.	2·440d.	1 535 926	+31 261	1 183	14·77	(2) 642	See footnote (2)	—
Liverpool C.C.	1 096 052	453 040	+135 293	0·529d.	1·178d.	172 044 686	17 274 686	73 614	23·58	(3) 1 401	—	65 000
Maidstone T.C. ..	94 912	32 239	+10 764	0·824d.	1·135d.	16 660 477	+1 271 000	5 600	41·20	(No.) 790	(No.) 736	—
Marylebone (London) B.C.	401 678	202 764	+29 344	0·817d.	1·530d.	58 400 899	+7 733 466	34 000	20·80	16 432	4 262	—
Oldham T.C.	247 425	99 300	+30 417	0·780d.	1·143d.	45 564 621	+4 119 811	23 474	26·84	—	—	—
Peterborough T.C. ..	70 006	36 132	+7 678	0·761d.	1·501d.	10 019 230	+3 201 531	4 300	32·83	(3) (No.) 174	—	—
Preston T.C.	129 951	58 832	(1)−15 316	1·135d.	2·440d.	15 250 029	+7 144 813	8 400	26·48	6 000	3 000	—
Salford T.C.	287 899	136 536	+44 236	0·712d.	1·157d.	49 776 217	+5 031 723	22 034	25·80	(2) 8 143	See footnote (2)	14 000
Sheffield C.C.	781 640	344 288	+72 441	0·568d.	0·971d.	161 339 751	+6 875 431	76 804	28·84	25 402	—	60 787
Southampton T.C. ..	188 620	76 405	+14 959	1·110d.	1·779d.	22 041 271	+4 295 015	11 680	28·40	11 523	—	—
Stafford T.C.	38 404	21 686	+2 619	0·690d.	1·480d.	5 812 018	+74 158	3 471	22·40	(5) (No.) 136	(5) (No.) 18	4 500
(c) Stirling	16 063	4 863	−44	1·700d.	2·400d.	1 078 425	+92 245	678	20·10	(2) 200 kW	See footnote (2)	—
Stockton T.C.	44 319	13 262	+2 000	1·280d.	2·080d.	4 648 662	−197 737	2 452	25·20	—	—	2 000
Warrington T.C. ..	115 102	44 183	+10 319	0·790d.	—	17 179 291	877 137	7 796	31·38	1 829	717	4 000
West Ham T.C. ..	381 615	150 663	+37 556	0·770d.	1·190d.	63 520 349	+5 213 161	24 060	30·13	(3) 291	(4) 2 186	15 940
Weymouth T.C. ..	28 799	9 677	+4 222	2·290d.	3·080d.	1 880 354	+ 295 315	1 023	20·90	976	—	—

(a) Including management, repairs and maintenance, and, usually, rates and taxes and special charges. (b) Year ended May 31st, 1926. (c) Year ended May 15th, 1926.
(1) Due to increased capital charges in connection with the new Ribble power station, new mains, etc. (2) Including other domestic appliances. (3) Cookers only.
(4) Including radiators. (5) On hire from department.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given.

BELFAST EDUCATION COMMITTEE, November 5th.—Electrical machinery and apparatus for the Electrical Engineering Laboratory of the Municipal College of Technology. Specifications, etc., can be obtained at the General Office, Municipal School of Technology, Belfast.

EASTBOURNE CORPORATION, November 5th.—Supply and erection of one water-tube boiler, economiser, feed heaters, two steel chimneys with induced draught, pipework, etc. Specifications from Mr. J. K. Brydges, Electricity Works, Eastbourne; deposit £1.

INDIA STORE DEPARTMENT, November 5th.—Two 50 kW oil engine driven generating sets and 5 000 yd. of dry core paper insulated, 40 wire armoured composite cable. Specifications (Nos. 2 and 3 respectively) from the Director-General, Branch No. 11, Belvedere Road, London, S.E.1; 5s. each.

SALFORD CORPORATION, November 5th.—One 5 000 kVA three-phase transformer unit. Forms of tender, etc., from the Borough Electrical Engineer, Electricity Works, Frederick Road, Pendleton, Salford.

SKIPTON URBAN DISTRICT COUNCIL, November 5th.—(1) Supply and (2) laying, etc., of 500 yards 0·1 by 0·1 by 0·1 sq. in. four-core, paper insulated, lead-covered and double steel tape armoured l.t. cable.

DUBLIN CITY COMMISSIONERS, November 6th.—Repair of electric motor lorry.

SALFORD GUARDIANS, November 6th.—Electric wiring, fitting, etc., of the new mortuary and converted laundry buildings at the Union Infirmary, Hope, Pendleton, Salford. Specification from Mr. E. H. Inchley, Clerk to the Guardians, Poor Law Offices, Eccles New Road, Salford; deposit £2 2s.

DUBLIN UNITED TRAMWAYS CO. (1896), LTD., November 8th.—Twelve months' supply of stores, including cables, car fittings, electric lamps, electric fittings, trolley fittings, etc. Forms of tender (2s. 6d.) from the company's offices, 59, Upper Sackville Street, Dublin.

DUNDEE CORPORATION, November 8th.—Electric light installation work in connection with additions and alterations to Clinic No. 1, Nelson Street, Dundee. Particulars from the Town Clerk.

CAERPHILLY URBAN DISTRICT COUNCIL, November 9th.—Electric wiring of 54 houses at Nantgarw. Specifications from Mr. W. C. B. Hillman, electrical engineer, Council Offices, Mountain Road, Caerphilly.

KIRKCALDY DISTRICT COMMITTEE, November 9th.—Electric light wiring of 96 houses comprised in the Methilhill housing scheme. Plans can be seen at the office of Mr. G. B. Deas, architect, Central Chambers, Kirkcaldy.

ADWICK-LE-STREET URBAN DISTRICT COUNCIL, November 10th.—Internal wiring of 264 Council houses, including supply of lamps, shades and switches. Specification (5s.) from the Surveyor, at the Council Offices, or from Mr. W. M. Selvey, consulting engineer, Independent Buildings, Sheffield.

STOKE-ON-TRENT CORPORATION, November 10th.—Coal and ash handling plant at central electricity generating station, Hanley. Specification from the City Electrical Engineer, St. George's Chambers, Wolfe Street, Stoke-on-Trent.

STOKE-ON-TRENT CORPORATION, November 10th.—Wiring and fitting of eight electric houses in Avenue Road, Hanley. Specification from the City Electrical Engineer, St. George's Chambers, Wolfe Street, Stoke-on-Trent.

STOKE-ON-TRENT CORPORATION, November 10th.—Supply of e.h.t. switchgear for central power station (contract 2 620); e.h.t. switchgear, etc., for Stoke sub-works (contract 2 625); and neutral earth resistance for central power station (contract 2 626). Specifications from the City Electrical Engineer, St. George's Chambers, Wolfe Street, Stoke-on-Trent, on payment of £2 in respect of each contract.

NEWARK CORPORATION, November 12th.—Electric lighting installation in main electricity substation, Queen's Road Depot, Newark. Specification from the Electrical Engineer, 2, Market Place, Newark; deposit 10s. 6d.

BRADFORD CORPORATION, November 13th.—Twelve months' supply of stores to the Tramways Department, including electrical fittings for tramcars, insulating material, etc. Schedules and forms of tender from Mr. R. H. Wilkinson, general manager, 7, Hall Ings, Bradford.

DUBLIN BOROUGH COMMISSIONERS, November 13th.—One year's (*a*) supply or (*b*) supply and erection of transformers, for the Electricity Departments. Specifications from the City Electrical Engineer, Fleet Street, Dublin; deposit £1 1s.

EVESHAM CORPORATION, November 16th.—Electrical installations in the Public Hall and Town Hall. Specifications from the Borough Surveyor, Municipal Offices, Evesham.

AUCKLAND, SHILDON AND WILLINGTON JOINT HOSPITAL BOARD, November 18th.—Electric wiring and fitting of Helmington Row Isolation Hospital. Particulars from the Clerk, Union Offices, Bishop Auckland.

GREAT WESTERN RAILWAY, November 19th.—Supply of stores, including (Form 18) telegraph instruments; (Form 19) electrical apparatus (insulators), etc.; (Form 20) electrical wires and cables; (Form 21) telegraph ironwork and tools; and (Form 22) telegraph drysalteries. Specifications and forms of tender from the Stores Superintendent, Swindon. Form 20 will not be available until November 10th.

LEYTON CORPORATION, November 19th.—Electric light installation at Knott's Green Special School. Specifications from Mr. J. H. Jacques, 61, West Ham Lane, Stratford, London, E.15.

CARDIFF CORPORATION, November 22nd.—(1) Water tube boiler, mechanical stokers and forced draught plant; (2) steel chimney and grit collecting plant; (3) induced draught plant. Particulars and specification from the City Electrical Engineer, The Hayes, Cardiff. Only members of the King's National Roll are invited to tender.

RICHMOND (SURREY) CORPORATION, November 24th.—Overhauling and maintenance of fire alarm, fire telephone and firemen's call bell systems. Specifications from the Borough Engineer and Surveyor, Town Hall, Richmond.

BRIGHTON CORPORATION, November 25th.—Supply and erection at Southwick power station of 15 625 kW turbo-alternator, with condensing plant and auxiliaries. Specifications from Mr. John Christie, Electricity Department, North Road, Brighton; deposit £3 3s.

DUBLIN PORT AND DOCKS BOARD, December 1st.—Supply and erection of a 4-ton level luffing electric portal crane. Specification from the Engineer of the Board (Mr. J. Mallagh), East Wall, Dublin.

GREAT SOUTHERN RAILWAYS CO., December 9th.—Six or 12 months' supply of electric cables (under form 129), electric lamps (form 137), etc. Forms (6d. each) from the Stores Superintendent, Great Southern Railways, Inchicore, Dublin.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trades (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, November 8th.—Diaphragms, cords, etc. (Reference B.X. 2 860.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone transformers. (Reference B.X. 2 707.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 9th.—Telephone protective apparatus. (Reference B.X. 840.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, November 10th.—Supply and erection of steam-turbine-driven centrifugal boiler-feed pump. (Contract No. 770.) (Reference A.X. 3 534.) Supply and erection of motor-driven centrifugal boiler-feed pump. (Contract No. 771.) (Reference A.X. 3 536.)

SYDNEY CITY COUNCIL, November 15th.—Supply of 33 000 V cable and pilot cable. Specification (No. 1 047) from the Constructional Engineer, Electricity Department, Town Hall, Sydney.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 16th.—Supply of timing clocks for indicating the duration of telephone trunk line calls. (Reference B.X. 2 827.)

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LATVIAN POST AND TELEGRAPH ADMINISTRATION, November 20th.—High frequency telephone equipment. (Reference B.X. 2 993.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 23rd.—Lightning arresters and transformers. (Reference B.X. 2 792.)

PORT ELIZABETH MUNICIPALITY, November 25th.—Supply and erection of duplicate electrically-driven automatic float controlled centrifugal sewage pumps, etc. (contract 24, Mill Park). (Reference A.X. 3 680.*)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 26th.—Primary battery material.

SYDNEY CITY COUNCIL, November 29th.—High and low tension cables (contract 1 057). (Reference B.X. 2 959.)

SYDNEY CITY COUNCIL, November 29th.—Three-phase oil-immersed induction voltage regulator. (Reference B.X. 2 936.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 30th.—Supply of 110 kW transformers. (Reference X.B. 2 874.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, November 30th.—Two tons of galvanized building wire. (Reference A.X. 3 721.)

EGYPTIAN MINISTRY OF THE INTERIOR, December 1st.—X-ray apparatus (Reference B.X. 2 999).

SOUTHLAND ELECTRIC POWER BOARD, INVERCARGILL, N.Z., December 1st.—Supply of a 3 000 H.P. horizontal Francis turbine and 2 350 kW generator. (Reference B.X. 2 822.)

SYDNEY CITY COUNCIL, December 1st.—Tungsten filament electric lamps (Reference B.X. 2 995.)

VICTORIAN RAILWAY COMMISSIONERS, December 1st.—Rotary converter or rectifier set, with switching equipment for its automatic operation.

EGYPTIAN MINISTRY OF THE INTERIOR, December 5th.—Electric motors and accessories. (Reference B.X. 2 996.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, December 6th.—Key switches. (Reference B.X. 2 962.)

STATE ELECTRICITY WORKS, MONTEVIDEO, December 6th.—Diesel-electric generating sets.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 7th.—Three-phase induction regulator for Waikato electric power scheme (section 206.) (Reference B.X. 2 935.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 10th.—Electric motors. (Reference B.X. 2 861.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 15th.—Switchgear, cable, motor-generator sets, junction boxes, etc., for Hutt Valley Locomotive Workshops. (Reference B.X. 2 949.)

VICTORIAN ELECTRICITY COMMISSION, December 15th.—Water tube boiler, with superheater, economiser, etc., for Yallourn power scheme. Specification (No. 28/82), from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.2; deposit £3 3s.

INDIA STORE DEPARTMENT, December 21st.—Supply and erection of overhead transmission line, 110 000 V, about 280 miles in length. Specification (5s.) from the Director-General, Branch 14, Belvedere Road, London, S.E.1.

VICTORIAN RAILWAY COMMISSIONERS, December 22nd.—Supply of a wheel lathe, with electrical and other equipment (Reference A.X. 3 735.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 1st.—Supply and erection at site of Seru pumping and power station, of four Diesel engine alternator groups, three pumps and accessories. Specification (10s. 6d.) from Chief Inspecting Engineer, 41, Tothill Street, S.W.1.

INDIA STORE DEPARTMENT, January 4th.—Supply an erection of track equipment, including overhead equipment and steel structures for about 140 miles of railway route, suitable for 1 500 V. Specification (£2) from the Director-General, Branch 14, Belvedere Road, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 4th.—Supply of switchgear and transformers for Waikaremoana electric power scheme. (Reference B.X. 2 872.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 4th.—Bells and buzzers (schedule C147). (Reference B.X. 2 984.)

CHINA, January 15th.—Turbo-generators, condensers, boilers, switchgear, transformers, etc. Tenders are invited by a Chinese company holding a concession for water and electricity supply (Reference B.X. 2 998).

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 18th.—Transmission line steel towers for Waikaremoana electric power scheme (section 31). (Reference A.X. 3 732.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 1st.—Storage battery and booster for Waikaremoana Electric Power Board (section 28). (Reference B.X. 2 937.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 15th.—Transformers, for Waikato (section 207). (Reference B.X. 2 985.)

Tenders Accepted.

BARNES URBAN DISTRICT COUNCIL.—Macintosh Cable Co., 880 yds. distributor cable, £346 14s. 4d.

THAME (OXON) GUARDIANS.—Holland, Beachey and Co., electric light installation at the institution, £240.

GRAVESEND CORPORATION.—British Electric Transformer Co., transformer, for Tollgate supply, £289 15s. 9d.

PORT OF LONDON AUTHORITY.—General Electric Co., Ltd., six months' supply of Osram gasfilled electric lamps.

WHITEHAVEN RURAL DISTRICT COUNCIL.—Moresby Colliery Co., supply of electricity for public lighting at Moresby.

SURREY EDUCATION COMMITTEE.—E. Brook, Ltd., power motor for engineering workshop at Redhill Junior Technical school, £36 12s. 6d.

SLOUGH URBAN DISTRICT COUNCIL.—Allen and Simmonds, substitution of electric motor for Diesel engine at Stoke pumping station, £103 4s. 6d.

CHIPPENHAM ISOLATION HOSPITAL.—A. R. Fox, electric light installation, £65 15s. 6d.; West Wilts Light and Power Co., extension of mains to the hospital, £65.

PRESTON CORPORATION.—British Insulated Cables, Ltd., auxiliary cabling to connect up turbo-generator and cables for connecting up to switchboard, £1 615 (recommended).

ADWICK-LE-STREET URBAN DISTRICT COUNCIL.—Callender's Cable and Construction Co., Ltd., electric lighting of the whole of the Park at Woodlands, £550 (extension of previous contract).

HERTFORD CORPORATION.—North Metropolitan Electric Power Supply Co., lighting fifteen 200 c.p. lamps on Stanstead Road estate, £5 3s. 6d. per lamp per annum, for a term of three years.

L.G.O.C. EMPLOYEES' DEATH LEVY DISTRESS AND SICK FRIENDLY SOCIETY.—Bastian Meter Co., Ltd. (Bastian and Allen), supply and installation of electric water-heating apparatus at the Convalescent Home, Hastings.

HAVANT RURAL DISTRICT COUNCIL.—Portsmouth Corporation, for public lighting at South Hayling, the Corporation to provide 20 standards and lamps, and supply electricity from October 1st to March 31st at £3 15s. per lamp.

The British Industries Fair.

List of Electrical Firms Who are Exhibiting in 1927.

APPLICATIONS for space in the Electrical Section of the forthcoming British Industries Fair are being received in increasing numbers, and in order to ensure representation at this great trade fair, electrical firms who have not already ordered their space should do so at the earliest possible moment. The following is a list of electrical firms who were on the roll of exhibitors on November 1st, 1926:—

C. H. Parsons, Ltd.; Premier Electric Heaters, Ltd.; Gent and Co., Ltd.; Manda Motors, Ltd.; Batteries, Ltd.; Geo. Nobbs, Ltd.; Record Electrical Co., Ltd.; Shropshire, Worcestershire and Staffordshire Electric Power Co.; E. H. Millington and Co., Ltd.; Sturge and Baker, Ltd.; Chloride Electrical Storage Co., Ltd.; K. F. M. Engineering Co., Ltd.; Geo. Ellison; Spauldings, Ltd.; Bulpitt and Sons, Ltd.; Electrical Power Engineering Co. (Birmingham), Ltd.; Electricars, Ltd.; Castle Fuse and Engineering Co., Ltd.; General Electric Co., Ltd.; S. J. Daulby; Kelvin, Bottomley and Baird, Ltd.; Birkbys, Ltd.; Hart Accumulator Co., Ltd.; M. L. Magneto Syndicate, Ltd.; Electric Fires, Ltd.; Berry's Electric, Ltd.; J. A. H. Hunt; William McGeoch and Co., Ltd.; Macintosh Cable Co., Ltd.; T. V. E., Ltd.; Barrett Wakefield and Co., Ltd.; Park Royal Engineering Co., Ltd.; Hewittic Electrical Co.; Hackbridge Electric Construction Co., Ltd.; London Electric Wire Co. and Smiths, Ltd.; British Electrical Repairs, Ltd.; J. H. Tucker and Co., Ltd.; Ebonestos Insulators, Ltd.; E. Rudd and Co.; Credenda Conduits Co., Ltd.; Wingrove and Rogers, Ltd.; Ward and Goldstone, Ltd.; Pritchett and Gold and E.P.S. Co., Ltd.; I. Calvete, Ltd.; Coventry Electrical Accessories, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.; John Harper and Co., Ltd.; Excelsior Shade Manufacturing Co., Ltd.; W. R. Small.

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ELECTRICITY SUPPLY.

Good Demand for Electric Cookers at Liverpool and Torquay—Ross-shire Hydro-Electric Scheme—Heaters on Slot Meter System in Llandudno Hydro.

IT is stated that 1 800 electric cookers are now connected to the Liverpool Corporation's mains.

Connah's Quay U.D.C. has decided to apply for powers to borrow a further £3 500 for electricity purposes.

Frant P.C. has adopted the proposal of the Weald Electricity Co. for the electric lighting of the Council's area.

An electricity sub-station in Brook Street, Oswaldtwistle, has been sanctioned by Accrington Corporation.

Reigate T.C. has decided to supply electricity to the Council houses to be erected on the Ringwood Avenue site.

Despite increased expenditure through dear coal, Todmorden Electricity Department has decided not to increase its charges at present.

Borrowing powers for £4 000 for mains and services and £200 for meters are being sought by Ashton-under-Lyne Corporation.

Longtown R.D.C. has consented to the application of Carlisle City Council for a Special Order to supply the district by means of overhead lines.

Extensions in Barnsley Rural District.

Barnsley R.D.C. has decided to raise no objection to the application of Electrical Distribution of Yorkshire for permission to supply the parish of Billingley.

Aberdeen T.C. has decided to lay a cable from Great Northern Road, Woodside, to the new houses which are being erected at Smithfield, at a cost of £1 400.

The local school committee recommends Aberdeenshire Education Authority to adopt electric lighting at the Craigton Higher Grade School and in the janitor's lodge.

The first cable in connection with Clitheroe's electricity undertaking was laid on October 28th, and supplies are expected to be available early in the New Year.

Huddersfield T.C. has received sanction to loans of £19 000 for transformers and mains, and £32 500, on account of £43 680 applied for, in connection with the linking up with Halifax.

Bath Corporation has applied to the Electricity Commissioners for a loan of £5 338, the additional cost of providing a duplicate supply to the West Wilts Electric Light and Power Co.

The Electricity Commissioners have granted, with certain modifications, the Special Order sought by Milford Haven U.D.C. The Council is to apply for a Fringe Order for Hollywood.

Nottingham Electricity Committee is converting the depot at Carrington into a new sub-station, with a view to meeting an anticipated increase of demand for current in the Mansfield Road area.

Ald. W. Emmett, chairman of the Electricity Committee, formally started last week a new 7 500 kW generator in the Halifax Corporation electricity works, making the total capacity of the plant 15 750 kW.

Kew Opposed Chiswick Power Station.

Kew ratepayers recently drew up a petition to the Minister of Health protesting against the proposal to erect an electric power station on the Duke's Meadows, Chiswick, in connection with the London and Home Counties electricity scheme.

Guildford T.C. has decided to utilise electricity for motive power for the new compressor plant at the destructor. Aldershot T.C. has asked for terms for a bulk supply, and Guildford Council has promised to give such a supply as soon as practicable.

Carndonagh Public Health Committee has adopted a resolution recommending the County Donegal Board of Health to accept the scheme of Tillie and Henderson, shirt manufacturers, Derry and Carndonagh, for lighting the town electrically.

Wallingford Electric Light Co. is seeking the support of Wallingford R.D.C. to the company's application for authority to extend its area to include East and West Hagbourne, Harwell, Didcot, North Moreton, South Moreton, and East Hendred.

The Minister of Transport proposes to confirm the Special Order authorising the South Wales Electrical Distribution Co. to give a supply in Llanfrechfa Upper urban district. Any objections must be sent to the Ministry of Transport by November 8th.

A meeting of property holders was held at Kyle, Ross-shire, recently to consider a proposal to promote a hydro-electric scheme for Lochalsh parish. Sir Daniel Hamilton of Balmacara has offered to help, and an electrical engineer has been instructed to make a survey of the lochs on the Balmacara estate.

Prestatyn Electricity Committee is endeavouring to get the transformer station erected and the distribution cables laid so that the supply available from the North Wales Power Co. may be at the service of consumers by March 14th next, the date on which the Council begins its payments to the company.

Bridgend U.D.C. has asked Penybont R.D.C. to waive its objection to Bridgend Council's application for an Order to extend its electricity supply system into the Penybont district. The Penybont Council seeks to impose a condition regarding the allocation of a certain proportion of the profits to the reduction of charges.

Torquay Corporation is applying for a loan of £12 500 to cover commitments for mains and services during the coming year, and a considerable sum is to be spent on new plant for the Upton Valley sub-station. There has been a rush for electric cookers. Electricity generated since March 31st last shows an increase of 1 242 208 kWh.

Miss M. Partridge (of M. Partridge and Co., electrical engineers, Exeter) has notified Frome R.D.C. of the firm's intention to apply for an Order to authorise the supply of electricity in Beckington and Rode and part of Southwick from a generating station to be erected at Clifford Mill. Frome R.D.C. has approved the proposal.

Representatives of the Electricity Distribution of North Wales and District Co. recently submitted to Ellesmere U.D.C. details of the company's proposal to supply electricity in the district. The Council has decided to insist upon the use of underground cables in certain thoroughfares, unless structures for supporting overhead lines can be so situated as not to interfere with traffic.

Leicestershire and Warwickshire Power Co.'s Bill.

Market Bosworth R.D.C. has declined to support the Leicestershire and Warwickshire Electric Power Co.'s Bill for powers to supply the area. The Council has agreed to comply with the request of Market Bosworth P.C. to ask the Pooley Hall Colliery Co. to extend its lighting area to Market Bosworth. The Pooley Hall Co.'s terms are 6d. per kWh for lighting, 2d. for power, and 1½d. for domestic purposes.

As stated last week the proprietors of the Llandudno Hydro have asked the Llandudno Council to arrange for the installation of slot meters in the bedrooms of the hydro, for heating them by electricity. The Electricity Committee recommends that the meters be installed, the hydro company to pay a rental of 3s. a quarter and to be responsible for the whole electricity bill for the hotel. The Council will consider the matter.

At last week's meeting of Scarborough T.C. it was stated that the power to drive the new machinery at Irton Waterworks in conjunction with the water undertaking should be electricity generated at the Seamer Road works and conveyed by overhead cables to the new waterworks. It was also reported that builders in the outlying parts of the town were wiring houses for electricity in response to the appeal of the Electricity Committee.

Shoreditch Lighting Committee reported recently that an offer had been made to the Public Health Department of the Corporation of London to supply electricity to tenements in the block of dwellings to be erected in Shepherdess Walk, to undertake the wiring of the tenements for lighting and to charge 7d. per kWh for lighting and not exceeding 2d. for heating and cooking, including hire and maintenance of appliances. The Committee also reported that the borough electrical engineer proposed the purchase and installation in the new Evelyn Street sub-station of a 1 500 kW motor-converter and the laying of the necessary feeder main and switchgear, the estimated expenditure being £18 475, and that the Committee had instructed the engineer to prepare specifications for the plant and apparatus. It is proposed to spend £420 on electric cookers and kettles for tenants of Provost Dwellings.

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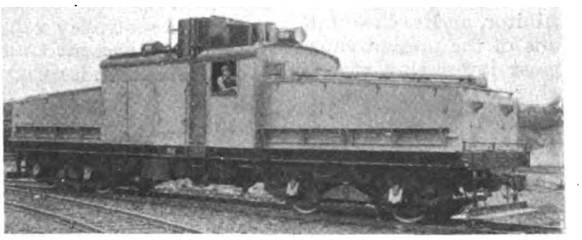
NEWS IN PICTURES

Mr. S. F. Snow, apprenticed with Marryat and Place, Ltd., who has received the E.C.A. Bronze Medal and £10 for obtaining second highest marks in Grade I. of the City and Guilds Examinations.



This storage battery locomotive, made for service on the Chicago and North Western Railway, weighs 110 tons, and is claimed to be the largest of its kind in existence. It is capable of hauling a 1·500-ton train at a speed of from eight to ten miles an hour. Its Exide battery weighs over thirty-nine tons.

Mr. J. W. J. Townley, deputy city electrical engineer of Bradford, who has been appointed electrical engineer to the London County Council Tramways Department, in succession to Mr. P. L. Rivière.

An improved type of telephone booth which is being installed in American cities. It occupies much less space than the usual call box.

In Birmingham the Wiring the Homes of Britain Campaign is being vigorously exploited by the municipal electricity undertaking and by the big electrical manufacturers. Here is a display of Campaign posters in the Electric Supply Department's offices in Dale End.

The Newcastle-upon-Tyne Electric Supply Co. and associated companies have connected 12 000 new consumers since January 1st, 1926, and it is hoped to increase the figure to 15 000 before the end of the year.

Following the announcement made in THE ELECTRICIAN last week to the effect that a new 41 000 kW set was to be added to the Barton power station by the Metropolitan-Vickers Electrical Co., it is now possible to say that the condensers will be provided by Richardsons Westgarth, the boilers by Babcock and Wilcox, the fans by Davidson and Co., and the motors by the Lancashire Dynamo Co.

Easingwold (Yorks) R.D.C. has approved, provisionally, a scheme for supplying electricity to surrounding villages. The project has been put forward by John C. Bannister and Co., Ltd., of the Easingwold electric power station. It is proposed to carry overhead cables to the parishes of Raskelf, Thormanby, Husthwaite, Carlton Husthwaite, Coxwold, Newbrugh, Ouston, Crayke, Stillington, Sutton-on-Forest, Huby, Tollerton, Alne, Flawith, Tholthorpe, Myton and Helperby.

The Electricity Commissioners' inquiry into the applications for powers to supply electricity in the South Craven district has been concluded. Electrical Distribution of Yorkshire, Ltd., sought an Order to supply in Barnoldswick, Earby and Silsden urban districts and 26 townships in Skipton rural district, and Keighley Corporation asked for authority to supply in Silsden and four townships in the Skipton rural district, while the Barnoldswick, Earby and Silsden Councils sought powers for their own areas.

The Electricity Commissioners have refused to sanction the application of Nuneaton T.C. for authority to extend its generating plant. The Commissioners are not satisfied that the Corporation would be (if the proposed extension were allowed) in a position to give a supply adequate in quantity and regularity to meet present and prospective demands at a cost not greater than that at which they could give a supply if they obtained it from the Leicestershire and Warwickshire Electric Power Co. on the terms put forward at the local inquiry.

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WIRELESS NEWS.

Successful Wireless Exhibition Organised by "Manchester Evening Chronicle."

As briefly reported in our last issue, the third annual Wireless Exhibition, organised by "The Manchester Evening Chronicle," was opened on October 26th, and in view of the great popularity of the show last year, when even Olympia records were all beaten, many additional stands were taken. Chatting over results with a leading exhibitor, an ELECTRICIAN representative concluded that the results of the present show will be equally good. One of the most interesting stands was Ferranti's. This firm were showing a new milliameter for use in the plate circuit, to prevent distortion. This firm were operating 100 loud speakers in different parts of the Hall from a public address system erected in the gallery, and were using a new loud speaker which they are busy perfecting, prior to putting on the market.

In the centre of the "Exide" stand there was a large illuminated model of an "Exide" car starter battery, and there was also a complete range of Exide batteries for every wireless requirement, including h.t. batteries in 20 and 24 V. and larger units, as well as l.t. types in both glass and celluloid containers.

South American Trade Possibilities.

The foreign representative of a New York radio corporation, who has recently returned from a tour in South America, reports, according to the "Manchester Guardian" that there is a great demand for radio receivers in most of the South American republics, but only the best quality sets are wanted. A quarter of a million sets are in use in the Argentine, 40 000 to 50 000 in Chile, 60 000 in Brazil, and 12 000 licences for sets have been taken out in Peru, but it is calculated that as many more unlicensed sets are in use. In Uruguay there are 10 000 to 15 000 wireless receivers, and in Ecuador about 5 000.

Wireless News in Brief.

The Eastern Telegraph Co. has entered into an agreement with the Marconi Co. for the erection of a wireless station in Greece.

An exhibition under the auspices of the Irish Association of Radio Traders was opened on November 1st, at the Mansion House, Dublin.

A Decree has been issued reducing the amount of the tax on wireless receiving sets in Denmark to 5 kroner on a crystal set and 7.50 kroner on a valve set or set in which valves are used as amplifiers. The taxes were formerly 10 kroner and 15 kroner, respectively.

Festiniog T.C. has passed a resolution to support the application of the Wrexham Wireless Society for a national broadcasting station for Wales.

From its Commercial Secretary at Tokyo the Department of Overseas Trade learns that the three independent broadcasting associations hitherto existing at Tokyo, Osaka, and Nagoya have been merged in the Shadan Hojin Nihon Hoso Kyokai (Incorporated Japan Broadcasting Association).

"La T.S.F. Moderne" reports that a test was made in the National Bank of Arkansas, with a super-heterodyne receiver and a small frame aerial in a ferro-concrete vault, whose walls were completely lined with steel plates. In spite of this, reception of waves ranging between 150 and 250 m. length was possible. With this set, Chicago's transmission could be picked up at a distance of 1 200 km.

The Lead Market.

In their lead report dated October 30th, James Forster and Co. state that there is little fresh to report. Demand is still very quiet, and this applies to every section of the lead-consuming trade. On the other hand, supplies are plentiful and likely to remain so for some weeks to come.

While improved consumption is not expected under present conditions, it is quite probable that supplies in this country will tend to increase by the addition of surplus American and Mexican lead not required on the Continent, so that the prospect is for lower prices before any permanent recovery takes place.

Closing prices on October 29th were £30 6s. 3d. for October and £30 3s. 9d. for January, a fall on the week of about 7s. 6d. a ton.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

An electric train service from Leghorn to Spezia (Italy) was opened for traffic last Friday.

In spite of the difficulties connected with the coal stoppage, 35 new cars have been constructed and placed in service at Liverpool recently.

A trackless trolley vehicle service is to supersede four route miles of the present tramway track in Doncaster. The cost of the conversion is estimated at £47 000.

Blackpool Tramways Committee has accepted a quotation for the supply of 230 new destination indicator screens, and a similar number of side screens, for the tramcars.

Richmond T.C. has passed a resolution asking that the Bill of the District Railway Co. to extend the Piccadilly Tube to Ealing should include provision for a direct service to Richmond.

Tramcars running from the St. Germains district into Paris are now used in the earlier hours of the morning for bringing into the city fruit and vegetables grown in the St. Germain district.

The 200 Hull Corporation tramwaymen, displaced by volunteers during the general strike, have now been reinstated. The work is to be pooled, and the men given five days' employment per week.

The resources of the Nottingham Tramways Department are being taxed to cope with the growing traffic to Sherwood and Arnold. Twenty new top-covered cars have been ordered, and about six have been delivered.

Bath Surveying Committee has decided to support the Bath Electric Tramways, Ltd., in its application to the Ministry of Transport for authority to continue the present tramway fares for another 12 months.

Blackpool T.C. has authorised the construction of a double line of tramways in Talbot Road, form Talbot Square to Swainson Street, in place of the existing single track. An amendment to refer back the proposal was defeated by a large majority.

A new type of electric tramcar, built in the Tramways Department's works, was put into service last Friday by Rotherham Corporation. It is cushion seated, both on the upper and lower decks, has two 45 H.P. motors and can travel 25 miles an hour.

Cardiff Parliamentary Committee has decided in favour of applying for a provisional order to authorise three extensions of the tramways, to Gabalfa Church, to Llandaff Fields and to the Docks, respectively. Other extensions will be included in the next Corporation Bill.

Metal and Chemical Prices.

TUESDAY, November 2nd.

		Price.	Inc.	Dec.
***Copper*—**				
Best Selected	per ton	£65 0 0	—	—
Electro Wirebars	,,	£67 0 0	—	—
H.C. Wire, basis	per lb.	9⅝d.	—	—
Sheet	,,	9⅞d.	—	—
***Phosphor Bronze*—**				
Wire (Telephone) basis	per lb.	1s. 0⅛d.	—	—
***Brass* 60/40—**				
Rod, basis	per lb.	7¼d.	—	—
Sheet, basis	,,	10¼d.	—	—
Wire, basis	,,	10¼d.	—	—
***Pig Iron*—**				
Cleveland Warrants	per ton	£6 5 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 0 0	—	—
***Lead Pig*—**				
English	,,	£30 15 0	—	£1 0 0
Foreign or Colonial	,,	£29 5 0	—	£1 5 0
***Tin*—**				
Ingot	,,	£294 0 0	—	£16 15 0
Wire, basis	per lb.	3s. 8½d.	—	2½d.
Aluminium Ingots	per ton	£112 0 0	—	—
Spelter	,,	£33 12 6	—	10s. 0d.
Mercury	per bottle	£17 0 0	5s. 0d.	—

Sulphur (Flowers)—Ton £11 10 0 ***Sodium Chlorate***—Per lb. 2½d.
,, (Roll-Brimstone)—,, £10 5 0 ***Sulphuric Acid*** (Pyrites, 168°) per ton, £6 15 0
Copper Sulphate— ,, £25 to £25 10s.
Boric Acid (Crystals) ,, £37 ***Sodium Bichromate***—Per lb. 3½d.
Rubber—Para fine, 1s. 7½d.; plantation 1st latex, 1s. 7d. to 1s. 7½d.

The metal prices are supplied by British Insulated Cables Ltd.

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COMPANY NEWS.

Big Hydro-Electric Enterprise in Mexico—City of London Co.'s New Issue—Arrangement Between Burndept Wireless and Johnson & Phillips.

THE market for electrical shares—supply, transportation and equipment—is quiet, and changes in price quotations are irregular. Marconis have lost 1s. 3d. of last week's rise, and Eastern Extension and Western Telegraph shares show a slight recovery. A feature has been some demand for Siemens shares, which have gained 1s. 3d. G.E.C.'s are 6d. up. Metropolitan-Vickers shares are 1s. 3d. lower, as also are British Insulated Cables. Telegraph Construction £12 shares have eased off a point, and are below 30. British Electric Traction ordinary stocks at 143½ is 3 points higher, and London Electric Railway ordinary stock has risen 2 to 52½. London United Tram debenture stock at 40½ is 1 down. The only change in lighting issues is a rise of 1s. 3d. in County of London shares.

Last Annl. Divd %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
	Electricity Supply.				
10	Brompton & Kensington Ord. ..	31/3	31/3	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	90	90	100	67
15	Charing Cross Elec. Ord. (£1) ..	47/6	47/6	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	49/4½	49/4½	52/6	20/3
6	,, ,, 6% C.P. ..	23/-	23/-	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	62/6	61/3	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	17	17	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	36/6	36/6	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	40/7½	40/7½	41/6	8/-
4½	,, ,, 4½% C.P. ..	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6*	22/6	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord. (£5) ..	18½	18½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	41/3	41/3	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
6	,, ,, 6% C.P. ..	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	143½	140½	123	24
6	,, ,, 6% Pf. Stk. ..	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69	69	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	77½*	78½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	52½	50½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	76½	76½	89	65
4	Lon. Un. Trams. 1st Deb. ..	40½	41½	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	65½	65½	101½	49
5	,, ,, 5% Deb. ..	66½	66½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	60	60	84½	19
3½	,, 3½ Pf. Stk.	63½	63½	88½	40½
3½	,, 3½% Deb.	69½	69½	92½	51
3½	Met. Dis. Ord. Rly. Stk. ..	54	54	58	12½
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb. ..	68	68	73½	48½
¶5	Yorks. (W.R.) Trams. Ord. ..	11/6	11/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	68/9	70/-	62/-	26/6
6	,, ,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	22/6	22/6	23/4	19/7
7	,, ,, ,, 7% Deb.	103½*	106½	107½	92
10	Brush Electrical Ord.	26/3	26/3	29/-	10/-
‡15	Callender's Cable Ord.	65/-*	66/3	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref.	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)	12/9	12/9	28/9½	1/1
7½	,, ,, 1st Pref. ..	22/6	22/6	26/-	5/-
10	Elec. Construction Ord. ..	31/10½	31/10½	30/4	6/7
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	14/-	14/-	29/3	7/3
6	,, ,, 6% C.P. ..	17/6	17/6	21/3	10/6
—	Ericsson Telephones 7% Pref.	21/10½	21/10½	21/-	12/7
6	Ferranti 6% Pref.	18/9	18/9	18/6	16/9
7	,, 7% 2nd Pref. ..	18/-	18/-	19/-	13/9
7½	General Elec. Ord.	29/-	28/6	59/-	13/6
20	W. T. Henley's Ord.	80/-	80/-	86/6	23/3
17½	Johnson & Phillips Ord. ..	63/9	63/9	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	23/9	23/9	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	46/3	47/6	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	28/9	27/6	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	29½	30½	56/2/6	19
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	74½	74½	87½	60
10	Eastern Ord. Stk.	179½	180	213½	113/2/6
3½	,, 3½% Pref. Stk. ..	66½	66½	84/17/6	49
4	,, 4% Deb.	78½*	79½	103½	60
10	Eastern Extension Ord. (£10) ..	18	17½	21½	10/12/6
4	,, ,, 4% Deb. ..	78½	78½	97½	60
22	Gt. Northern Telegraph (£10) ..	27	27	42/12/6	19
‖10	Indo-European (£25)	47½*	47½	59½	25
—	Marconi's Wireless T. Ord. ..	16/3	17/6	9/16/3	20/9
7½	,, Int. Mar.	22/6*	22/6	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	17½	17	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	78½	78½	10	60/2/6

* Ex dividend.
‡ Plus share bonus. ¶ Plus 3 p.c. in respect of 1921. ‖ Including bonus.

ASSOCIATED FIRE ALARMS, LTD.—Pft. for year ended June, 1926, £3 757, less £752 reserved for income tax, plus £2 056 brt. in. Placed to res., £1 000; div. 6 p.c., less tax; fwd., £1 318.

BROMPTON AND KENSINGTON ELECTRICITY SUPPLY CO., LTD.—The directors propose to capitalise £60 000 of reserves, which will allow of the issue to shareholders of one new share for every five shares held.

ANGLO-PORTUGUESE TELEPHONE CO., LTD.—Applications have been invited during the present week for an issue of £300 000 7 per cent. 1st deb. stk., at par. The issue was underwritten by the Second Consolidated Trust, Ltd.

MEXICAN LIGHT AND POWER CO.—It is reported that this company has entered into a contract with the Mexican Government for the largest flood prevention, irrigation and hydro-electric enterprises ever undertaken in Mexico. The company expects to expend about £1 500 000 on the dam and hydro-electric plant.

A. J. STEVENS AND CO. (1914), LTD.—Net pft. for year ended August 31st, 1926, £44 891, against £42 117; to res. £10 000, against £15 000. Div. 12½ p.c., the same rate as last year, although paid-up capital has increased from £307 416 to £494 916. Fwd. £28 136, against £26 523. Pft. on wireless sets continues to expand.

CITY OF LONDON ELECTRIC LIGHTING CO., LTD.—The directors have created £600 000 5 p.c. consolidated deb. stk., ranking as a floating charge after the two existing issues. It is proposed to reserve £380 000 for offer to holders of the 4½ p.c. second debs. The remaining £220 000 is to provide for capital expenditure and has been sold at 98 to the Electric and General Investment Co.

EVER READY CO. (GREAT BRITAIN), LTD.—Intm. div. for half-year ended September 30th, 1926, at rate of 10 p.c. per annum on pref. shs., 10 p.c., actual, on ord. shs., both payable on November 30th, 1926.—The directors propose to increase the capital of company by the offer of ord. shs. to the pref. and ord. shareholders in proportion to their holdings on advantageous terms. Particulars will be posted on November 18th.

SOCIETE INTERNATIONALE D'ENERGIE HYDRO-ELECTRIQUE.—The div. for the financial year 1925-26 will be paid at the following rates against presentation of coupons No. 3 :—Coupons from pref. shs. at 35·25 francs (equal to 7·05 belgas); coupons from ord. shs. at 35·25 francs (equal to 7·05 belgas); coupons from Founders' shs. of 110·45 francs (equal to 22·09 belgas). Coupons may be presented at the offices of Baring Brothers and Co., 8, Bishopsgate, E.C.2, and Messrs. J. Henry Schroder and Co., 145, Leadenhall Street, E.C.3, London.

LISBON ELECTRIC TRAMWAYS, LTD.—Net pft. for year ended December 31st, 1925, £166 624, after deducting interest and amortisation due on debs. of Companhia Carris de Ferro de Lisboa and payment of £24 615 in. on and redemption of debs. of this company. To this pft. is added credit blce. £9 631 brt. fwd. Transferred to res. £50 000, leaving blce. £126 255, out of which the pref. div. for year was set aside, with the further sum of £76 600 on account of the pref. div. arrears, also £5 000 had been placed to staff benefit fund and £10 000 to exchange res.; fwd. £9 122. Div. for year on 6 p.c. cum. pref. shs. paid January 1st, 1926, and further div. on account of arrears on those shs., absorbing £76 560, paid on July 19th, 1926.

BURNDEPT WIRELESS, LTD.—In a circular to the shareholders, the directors announce that an arrangement has been concluded by which Johnson and Phillips, Ltd., will become closely associated with the conduct of the company's business, and will provide the necessary finance for the company's trading operations. The arrangement will obviate the necessity of calling upon the shareholders to provide further finance for the company. Johnson and Phillips, Ltd., have agreed to lend the company £50 000 at 8 per cent., and will acquire an option at par for five years on the unissued £114 993 preferred ordinary capital of the company, and nominate three directors to the board. A confirmatory meeting of the company will be held on November 10th.

INTERNATIONAL LIGHT AND POWER CO., LTD.—Income for year to June 30th, 1926, £81 908, against £73 399. Deducting £42 282 for deb. service note interest and administration expenses, adding £14 382 brt. fwd. and providing £2 500 for

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res. for contingencies, £4 813 for discount on debs. and £17 906 for pref. div. for 12 months to June 30th, 1926, left £28 789 to be carried fwd. Mexican, Argentine and Brazilian subsidiaries have shown a satisfactory growth of business, consumers increased in Mérida from 5 940 to 6 544, in Paraná from 4 098 to 4 433, in Curityba from 5 979 to 6 312, and on the Paraná tramway system passengers increased from 2 016 888 to 2 210 558. In Caracas the number of consumers decreased from 11 852 to 9 921, due to the activities of the competing local company. The transference of consumers to the competitor's distribution system is gradually diminishing.

MARCONI INTERNATIONAL MARINE COMMUNICATION CO., LTD.—It has been decided to pay an interim dividend of 3¾ per cent., equal to 9d. p.sh., less tax, on the shares numbered 1 to 1 192 726, on account of the year ending December 31st, 1926. The directors announce that the company and its principal competitor, the Radio Communication Co., Ltd., have recently come to a working arrangement which should enable each company to effect substantial reductions in expenditure and to improve the general service given to shipowners. This arrangement in no way interferes with the separate entity of the two companies. Each company will continue to develop and supply its respective types of marine equipment and to maintain a healthy spirit of competition. The directors are satisfied that this arrangement will prove to be in the best interests of both the marine wireless companies and their shipowner clients.

BRUSH ELECTRICAL ENGINEERING CO., LTD.—A meeting of the shareholders will be held on November 8th, to consider the directors' scheme for co-partnership between the shareholders and employees. It is proposed that the co-partnership scheme shall embrace all employees over eighteen years of age and of one year's service with the company. It provides for sharing between the shareholders and the employees any surplus there may be on revenue account after paying 10 per cent. dividend on the ordinary shares and providing for depreciation and other charges at agreed rates. The surplus of £8 751 from 1925 will be placed to the co-partnership fund, and the proportion due to employees will be applied to the purchase of ordinary shares at par, which will be distributed in the three classes of employees. Each employee has the option of taking his proportion of the surplus either in cash or in fully-paid ordinary shares at par.

Company Meetings.

STOTHERT AND PITT, LTD.—Sir Percy Stothert presiding at the meeting last week, announced that the company, after a period of depression, had secured a contract for 36 electric cranes for the Port of Santos, Brazil. Hitherto the port had been equipped with German cranes. The company has also obtained important contracts from Calcutta and Karachi, and has now orders sufficient to keep over 1 000 men in full work for 12 months. But for the coal strike the works would have been in full swing.

AMALGAMATED WIRELESS (AUSTRALASIA), LTD.—The report, submitted at the annual meeting on Friday last, shows a net profit of £12 190 for the year ended June last, against £5 030. Assets have increased by £76 000 to a total of £149 000, due to the transfer of the coastal stations from the Government to the company at cost. The company already operates services to ships, also to New Guinea and New Caledonia, and manufactures wireless apparatus, including that required for broadcasting stations. The directors are confident of the immediate success of the direct services by the beam system to England and Canada.

ASSOCIATED FIRE ALARMS, LTD.—Mr. Gordon H. Brown, presiding at the meeting last week, said they maintained their dividend at 6 per cent., and were able to place enough to reserve to bring the total of the account up to £20 000, equal to one-third of the authorised capital, or 35 per cent. of the issued capital. On the whole, their financial position was thoroughly sound and satisfactory. He was able to tell the shareholders last year that, as a result of negotiations then in progress, he was hopeful that adequate insurance facilities at a rate considerably below tariff would soon be at the service of the subscribers. That hope was realised soon after the date of the meeting, and arrangements were made for the cover, even of the largest risks, at Lloyd's at a rebate of 25 per cent. off the ordinary rates charged by Lloyd's underwriters. To-day he was happy to announce that this rebate had been increased to 30 per cent.

MONTE VIDEO TELEPHONE CO., LTD.—At last week's meeting the chairman (Viscount St. Davids) moved the adoption of the report and accounts and approval of the dividend of 5 per cent., tax free, making with the interim dividend of 3 per cent., less tax, 8 per cent. for the year. The chairman also said that latterly their position had been improving, and they had been able to increase the dividends. Their plant was old-fashioned, but it could only be improved by their obtaining a new concession to enable them to instal up-to-date plant. He had never known any company that had a stronger representation than they had in Monte Video, and, in his judgment, there was quite a fair chance that they might arrange for a new concession. Even if they did not get a new concession, he was of opinion that they could carry on, that their capital was more than safe, and that substantial dividends could be paid in the future. The report and accounts were adopted and the dividend was approved.

ARGENTINE LIGHT AND POWER CO., LTD.—Sir George A. Touche, presiding at the meeting last Friday, said the economic and financial conditions in Argentina during the past year were favourable, though the volume of business was restricted. The Cordoba Tramways again had record figures in both gross and net receipts. They need have no alarm about the competition of omnibuses in either Cordoba or Santo Fé at present. The gross receipts of the combined businesses in Cordoba and Santa Fé were £573 724, the expenses £272 623, and the net receipts £301 101. These figures were before allowing for depreciation, loss on exchange, and certain other charges. During the first five months of the current financial year the results showed a further satisfactory advance. After making provision for wear and tear and providing £9 317 for loss on exchange, the revenue from these companies and other sources totalled £215 076. The balance left, after various transfers, was £44 135, out of which they proposed to apply £29 606 to the payment of a dividend at the rate of 4 per cent. (subject to tax) on the ordinary shares for the year to March 31st last, leaving £14 528 to be carried forward. The report and accounts were adopted and the dividend was approved.

DRAKE AND GORHAM, LTD.—Mr. B. M. Drake, presiding at the meeting last week, said the reorganisation had led to better results. The profit of £8 920 for the past year showed an increase of £6 017. The gross profit improved by £2 596, and a reduction in standing charges of £3 421 had been effected. They were continuing their endeavours to promote a combined service of gas and electricity by which they were convinced that the greatest economy would result, especially in provincial towns, and they were assisting gas companies to obtain Special Orders in districts not already covered. Although domestic electric requirements, including lighting, power, heating, cooking, pumping, water supply and water softening, still represented a considerable proportion of their turnover, they were constantly engaged in large industrial contracts both in equipping mills and works with motors to utilise electrical energy obtained from the mains, and also in providing modern generating plant which, with a good load factor, would produce electricity at a lower figure than was charged by most of the supply companies. After giving a list of numerous works and private residences in which the company was installing or extending electric light and power equipment, the chairman added that their wireless department had carried out contracts for 80 hospitals.

New Companies.

STRETLINE CONDENSER, LTD.—Cap., £500. Manufacturers of wireless apparatus, etc. Reg. office: 77, Fleet Street, Birmingham.

PREMIER ELECTRIC CO. (STOCKPORT), LTD.—Cap., £100. Electricians, wireless engineers and factors, electrical and mechanical engineers, etc. Reg. office: 135, Castle Street, Edgeley, Stockport.

PHILIP HENRY AND CO., LTD.—Cap., £100. To acquire business of manufacturer, factor and retailer of electrical and wireless supplies carried on by V. A. Walker at 20, Stafford Street, Birmingham.

RHEOSTORS, LTD.—Cap., £100. Manufacturers and assemblers of and dealers in microstat filament resistances, wireless and electrical apparatus and component parts, etc. Reg. office: 7, Waterloo Street, Birmingham.

TELEPHONE BERLINER (LONDON), LTD.—Cap., £1 000. Manufacturers of and dealers in wireless apparatus, accessories and component parts, electrical appliances, etc. Reg. office: 34-5, High Holborn, London, W.C.2.

INCORPORATED RADIO SOCIETY OF GREAT BRITAIN.—Registered as a company limited by guarantee and not having a share capital. The word "Limited" is omitted from the title by licence of the Board of Trade. The objects are to take over such of the property, rights and obligations of the existing Radio Society of Great Britain as may be lawfully acquired to promote the general advancement of the science and practice of radio communication, etc. Reg. office: 53, Victoria Street, Westminster, S.W.1.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BOLTON BATTERY SERVICE, Princess Street, Bolton, electrical engineers. £17 12s. 8d. September 29th.

COLLINS, James A., 9, Saxon Street, Abington Park, Northampton, electrical engineer. £14 5s. 7d. September 16th.

ELECTRICAL MAINTENANCE AND ENGINEERING CO., 8, St. Martin's Court, Newgate Street, Newcastle-on-Tyne. £10 5s. 6d. September 30th.

ELLIS AND SON (1923), LTD., 6, Panyer Alley, Paternoster Row, E.C., electrical engineers. £14 17s. 4d. September 10th.

JENSON, Oscar, 38, Carnaby Street, Regent Street, electrical engineers. £22 1s. 3d. September 22nd.

PREMIER DRY BATTERY CO., 17, Riches Road, South Tottenham, battery makers. £11 11s. 6d. September 21st.

SMITH, Harold L., 10, Ordell Road, Bow, E., electrical engineer. £19 3s. 2d. September 17th.

WALKER, L. AND CO., St. Mark's Street, Wakefield, electrical engineers. £15 16s. 4d. October 1st.

WALLIS, H. O. AND CO., Newdigate Street, Nottingham, electrical dealers. £22 11s. 4d. September 10th.

Deed of Arrangement.

BRABY, John Benzie, 87, Maybury Road, Woking, electrician. Filed November 1. Trustee, W. A. J. Osborne, Balfour House, Finsbury Pavement, E.C., accountant. Liabilities, unsecured, £330; assets, less secured claims, £80.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

GOOD BROS., LTD., electrical engineers, 35, South John Street, Liverpool. The voluntary liquidation of this company has been confirmed by the statutory meeting of creditors, at which the liquidator submitted a statement of affairs showing liabilities of £328, of which £243 is due to the trade and £85 to cash creditors. The assets are estimated to realise £50, less £16 for preferential claims, leaving net assets of £34, or a deficiency of £294. The company was registered in May, 1922, with a nominal capital of £3 000, for the purpose of taking over an existing business. The company has been chiefly engaged in the manufacture of patent lamp shades, and a considerable sum was spent in advertising and experimenting, practically the whole of the capital being absorbed.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Companies Winding-up Voluntarily.

SELLING WIRELESS, LTD.—J. A. Couper, 17, East Parade, Leeds, chartered accountant, appointed liquidator, October 14th.

STRATHPEFFER AND DINGWALL ELECTRIC CO., LTD.—C. G. Macdowall, Chartered Accountant, Dingwall, appointed liquidator. Meeting of creditors at the liquidator's office, 4, Tulloch Street, Dingwall, on Wednesday, Novemver 10th, at 12 noon. All creditors have been or will be paid in full.

Bankruptcy Information.

SELLERS, Reginald Victor Greening, wireless engineer, Town Hall Buildings, Banbury, trading as the WIRELESS SUPPLIES AND INSTALLATIONS. First meeting, November 11th, 12 noon, 37, Cornmarket Street, Oxford. Public examination, November 12th, 3 p.m., Town Hall, Banbury.

Notice of Dividend.

SQUIRE, William Robert, 11, Steward Street, Spring Hill, Birmingham, electrical engineer. Supplemental dividend, 10s. 4d. per £, payable November 8th, Official Receiver's office, 191, Corporation Street, Birmingham.

Notice of Intended Dividend.

COXON, William Keeling (separate estate), trading with Edward Weare under the style of Western Manufacturing Co., Nurshill, Lydney, wireless apparatus manufacturer. Last day for receiving proofs, November 15th. Trustee, C. Latham, 78, New Oxford Street, London, W.C.1.

Bankruptcy Proceedings.

FULLER'S UNITED ELECTRIC WORKS, LTD., Woodland Works, Chadwell Heath, Essex. In this compulsory liquidation the Official Receiver has now issued a summary of the company's statement of affairs, showing liabilities £603 049, of which £363 248 are treated by the officers of the company as expected to rank. The assets are estimated to realise a gross amount of £236 256, but after payment of the preferential claims which amount to £3 560 and of the prior lien debenture stock which totals £61 950, there is only a sum of £170 746 available to meet other debenture claims amounting to £391 869. There are accordingly no assets available to meet the claims of the 1 366 unsecured creditors which amount to £136 725. With reference to the shareholders there is a total deficiency disclosed of £498 094. The company was registered as a public company on March 13th, 1919, to take over as a going concern the businesses of electrical and general engineers, carried on at Woodland Works, Chadwell Heath, Essex, by four companies known as The Fuller Accumulator Co., Ltd., John C. Fuller and Son, Ltd., Fuller's Wire and Cable Co., Ltd., and Fuller's Carbon and Electrical Co., Ltd. The business was originally established in 1875 by John C. Fuller, who was one of the pioneers in the invention and manufacture of electrical batteries, and it is stated that the four undertakings above mentioned were successful from their incorporation. The businesses included the manufacture of acccumulators, cables, batteries, ebonite and carbon black, and there were depots and branches in various places in t his country and abroad.

The company's trading for the first year showed a profit of £48 045 15s. 5d., and a dividend of 10 per cent. per annum was paid on both preference and ordinary shares. The results for the following three years to January 31st, 1923, however, were unsatisfactory and a loss of about £283 000 was shown for this period.

The capital, originally £500 000, was reduced in 1921 and again at the end of 1922. In 1923 there was a scheme of arrangement, and the present issued and paid up share capital is shown in the statement of affairs at £134 845 6s., consisting of 197 046 ordinary shares of 1s. each (of which 150 000 were issued as fully paid to the vendors, 45 539 issued as fully paid as a bonus under the scheme of arrangement, and 1 507 issued for cash and paid for), and 249 986 preference shares of ten shillings each, of which 50 000 were issued as fully paid to the vendors, and 199 986 were issued for cash and paid for in 1919 (the original 200 000 issue less 14 shares forfeited).

The trading results after the reconstruction for a time improved, and for the 14 months to March 31st, 1924, there was a profit of £19 109, and for the 12 months to March 31st, 1925, of £31 027; in each case before, however, charging depreciation and the first mortgage debenture stock interest. No accounts were issued for the year to March 31st, 1926, and the results for this period show a loss of approximately £100 000. On April 29th, 1926, Sir John Mann, K.B.E., of 8, Frederick's Place, Old Jewry, E.C., was appointed by the bank as receiver, in consequence of the non-payment by the company of the sum of £71 010 then owing to the bank on the working account (with interest thereon amounting to £2 370), payment of which had been demanded, owing, it is understood, to certain executions levied at the company's works, and he then entered into possession of the assets. On May 4th, 1926, the Court appointed Sir John Mann receiver and manager on behalf of the bank as holders of the prior lien debenture and of holders of the first mortgage debenture stock.

The directors estimate the assets (consisting of freehold land, buildings, machinery, stock and book debts) to realise approximately £236 256. The business is being carried on by the receiver and manager with the view of selling it as a going concern, either as a whole or in separate departments, and it appears that certain negotiations are now pending which, if successful, should result in the payment in full of the prior lien debenture, and a distribution to the first mortgage debenture stock holders, but it is doubtful if sufficient will be realised to pay them in full. In these circumstances it appears that any return to the income debenture stock holders, amounting to £187 758, is very remote, and consequently there is no prospect of a dividend for the unsecured creditors or of any return of capital to the shareholders. The receiver and manager states that it is impossible to say what profit or loss is being made under his trading without taking stock, but it appears that he has utilised and turned into sales the work in progress at the date of his appointment (valued on a cost basis at about £15 000), which would otherwise probably have realised very little more than scrap value.

PEGRUM, Abraham William, trading under the style of ECONOMIA, 258, High Holborn, London, W.C. This debtor, who has carried on business as an electrical contractor and decorator, attended in the London Bankruptcy Court, on Wednesday, for his public examination. His liabilities are returned at £4 511, of which £4 273 are expected to rank, and no net assets are disclosed. It appeared that in March, 1923, the debtor and others formed a limited company with the object of manufacturing and selling a patent electric grill. It used his premises, and he was appointed a director, but only received two months' remuneration of £41 a month. The company was, however, not a success. The debtor attributed his failure to bad trade, heavy overhead charges, and loss in connection with an agency. The examination was concluded.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

244 841 IGRANIC ELECTRIC CO., LTD., and W. K. ALFORD. Means for inductively coupling electric circuits. (26/9/24.)
244 850 IGRANIC ELECTRIC CO., LTD. (CUTLER-HAMMER MANUFACTURING CO.). Controllers for electric motors. (2/10/24.)
244 851 J. H. GATH. Means for locking and unlocking electric switch plugs. (4/10/24.) (Addition to 175 794.)
244 854 W. OSTERMAYER. Control devices for electric illuminating signs. (9/10/24.)
244 858 E. A. GRAHAM. Electrical transforming devices and associated telephonic receivers. /15/10/24.)
244 862 T. C. ANGUS. Small electric arc lamps. (17/10/24.)
244 864 W. R. BULLIMORE. Method of and means for supporting electrodes in thermionic valves and the like. (17/10/24.)
244 866 G. B. ELLIS (T. E. MURRAY). Electric welding and the like. (20/10/24.)
244 867 W. J. PATTISON, A. J. HOLYOAK, and W. L. TURNER. Manufacture of thermionic valves. (21/10/24.)
244 868 BRITISH THOMSON-HOUSTON CO., LTD., A. P. YOUNG, and J. H. BUTCHER. Loud-speaking telephones and like sound emitting and converting apparatus. (21/10/24.)
244 871 IGRANIC ELECTRIC CO., LTD., and C. F. TUBBS. Contact drums for electric controllers. (24/10/24.)
244 874 SIEMENS AND HALSKE AKT.-GES., and M. LANGER. Circuit arrangement for transmitting current impulses in automatic telephone exchanges. (28/10/24.)
244 878 BRITISH THOMSON-HOUSTON CO., LTD., H. C. HEATH, and H. E. COX. Insulator bushings for switchgear and other electrical apparatus. (4/11/24).
244 879 E. W. HOVENDEN. Variable inductance devices. (5/11/24.)

Applications for Patents.

October 4th.

24 544 T. G. BYSH and C. G. COLLINS. Slow-motion dial for variable electric condensers.
24 528 R. KAHN. Electric lighters for cigars, etc.
24 529 J. OBERMAIER. Electric luminous advertising apparatus.
24 494 P. D. QUAIFE. Earthing-switches for wireless, etc.
24 542 A. S. F. ROBINSON. Means for remote control of wireless apparatus.
24 555 SIEMENS-SCHUCKERTWERKE GES. Manufacture of electric cables. (5/10/25 Germany.)

October 5th.

24 668 BRITISH THOMSON-HOUSTON CO., LTD., E. G. PARROTT and J. H. POLLARD Distributors for magneto-electric machines.
24 708 and 24 711, G. R. BROWN. Apparatus for electric-current distribution.
24 709 G. R. BROWN. Electric plug and socket couplings
24 710 G. R. BROWN. Electric switches.
24 712 G. R. BROWN. Electrical fuse blocks.
24 713 G. R. BROWN. Bracket couplings for electric lighting apparatus.
24 691 T. J. DIGBY. Electric lamp fittings for signs, etc.
24 640 J. D. DUNTHORNE and W. J. RICKETS. Electric switch mechanism.
24 656 ENGLISH ELECTRIC CO., LTD., and E. H. H. HASSLER. Brush-holders for dynamo-electric machines.
24 744 A. ESAU. Radiation of electrical energy. (7/10/25, Germany.)
24 648 R. L. HOWARD-FLANDERS. Wireless receiving apparatus.
24 717 E. GELES. Wireless receiving apparatus. (5/10/25, Roumania.)
24 666 H. L. GRANT. Protecting-device for electric detonators. (19/10/25, U.S.)
24 698 J. H. HEWITT and WILKINS AND WRIGHT, LTD. Variable electric condensers.
24 649 C. C. HOWELL. Electric safety gates for railway crossings.
24 693 H. KUCHENMEISTER. Telephone apparatus. (13/10/25, Germany.)
24 726 W. H. LE BRETON. Variable electric condensers.
24 720 W. G. NAGEL ELECTRIC CO. Electrical indicating instruments, etc. (7/10/25, U.S.)
24 671 MAJOR SMITH AND STEVENS, LTD., and P. H. STEVENS. Control of electric lifts.
24 674 STANDARD TELEPHONES AND CABLES, LTD. (WESTERN ELECTRIC CO.). Radio-transmission systems.
24 662 WIRED RADIO, INC. Piezo electric crystal control system. (24/10/25, U.S.)

October 6th.

24 767 J. E. ALLAN. Manufacture of electric cables.
24 805 A. MASSEY-ALLEN and R. B. NORTH. Magneto-electric machines.
24 773 C. A. DALLIMORE. Electric accumulators.
24 788 and 24 789 M. E. ELLIOTT. Inductance coils.
24 840 FELTEN U. GUILLEAUME CARLSWERK AKT.-GES. Copper conductors for electric power cables. (12/4/26, Germany.)
24 841 FELTEN U. GUILLEAUME CARLSWERK AKT.-GES. Cable for transmitting a wide frequency band. (31/5/26, Germany.)
24 759 A. HENDERSON. Electric light fitting.
24 856 J. JERIKE. Terminals for electric conductors. (6/10/25, Germany.)
24 827 TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE. Picture, etc., telegraphy. (7/10/25, Germany.)
24 790 H. J. WOOD. Wireless receiving circuits.

October 7th.

24 932 BRITISH THOMSON-HOUSTON CO., LTD. Electric arc welding. (7/10/25 U.S.)
24 960 G. CONSTANTINESCO, CONSTANTINESCO TORQUE CONVERTER, LTD., and J. SWINBURNE. Driving electric railway vehicles.
24 905 J. V. FOLL, E. S. HEURTLEY, F. H. MUIRHEAD, and MUIRHEAD AND CO., LTD. Valve amplifiers.
24 906 J. V. FOLL, E. S. HEURTLEY, and MUIRHEAD AND CO., LTD. Synchronous systems.
24 907 J. V. FOLL, E. S. HUERTLEY, MUIRHEAD AND CO., LTD., and E. S. MUIRHEAD. Electrical, etc., contact-making devices.
24 972 G. MAIRE. Automatic thermal circuit-breaker for electric circuit. (7/10/25, Switzerland.)
24 968 E. C. R. MARKS (AKTIESELSKAPET DE NORSK SALTVERKER). Electric irons.
24 969 E. C. R. MARKS (ARTIESELSKAPET DE NORSK SALTVERKER). Electric conductors.
24 966 SIR C. A. PARSONS and J. ROSEN. Dynamo-electric machines.
24 924 H. WADE (NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN) High-frequency amplification circuit arrangements.
24 925 H. WADE (NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN). Electric lamps.

October 8th.

25 033 H. W. ADEY and ALPHIAN WIRELESS, LTD. Thermionic-valve holder, etc.
25 072 C. BOWEN and A. W. SCOTT Electric massage appliances.
25 051 BRITISH THOMSON-HOUSTON CO., LTD. Electric furnaces. (10/10/25, U.S.)
25 096 CLAYTON WAGONS, LTD., and S. A. CURRIN. Electrical indicating devices for automobiles.
25 046 J. DIXON and ENGLISH ELECTRIC CO., LTD. Control of electrically driven winding engines, etc.
25 064 DUBILIER CONDENSER CO. (1925), LTD. Electrical condensers. (12 1 26, U.S.)
25 066 DUBILIER CONDENSER CO. (1925), LTD. Photo-electric modulator devices. (16/2/26, U.S.)
25 067 DUBILIER CONDENSER CO. (1925), LTD. Electrical condensers. (26 2 26, U.S.
25 111 C. S. FRANKLIN. Aerials, etc., for wireless telegraphy, etc.
25 097 A. C. FULLER. Radio-telephony.
25 090 LANDIS and GYR AKT.-GES. Electricity meters. (24/10/25, Switzerland.)
25 079 G. S. LANE. Circuit interrupter.
25 070 G. MESSIEN. Electrical earth plates. (25/11/25, France.)
25 059 J. B. TAUNTON. Electric switches.
25 060 J. B. TAUNTON. Joints in electric cables, etc.
25 078 O. WAWRA. Electric advertising devices. (3/8/26, Austria.)

October 9th.

25 189 I. M. E. AITKEN, D. A. GORDON and METROPOLITAN-VICKERS ELECTRICAL CO., LTD Electric signalling, etc., systems.
25 167 BRANDES LABORATORIES, INC. Electromagnetic sound-reproducers. (16/7/26, U.S.)
25 190 D. R. DAVIS and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Electrical switchgear.
25 188 T. D. EDWARDS. Electric switch and fuse.
25 129 ELECTRICAL APPLIANCES (BLACKPOOL), LTD., and R. T. WAITE. Electric switches.
25 154 C. B. JERRED and J. G. NEWEY. Electroplating apparatus.
25 191 BRITISH THOMSON-HOUSTON CO., LTD. Electric heating devices. (10 10 25, U.S.)
25 135 L. W. NEVILL. Electric fuses.

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Friday, November 5th (To-day).

INSTITUTION OF ELECTRICAL ENGINEERS (LONDON STUDENTS' SECTION).—Institution, Savoy Place, Victoria Embankment, London, W.C.2. Opening address by Mr. E. H. Shaughnessy on "The Rugby Radio Station." 6.15 *p.m.*

INSTITUTION OF FUEL ECONOMY ENGINEERS.—Royal Society of Arts, John Street, Adelphi, London. Lecture by Mr. R. Jackson on "Pulverised Fuel Firing for Steam Boilers." 6 *p.m.*

ELECTRICAL POWER ENGINEERS' ASSOCIATION (SOUTHERN DIVISION).—Institution of Electrical Engineers, Victoria Embankment, London. Lecture on "Televisory Remote Control Sub-Stations," by Mr. C. I. Shuttleworth. 7 *p.m.*

Saturday, November 6th.

PAISLEY ASSOCIATION OF ELECTRICAL ENGINEERS.—Visit to the British Broadcasting Co.'s station at Port Dundas.

ASSOCIATION OF MINING ELECTRICAL ENGINEERS (SOUTH WALES BRANCH).—South Wales Institute of Engineers, Park Place, Cardiff. General meeting. Paper by Mr. E. I. David on "Protection of A.C. Systems against Short Circuits." 6 *p.m.*

Sunday, November 7th.

THE GUILDHOUSE.—Eccleston Square, London. Address by Dr. W. H. Eccles, F.R.S., on "The Influence of Wireless on Modern Life." 3.30 *p.m.*

Monday, November 8th.

INSTITUTION OF ELECTRICAL ENGINEERS (WESTERN CENTRE).—Merchant Venturers' Technical College, Unity Street, Bristol. Ordinary general meeting. Chairman's inaugural address by Mr. W. G. Heath. 6 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS.—Savoy Place, Victoria Embankment, London. Informal meeting. Discussion on "The Economics of Lamp Choice." (Opened by Mr. D. J. Bolton.) 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (MERSEY AND NORTH WALES—LIVERPOOL—CENTRE).—Laboratories of Applied Electricity, The University, Liverpool. Paper by Mr. L. C. Grant on "High-Power Fusible Cut-outs." 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH-EASTERN CENTRE).—Armstrong College, Newcastle-on-Tyne. Papers by Mr. S. Mavor on "The Applications of Machinery at the Coal Face," Mr. L. Miller on "The Design of Storage Battery Locomotives for Use in Coal Mines," and Mr. R. Nelson on "Electricity in Mines—A Short Survey." 7 *p.m.*

Tuesday, November 9th.

ELECTRICAL CONTRACTORS' ASSOCIATION (LEICESTER BRANCH).—Corridor Chambers, Leicester. Ordinary meeting. 2.30 *p.m.*

HACKNEY ELECTRICITY DEPARTMENT.—Demonstration Halls, 18-24, Lower Clapton Road, London. Free popular talk on "History of the Underground Railway," by Mr. R. H. Bailey. 6.45 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (SCOTTISH CENTRE).—Royal Technical College, Glasgow. Chairman's address by Mr. W. L. Winning. 7.30 *p.m.*

Wednesday, November 10th.

UNIVERSITY OF LONDON.—Institution of Electrical Engineers, Victoria Embankment, London. Lecture V. on "Telephony," by Dr. J. A. Fleming. 5.30 *p.m.*

ELECTRICAL CONTRACTORS' ASSOCIATION (SHEFFIELD BRANCH).—Angel Hotel. Ordinary meeting. 5.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (SOUTH MIDLAND CENTRE).—University, Edmund Street, Birmingham. Paper by Mr. J. R. Beard and Mr. T. G. N. Haldane on "The Design of City Distribution Systems and the Problem of Standardisation." 7 *p.m.*

INSTITUTE OF WIRELESS TECHNOLOGY.—Engineers' Club, Coventry Street, London. Paper on "High-Speed Automatic Transmission," by Mr. A. H. A. C. Cranmer. 7 *p.m.*

ELECTRICAL TRADES' BENEVOLENT INSTITUTION.—Trocadero Restaurant, Piccadilly, London. Annual Festival. 7.30 *p.m.*

Thursday, November 11th.

ELECTRICAL CONTRACTORS' ASSOCIATION (NOTTINGHAM BRANCH).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION (EAST YORKS BRANCH).—Exchange Room, Metropole Hall, Hull. Ordinary meeting. 3.30 *p.m.*.

INSTITUTION OF ELECTRICAL ENGINEERS (DUNDEE SUB-CENTRE).—University College, Dundee. Paper by Prof. S. P. Smith on "An All-Electric House." 7.30 *p.m.*

Friday, November 12th.

UNIVERSITY OF LONDON.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Lecture VI by Dr. J. A. Fleming, F.R.S., on "Surges and Pressure Rises." 5.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (IRISH CENTRE—DUBLIN).—Physical Laboratory, Trinity College. Paper by Mr. R. Borlase Matthews on "Electro-Farming." 6.45 *p.m.*

BIRMINGHAM ELECTRIC CLUB.—Grand Hotel, Colmore Row. Lecture by Mr. A. C. Baker on "Electrical Tramways." 7 *p.m.*

MANCHESTER ASSOCIATION OF ENGINEERS.—Engineers' Club, Albert Square. Paper by Mr. J. Smith on "Steel Works Machinery." 7.15 *p.m.*

JUNIOR INSTITUTION OF ENGINEERS.—39, Victoria Street, Westminster. Annual general meeting. 7.30 *p.m.*

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THE ELECTRICIAN

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ELECTRICAL STATISTICS.

IN July, 1925, the Electricity Commissioners issued a volume in which were given financial and engineering statistics relating to the authorised undertakings of Great Britain for the period ending March 31st, 1923 (or May 15th, 1923) in the case of local authority undertakings, and December 31st, 1922, in the case of company undertakings. At the time it was announced that the Commissioners had under consideration the issue of corresponding statistics for the two years 1923–24 and 1924–25 and of thereafter publishing the return annually. As the first of these promised compilations was issued last week by the Stationery Office we take it that the very useful policy outlined in the previous sentence has been adopted. In general arrangement the volume under review is the same as its predecessor. It gives in a series of tables data relating to the system of supply, plant installed, maximum load, total connections, electricity generated and sold, population and electricity sold per head of population by the municipal and privately owned undertakings of the country. Full details as to the financial position of the undertakings are also set out. It, however, possesses the advantage over its predecessor that it has been possible to make a comparison between the position in March, 1925, and the position in March, 1923, and though some of the figures have been given before, set out concisely as they are in a general review at the beginning of the publication, they enable some useful lessons to be drawn.

In the first place we note that the number of undertakers who hold powers of supply had risen from 535 at the end of the first period to 563 at the end of the second; only 511 of these were, however, giving a supply. After making adjustments, the nature of which are explained in the report, it is found that there were 541 separate supply undertakings. Of these 301 generated for themselves, 121 used a bulk supply only and the remainder did partly one and partly the other. In other words, 420 undertakings, or 78 per cent. of the whole, relied either wholly or partly on local generation. The total capacity of plant installed in these stations was 3 723 514 kW, or 629 835 kW more than at the date of the previous return. This shows that the average increase of 300 000 kW per annum was maintained. On the other hand, an examination of the returns shows extraordinary differences in the size of stations. These ranged from Stuart Street, Manchester (106 750 kW) to Masham (15 kW). Forty-two stations had a capacity of 25 000 kW and over and accounted for 50·6 of the total plant installed. Over 200 stations had a capacity of less than 1 000 kW. It is no wonder then the Commissioners and those who think with them preach the value of concentration. This is also shown by the fact that there were only 87 sets in the country with an output of more than 10 000 kW, though this compares favourably with the 56 shown in the previous return. These units totalled 31 per cent. of the installed capacity. As regards a.c. plant 50 cycle equipment accounted for 77 per cent. of the total and 40 cycle and 25 cycle accounted for 85 per cent. of the remainder.

The total output was 6 022·2 million kilowatt hours, which, as has already been pointed out, shows an increase of about 16 per cent. per annum. It will be interesting to see whether and to what extent the present industrial crisis affects this rate. That it must have some effect is obvious from the fact that some 69 per cent. of the electricity sold is used for power purposes. It is also interesting to note that the domestic electric campaign has yet not made much difference in the relative positions of these two means of utilisation, though the absolute amount consumed for the latter purpose is, of course, steadily increasing. Nineteen undertakings, as compared with twelve in the previous return, had a consumption of over 300 kWh per head of population. On the other hand, 254, instead of 248, undertakings showed a consumption of less than 50 kWh. This is abundant proof that there is plenty of leeway to be made up. The total connected was 6 434 942 kW and 5 892 369 kW respectively in the two periods under review.

Turning to the financial statistics, some interesting results are evident. The loans raised at the end of 1924-25 by municipal undertakings amounted to £114 087 565, compared with £103 896 440 at the end of 1923-24. The respective net debts were £70 075 675 and £63 794 658. The former figure represents 61·4 per cent. of the loans raised. The capital raised in various ways by the companies increased from £50 959 398 to £57 901 028, about 40 per cent. of this being by way of loan. The capital expenditures at the end of 1924-25 were £125 312 527 in the case of municipalities and £68 707 131 in the cases of companies. Of the total amount 45·4 per cent. had been spent on generation and 54·6 per cent. on transmission and distribution. This works out at £52·1 per kW installed.

It is interesting to note that the net revenue per kilowatt hour sold fell from 1·87d. to 1·76d., and the revenue

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per £100 of capital expenditure has fallen from £24·6 in 1921-22 to £21·1 in 1924-25, whereas the ratio for each year between the total electricity sold to consumers and the total capital expenditure has shown a steady increase. The fact that the annual revenue has increased at a slower rate than the annual sales is ascribed to reductions in charges. Examining this question more closely it appears that the average revenue per kilowatt hour sold for lighting and domestic purposes was 4·2d, and for power 10·7d, so that the former constitutes a revenue of the same order as the latter, while between them they account for 91 per cent. of the revenue. The danger of relying too much on "bulk averages" is shown by the fact that in the case of lighting supply the averages range from 10d. to 3d., while in the case of power the limiting figures are 6d. and 1d. Again the working expenses per kilowatt hour sold are almost exactly 1d., a fact which, stated in its baldness, will cause the unitiated to wonder why in some places electricity is so expensive. These figures, it may be remarked, show a progressive reduction since 1921-22, in which reduction the cost of fuel has played a part. The influence during the present year will, we fear, be all the other way Over 50 per cent. of the total working expenses go in generation, which does not bear out the contention that a reduction in this item will have little effect on the total costs. The overall average cost of generation is 0·46d., compared with 0·48d. in the previous period, the average prices for coal being 20s. 8d. and 20s. 2d. respectively.

At the end of the period under review 41 392 staff and workmen were employed, an addition of about 5 000 over the previous period. This amounts to about 11 persons per 1 000 kW installed, which cannot be considered a low figure. The number employed on generation and distribution is about the same, amounting in each case to 42 per cent. of the total.

We have already remarked that the statistics confirm the wisdom of the policy of gradually concentrating the generating plant of the country in a few large stations. They also confirm the necessity of making every effort to bring the maximum prices for current somewhere nearer to the average.

Current Topics.

The Electricity Bill.

THIS week the Electricity Bill is passing through the report and third reading stages in the House of Commons, and the deliberations on it will, it is expected, be completed to-day. Unless it is blocked by some unforeseen obstacle in the House of Lords, it will probably pass into law before the end of the year. Presuming that it does not undergo any further radical change from its present form, it will emerge, except in one important particular, very little different from the first draft. And in Mr. GARCKE's words, it will then be the duty of all concerned to make the best of it. That to do this will require a great strain we do not believe. Putting it broadly, the Electricity Commissioners will now prepare the scheme and submit it to the new Central Board for adoption, with or without amendment, after which the Board will be responsible for carrying out the changes, which the measure will enact. Everything, therefore, depends on the Central Board, and consequently very largely upon the persons of whom the Board is made up. The electrical industry would do well to combine on this point and to insist that, at least unofficially, they shall have considerable say in the constitution of this body. This is more important than fighting over details. A number of amendments still remain to be pressed. Among these the most important is the proposal to postpone the standardisation of frequency. As we have said before, however, if this is to be done at all, it must be done now—or never.

Selling Powers Clause Inserted.

THE exigencies of our publishing time-table prevent us from doing more than comment on Tuesday's proceedings in the House of Commons. By far the most important event in the long-drawn-out debate on that day was the acceptance by a free vote of the House of a clause enabling municipal electrical authorities to sell electrical fittings. It will be remembered that an agreed clause on this subject was cut out during the proceedings in Committee. For the rest a large number of new clauses and amendments proposed by the Conservative opposition were dealt with and disposed of, the ATTORNEY-GENERAL taking up the attitude that they were intended to wreck the Bill, and Mr. DENNIS HERBERT, the spokesman for the other side, that they were intended to improve it. The official Conservatives, and the Labour and Liberal members, however, sided with the Government, in spite of the fact that Mr. HARDIE let the cat out of the bag by saying that the Opposition would like to see the Bill defeated, because in that case the next immediate step must be the nationalisation of the industry. Several valiant attempts were made to whittle down the Board's powers, or alternatively, those of the Commissioners, but the only change made was that the Board was forbidden to delegate its powers in respect of selected stations without the consent of the owners of such stations.

Imperial Standardisation.

AS mentioned in THE ELECTRICIAN a fortnight ago, the Imperial Conference now sitting in London appointed a sub-committee to deal with the important question of standardisation within the Empire, and that body has now issued an interesting and valuable report. The sub-committee is impressed, as all right thinking persons must be, with the advantages which would accrue to manufacturers and buyers alike, if the principles of standardisation, or, as they prefer to call it, simplification, were more generally employed. It is mentioned, for instance, that the value of the stocks of electric lamps outside factories in Great Britain are said to approach some £4 000 000 sterling, and it is believed that the ultimate effects of the unification of standard pressures would cut this sum down by one half. This particular branch of the subject received some attention during the discussion on Messrs. J. R. BEARD'S and T. C. N. HALDANE'S paper on "Distribution Systems" at the Institution of Electrical Engineers last week. Mr. C. P. SPARKS remarked that, from the point of view of the manufacturers, standardisation was vital and that we were emulating the ostrich in not recognising this, while Mr. PAGE added that pressure standardisation was a first step to system standardisation. On the other hand, both the sub-committee and the Institution of Electrical Engineers recognise this is a question, in dealing with which it would be wise to hasten slowly. One reason for this is that the risk of impeding technical progress must be avoided. At the same time, standardisation on the correct lines is making headway, and, its value being what it is, we are glad to see the sub-committee calling attention to the need for even greater co-operation between the various standardising bodies in the Empire than at present exists. Especially is it necessary that some provision should be made for the interchange of information, and the sub-committee suggests that steps should be taken to set up the necessary machinery for this purpose. We hope that energetic steps will be taken to carry out this proposal.

The British Engineering Industry.

THE British Engineers' Association have published a monograph dealing with the economic situation of the British engineering industry. This document, which is of the highest importance, has been prepared at the request of the Preparatory Committee of the Economic Conference of the League of Nations for submission to the Conference. It forms a review of the present-day problems and prospects of the engineering industry, and while

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it "nothing extenuates nor sets down aught in malice" it may be wondered whether it is altogether wise to lay it before such a body as the League of Nations. As a nation we are prone unduly to decry our efforts, and other nations in turn are prone to take this self-depreciation at its face value. It cannot be wondered therefore that there is a tendency to regard us as down and out. For the British reader, however, the report will be of the highest value, as not only indicating the present position of one of our basic industries but as showing how the conditions, in the opinion of those who are connected with it, can be improved. Although the position is better, exports in 1925 did not exceed 85 per cent. of those in 1913, while the imports have been increased by 25·3 per cent. The tonnage of machinery exported was 74·9 per cent. of that in 1913, while the imports were 70·2 per cent., the figure marking a steady increase from 1922 onwards. In the electrical branch, however, our exports were 26·3 per cent. more than in 1913. The causes of the present state of things were fully explained in the report made by the Association to the Government Committee on Industry. The same causes operate to-day, though foreign competition, for various causes, has become less severe. On the other hand the recovery of the engineering industry has been much retarded by industrial strife, and the coal stoppage most unfortunately came at a time when the export trade was showing definite signs of improvement.

Improving the Salesmanship.

AN important point for the future is the defective organisation of the representation of the British engineering industry both at home and abroad for the promotion and defence of its interests. These defects are, it is considered, due to too much individualism, with the result that there is too great a sectionalism without co-ordination. Such a comment from an association is not unnatural, but there is another side to the question. The report goes on to say that the engineering productive capacity of the world is underloaded and that the only way to meet this difficulty is to cheapen the products, improve the salesmanship and to make the terms of payment easier for the purchaser. Alternatively, of course, it would be possible to wait for an increase in the world's purchasing power. But this fatalistic attitude is rightly condemned. It is further pointed out that there are several obstacles in the way of any arrangement based solely on economic considerations. One is that the resources of the engineering industry are essential to national defence. Another is the presence of tariff barriers. A third is, that the attractiveness of engineering tends to the establishment of home industries. A fourth is the increasing development of water power. These points are considered in some detail, and the conclusion is reached that although the protection and development of its own engineering industry must be the affair of each of the countries concerned, the interests of all of them might be well served by international conferences between duly accredited representatives of their respective trade organisations. The value of the report is much enhanced by the numerous statistics which accompany it.

Mr. Marconi.

MR. GUGLIELMO MARCONI has been elected an honorary member of the Institution of Electrical Engineers. This is a fitting culmination to a lifetime of useful work in the field of radio-communication and a no less fitting tribute to the commercial success which has recently attended the development of the short-wave beam system. In a general way Mr. MARCONI'S achievements in the wireless field are well known to readers of THE ELECTRICIAN. But it is interesting to note that it was in 1899 that he first established communication across the English Channel by that means and that two years later he succeeded in transmitting signals across the Atlantic. Since then, in co-operation with a band of devoted workers, his activities have been incessant, and the progress that has been made is not a little due to his efforts. His recent success has been spectacular, but on the technical side it shows that Mr. MARCONI possesses a flexibility of mind which is one of the most valuable properties of the scientist. It required not a little courage to desert the long wave work upon which everyone was engaged and to launch out into the uncharted seas of short wave investigation. There is a poetic justice in the fact that so great a success has crowned his efforts.

Broadcasting Week.

FOUR years ago the British Broadcasting Co. came into being and this week the occasion is being celebrated by the provision of more than usually excellent programmes in the hope that all licence holders will persuade their friends to become converted from potential to actual listeners-in. The progress that has been made in that period is well shown by Mr. J. C. W. REITH, the managing director of the British Broadcasting Co., in an article which is published in the current issue of the "Radio Times." There are now 2 105 000 licence holders and 34 230 000 of the population, or 79·74 per cent., are living within crystal range of a station. Despite, or perhaps because of, the criticisms which continue to be made, the programmes have been improved out of all knowledge and their organisation is so perfect that it is only noticeable when it breaks down. It is not too much to say that the B.B.C. is a real educational force and, while congratulating those who have made it so, we hope that its successors will continue the good work.

The Coal Dispute.

As we go to press, there seems some little possibility that the coal dispute will soon be settled. The miners have conceded the principle of district settlements on the basis of certain national principles in respect of the minimum percentage addition to basic wages rates, the ratio for the division of the proceeds of the industry between wages and profits and subsistence allowances. The length of the working day, the possibility of relating the standard minimum wage to the standard seven-hour day, and the setting up of a co-ordinating tribunal are still matters that are unsettled. There can, it is obvious, be no return to the general seven hour day, and the owners have considerable objections to the establishment of a national tribunal. At the time of writing, the miners' executive are consulting a delegate conference on these proposals, and what their decision will be it is, therefore, impossible to say. It is, however, obvious that a good deal will have to be conceded if the Miners' Federation is to retain even a proportion of its former power. The drift back to work is accelerating, and in Notts and Derby, a district agreement has already been arrived at. Between while we may note that the cost of the Poor Law Relief as a result of the stoppage is estimated at £5 800 000 in the areas directly affected by the dispute.

Brush Co-partnership Scheme.

AT a meeting on Monday, the shareholders of the Brush Electrical Engineering Co. passed resolutions providing for the adoption of a scheme of co-partnership. After providing for depreciation and necessary charges and a dividend of 10 per cent. on the ordinary shares, the surplus is to be distributed to the three classes of employers and to the shareholders in proportion to the total wages, salaries and dividends paid for the year. The amounts distributed may, at the option of the recipients, be invested in the ordinary shares of the company. In proposing the necessary resolutions, Mr. E. GARCKE said that the directors were asking both the shareholders and the employees of the company to move in the direction of producing better social conditions which would be attained when all workers were capitalists and all capitalists were producers, and neither was a consumer only.

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NOTES ON WIRELESS MATTERS.

The Rectifier in Telephone Receivers—Proportionality of Rectifier Output—Review of Causes of Acoustic Distortion—Advantages of Grid.

By L. B. TURNER, M.A., M.I.E.E.

(*Concluded from page* 420).

THERE remains the question as to the relation between the magnitudes of rectified current and of high-frequency amplitude. The relation *ought* to be a linear one. What it actually is depends upon the shape of the characteristic curve, the value of R, and the strength and modulation ration of the incoming signal. When R is small and the signal is weak, we

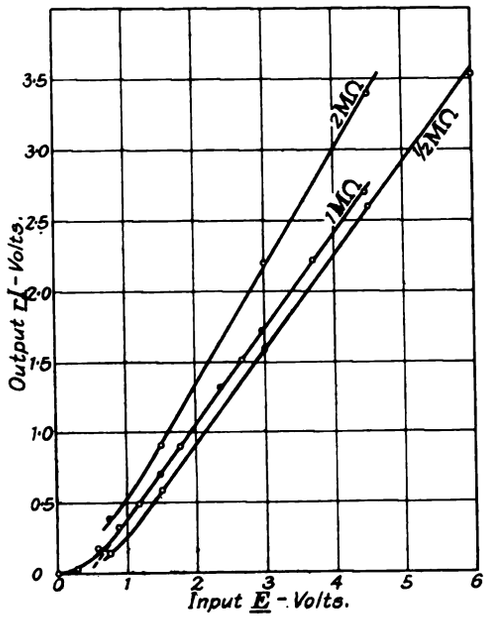

Fig. 1.

have seen that the rectified current tends to the value $\frac{1}{2} b_2 E^2$—i.e., is proportional to the *square* of the input e.m.f. But when R is large, with every increase of E the state point slips further back along the characteristic curve. This has the effect of making the rectified current I, and the rectifier output RI, rise more slowly than E^2, and in fact to tend towards a linear relationship with E.

This cannot be discussed in detail here, but a few typical observed curves will illustrate the facts. Fig. 2 shows the observed outputs RI of the crystal rectifier, whose characteristic curve has already been given, for different amplitudes E of the alternating P.D. applied to it. Curve (*a*) is for the low resistance $R = 27\,\Omega$; up to $E = 0{\cdot}5$ V it is indistinguishable from the curve $RI = 0{\cdot}186\ E^2$. Curves (*b*) and (*c*), for which R is 5kΩ and 51kΩ respectively, are very straight nearly down to the origin. The insertion of the higher values of R has not only raised the efficiency of the rectifier—thus, with $E = 1$ V, in the three cases, the outputs are 0·13 V, 0·80 V, and 0·98 V—but has also straightened the relation between input and output over a large working range. Thus, with $R = 51$ kΩ, the output RI is very closely linearly proportional to the input E over the range 0 to 2 V. (Actually here R is large enough to make RI sensibly equal to the limiting value E.)

In wireless telephone receivers the rectifier is not subjected to the tiny P.Ds, such as $E = 0{\cdot}01$ V to 0·1 V, which may be used in Morse telegraphy without heterodyne. However weak may be the acoustic signal at any moment, there remains the carrier wave; and in a receiver with signals strong enough for good head-phone reception at the rectifier, the carrier wave applies to the rectifier an E lying ordinarily between (say) 1 V and 3 V. With transmitter modulation ratios reaching at times (say) 50 per cent., which appears to be present practice at broadcasting stations, the grid amplitude would correspondingly sweep from 0·5 V to 1·5 V or from 1·5 V to 4·5 V. With rectification of the weak signal type, giving $RI \propto E^2$, there would be strong rectifier distortion: indeed, a pure tone would be reproduced with a second harmonic of one-eighth amplitude. But with curves such as (*b*) and (*c*) in Fig. 2, signals such as 0·5 V to 1·5 V, at any rate, should give very faithful reproduction; and signals of such strength are adequate for loud-speaker operation with a very moderate low-frequency amplification between the rectifier and the power triode.

If modulation ratios were kept really small, such as 5 per cent. instead of 50 per cent., almost any rectifier could yield faithful acoustic quality; but with the large ratios which actually obtain during loud passages, it is clearly necessary to provide a rectifier giving a response curve (relating RI to E) which is sensibly rectilinear over the particular range of E applied to it.

The crystal rectifier, as shown by our example, can meet the required conditions. But so, too, it would appear, can the grid rectifier. A typical observed response curve, very straight over a range of E about 0·4 V to 4 V, has been published* in a series of rectifier measurements with the familiar bright emitter "R" pattern of triode; and Fig. 2 shows that excellent curves can be got with the more modern dull emitters. The three curves in Fig. 1 give the observed drop of mean grid potential rI plotted against amplitude E of alternating P.D. applied to the grid. The triode was a G.E. Co's "D.E.5" (nominal $\mu = 7$, $\rho = 8$kΩ); the grid leaks were ½, 1 and 2 MΩ, and were connected to the positive end of the filament. The curves are sensibly straight over a range of E from about 0·9 V to over 4·4 V.

Without going into the mathematical theory of the shape of the observed response curve, one is driven to the conclusion that such a grid rectifier used with actual broadcast telephony signals (say 50 per cent. modulation) of appropriate strength can be made to give an output P.D. linearly proportional to the amplitude of modulation at the grid; and consequently that there will be no appreciable acoustic distortion *due to the rectifier*, provided that the sluggishness (and by the same token the dependence of performance upon acoustic frequency) is kept inappreciable. We have seen that this last condition may be met with shortish waves; and in any case it has equally to be met in the other types of rectifier.

A fuller analysis would have to take into account the fact that the load thrown upon the high-frequency circuit by the rectifier is not independent of the acoustic *amplitude*—an intricate subject for quantitative calculation. But it is easy, at some expense of efficiency, to arrange that this load is inappreciable; and, once again, it is enough in a defence of the grid rectifier to point out that the crystal rectifier is subject to the same effect.

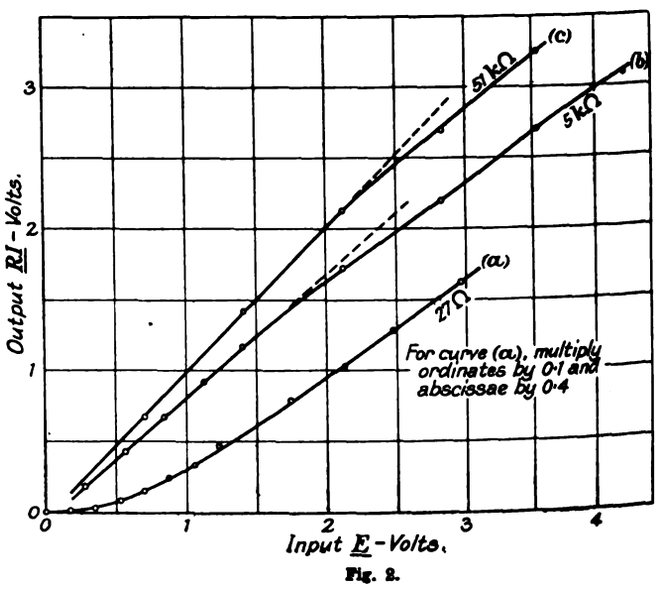

Fig. 2.

As regards the anode rectifier, a straight region of response curve is likewise obtainable, but the upper and lower limits of the straight part tend to be at higher values of E than in crystal or grid rectifiers. The curve in Fig. 3 was obtained

* "The Thermionic Triode as Rectifier," Moullin and Turner, "Journal I.E.E.," 1922, page 715, Fig. 19.

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with the same " D.E.5 " triode, but now used as an anode rectifier with 148 kΩ external resistance, 135 V anode battery and — 8·7 V grid bias. The values of the modulated E can be kept on a very straight region, but the signals must be amplified to an inconvenient strength to do so.

Judging from the particular curves here cited, it seems that with crystal and grid rectifiers the danger of distortion lies in excessive strength of the signals applied to the rectifier, while with the anode rectifier the signals may easily be too weak.

The conclusions to be drawn from the foregoing review of the acoustic distortion introduced by rectifiers of the three types in use may be summarised as follows :

(1) All rectifiers, if used without a large impedance in series, give non-rectilinear response with weak signals.

(2) The non-rectilinear response, while introducing harmonics of the acoustic frequency (and tones of sum and difference frequencies when more than a single tone is being transmitted), is unimportant if the modulation ratio of the transmitter is sufficiently low.

(3) Modulation ratios actually used are not kept low ; faithful reproduction consequently depends on the use of a rectifier

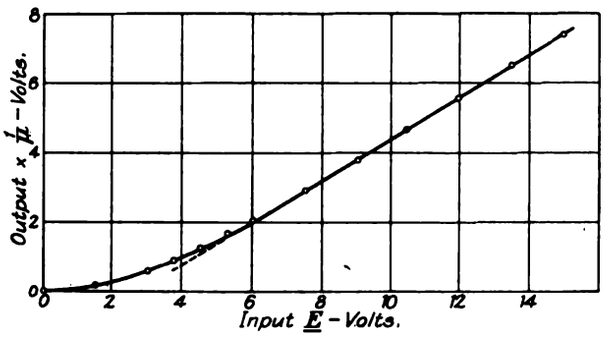


Fig. 3.

whose response curve is substantially straight over the range of amplitude of high frequency P.D. applied to the grid by the modulated signal. During loud passages such ranges ordinarily lie between about 0·5 V to 1·5 V and 1 V to 3 V.

(4) To make a rectifier an efficient instrument for actuating a low-frequency amplifier, an appropriately large external acoustic frequency impedance is placed in series with it. In the grid rectifier this impedance is the " grid leak."

(5) An effect of this impedance is to make the state point creep down the rectifier characteristic under the action of the signal. The effect is well known in the grid rectifier, and has been thought to differentiate this from the other types ; but this is not so. The creep influences the shape of the response curve, and may cause it to be very nearly a straight line over considerable ranges of grid amplitude. Consequently rectifiers of all three types are capable of giving faithful reproduction, provided that the signals applied are neither too weak nor too strong, so that the high-frequency amplitude never passes the limits of the straight portion of the rectifier's response curve.

(6) In all the rectifiers—not only in the grid rectifier, as has been supposed—the high-frequency shunting condenser introduces a sluggishness of response (and a falling efficiency with rising acoustic frequency) the harmfulness of which decreases as the ratio between radio-frequency and audio-frequency increases. At short wave-lengths (even perhaps including Daventry's) no perceptible ill-effect need be present.

(7) Crystal and grid, but not anode, rectifiers must to some extent produce acoustic distortion, (*a*) by causing high-frequency harmonics in the high-frequency circuit actuating the rectifier, as pointed out by Mr. H. L. Kirke ; and (*b*) by introducing a damping which varies with acoustic amplitude. (*a*) is unimportant when the circuit is, as usually, one of low decrement tuned to the carrier wave ; and (*b*) can be kept as small as desired.

(8) Finally, the grid rectifier, while admittedly offering advantages in point of convenience, should not be judged incapable of giving as good acoustic quality as do the other rectifiers.

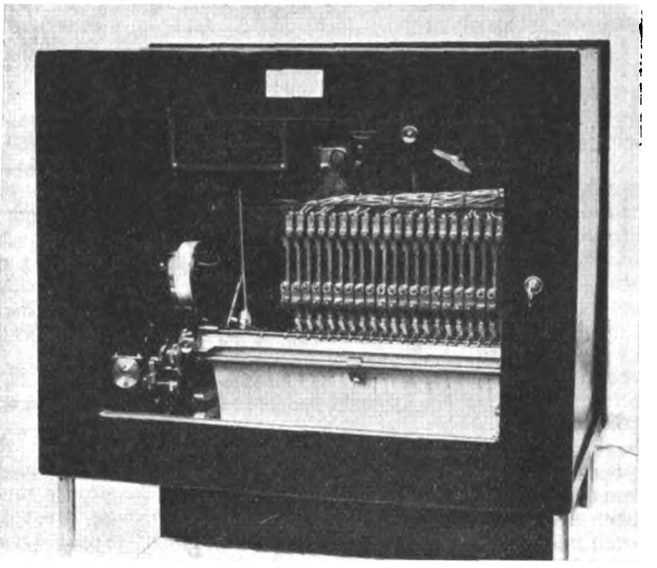
A monthly stock list issued by Hopkinson Induction Motors, Willesden Lane, North Acton, enables a selection to be made from a range of motors up to 30 B.H.P., for 50 cycles. Particulars of motors of other frequencies and speeds than those appearing in the list will be supplied upon application.

STATION RECORDER.

Graphic Determination of Station Operation.

THE instrument illustrated has been designed by the Cambridge Instrument Co. to record graphically the operation of various devices which constitute the switching equipment of automatically controlled stations. A paper feed mechanism is driven by a small electric motor which feeds a paper chart at a more or less constant speed under 20 pens supported on pivoted arms, the position of each pen being controlled by a small electro-magnet. The arms carrying the pens are held in position by gravity control. When an electro-magnet is energised, the armature is pulled into its closed position, moving the corresponding pen a distance of $\frac{1}{8}$ in. across the surface of the chart. The pen tips are equally spaced $\frac{3}{8}$ in. apart, and are arranged in a straight line above the chart. Ink is supplied from a long trough supported under the arm which holds the pens, and is fed up through the pens by capillary attraction.

A record of the station operation is obtained by a recording ammeter which is located to the left of the 20 pens ; the pen of this instrument is in alignment with, and makes its record at the same time as the other pens. The recorder chart paper is furnished in rolls having a total length of 50 ft. and a width of 10$\frac{1}{2}$ in. The left-hand section is ruled to accommodate the



View of the Cambridge Instrument Co.'s automatic station recorder.

record made by the pen of the recording ammeter and the records made by the 20 recording pens are traced on the right-hand section. To register the action of the station devices the magnet of each recording pen is connected in series with its proper external resistance, and either across the contacts, across the operating coil, or across the series resistor of the device, the action of which is to be recorded. The recording ammeter is connected to a suitable shunt in the main feeder, and thus records the total current passing. The record made by the recorder shows graphically the chronologic operation of the automatic switching devices and the relation of their operation to the current or other circuit variations for which the curve drawing element is intended. The records are of invaluable assistance in checking the sequence of operation of devices and in adjusting the various elements to make the switching equipment function most efficiently. The chart has a speed of approximately 3 or 12 in. per hour and the time is recorded by means of the twentieth pen on the right-hand side which is operated from a timing quick-make contact every ten minutes.

Turner Efficiency Indicator.

We are asked to state that the " Steam Turbo-Alternator Efficiency Indicator," described on p. 536 of last week's issue, is the invention of Mr. W. G. Turner, of Southampton.

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DISTRIBUTION AND STANDARDISATION.*

The Design of City Systems—Necessity for a Development Policy—Some Desirable Characteristics.

By J. R. BEARD, M.Sc., and T. G. N. HALDANE, B.A.

THIS paper is based on the belief that the development of electricity supply will be rapid and will at least double and possibly quadruple existing loads within the next ten years. The present is therefore an opportune time for distribution engineers to take stock of the present position and anticipate conditions during the next few years. Pioneering work is being paid for by lack of standardisation. Standardisation of distribution systems would have an important influence in cheapening and extending supply. Standardisation of voltage would be specially favourable to mass production and simplification. The ideal is that the consumer should never be troubled by technical questions arising from choice of voltage, type of current, etc.

The paper has therefore two main objects: (1) To lay down the outlines of the best type of distribution system as a standard in an urban area where no limitations are imposed by existing plant; (2) to urge the adoption of such as "standard system" for all large new developments and for the gradual modification of existing systems. The ideal standard system is, however, subject to limitations embodied in various regulations. Among the most fundamental are that the pressure to earth of any conductor in consumers' premises must not exceed 250 V, and that the domestic supply must not exceed this pressure. Further, the voltage must be maintained with ± 4 per cent. of the declared value. Overhead construction in city areas would be strongly opposed, and above ground sites for sub-station plant are difficult to obtain or prohibitive in cost. Further restrictions arise in connection with the opening up of streets, the lack of symmetry in the layout of streets, already largely occupied with gas and water pipes, etc., and the wide range of demand from prospective consumers.

A preliminary study of load densities ranging from 400 to at least 25 000 kW per square mile is necessary. The average load density in the Administrative County of London works out at about 2 000 kW per square mile. For the 20 county boroughs about 500 kW per square mile is estimated. Over individual square miles figures of 10 000 kW per square mile are attained, and in the exceptional case of the City of London 50 000 kW. Bearing in mind Sir John Snell's estimate that the existing sales of electricity will reach seven times the present figure by 1950, the limit taken above is by no means excessive.

In any case, it is advisable to look 15 years ahead by which time the load density will probably have doubled. In the authors' scheme three periods of five successive years are designated as stages I, II and III. Four types of area (A, B, C and D) are also considered corresponding to initial densities of 500, 1 000, 2 000 and 4 000 kVA. It is further assumed that energy will be delivered at three-phase 50 periods to a transmission station feeding main sub-stations from which it is again distributed at h.t. to transforming centres feeding low voltage networks for the consumer. Alternating current on the three-phase four-wire system with 400 V between phases and 230 V between phases and neutral is suggested as a suitable standard.

The transforming centres are assumed to be arranged in chessboard fashion. Two methods of laying out such a network are illustrated in the original paper. In both cases general distribution to groups of consumers is done from distributors, necessarily laid along every pavement in the area. Certain distributors have their section increased to carry the load on the remaining distributors as well as their own, and these are termed "main distributors," and the others "sub-distributors." For the assumed conditions the "distributor" type of network is preferred to the "feeder" type, which necessitates a greater mileage of cables. It can also deal with increased load with a minimum change in the cable system. It is obviously preferable to deal with increased load by adding transforming centres rather than by strengthening the cable network, and this is possible in the scheme suggested. At low load-densities the transformation centres are widely spaced, so that permissible voltage-drop plays an important part in settling the size of cables. It is assumed that the voltage drop in the low voltage cables should not exceed 6 per cent. (three-quarters of the permissible 8 per cent. variation). The remaining 2 per cent. drop is allowed to cover drop in the high voltage system and transformers.

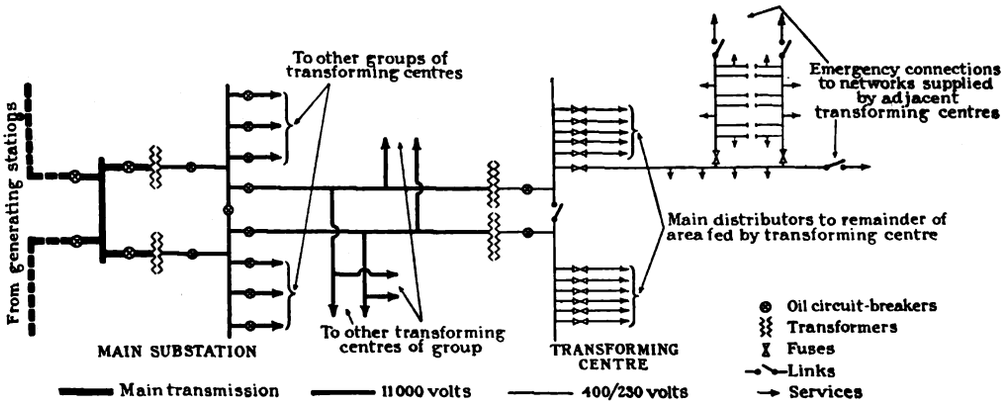

Diagram of "standard" system.

For four-wire distribution, four-core cables should be used. Three alternative methods of protecting and laying the cables may be considered: (1) The drawn in system; (2) armoured cables laid direct in the ground, and (3) unarmoured waterproofed cables laid direct in the ground with a suitable protecting cover. After weighing the merits of the first two methods the author considers that the comparison is strongly in favour of the armoured cable, which is no more expensive and has a higher current carrying capacity and lower maintenance costs. The third method, the use of unarmoured waterproofed cables laid direct, has merits. The cost of such cables is about 8 per cent. less than that of armoured cables, excluding excavation. The use of such cables may be considered, especially for all purely residential or semi-urban areas.

The next point considered is the type of high voltage distribution system layout. High voltage apparatus cannot be repaired or modified whilst alive, and any breakdown is usually complete. Hence each important feed into the low voltage system should be in duplicate. The primary requirement is continuity of supply. Assuming the use of soundly built and well designed apparatus, this is chiefly a question of (*a*) protective arrangements which will act reliably in disconnecting faulty apparatus, (*b*) elimination of as much switchgear as possible, and (*c*) housing and arranging apparatus so that a failure does not extend to the duplicate circuit.

High voltage systems for duplicate supply divide broadly into two types: (1) those employing radial parallel feeders and (2) those using a number of ring mains forming an interconnected network. These two methods are illustrated and described in detail in the original paper. The type of high voltage network most widely adopted to-day for general supply is the interconnected network in which all sections are connected together, thus forming a number of ring mains which can be looped, as required, into various transforming centres.

* Abstract of a paper read before the Institution of Electrical Engineers.

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Such methods have been rendered possible by balanced protective gear and have many advantages as regards cost per kVA of carrying capacity, ease of expansion with growing loads, and greater availability of high pressure supply for a given mileage of cable. They also give greater security of supply than is available with the older forms of radial network. Two sets of general calculations comparing the cost of the simplified radial, parallel-feeder system with that of the simplified interconnected system have been made. Some of the results are indicated by diagrams in the original paper. The number of variable factors is considerable and only an approximate comparison is possible. It appears, however, that for type "C" areas, with groups of three or more centres, and for type "A" area with groups of six or more centres, the radial system is cheaper at all stages. In addition, the possibility of eliminating high voltage switchgear, except at the main sub-stations, is a great advantage, which may be set against the greater flexibility of the interconnected system. As regards security there seems little to choose between the systems for the conditions assumed. On the grounds of simplicity, ease of operation and lower cost, the authors therefore prefer the radial system with three or four transforming centres per pair of feeders for the normal type of urban area with a relatively high load density. At the same time, local geographical considerations or uneven distribution of load may sometimes favour the interconnected system.

Consideration is given to three alternative voltages for the cables from the main sub-stations to the transforming centres, where the voltage is stepped down to 400. These are: (1) the voltage of the main transmission system (usually 33 000 V), (2) 11 000 V, and (3) some still lower voltage, such as 3 300 V. It is calculated that the respective annual costs, as affected by the choice of voltage at a load density of 4 000 kVA per square mile, are in the proportion 100, 102 and 113. The disparity will become larger as the load density is increased. The choice thus rests between the first two methods, and financially there is a slight saving in favour of the first. In addition, this method makes for simplicity, as it eliminates one complete transformation of energy. The chief difficulty is that the reliability of cables for this pressure is not equal to that of 11 000 V cables. In addition, there are a number of minor disadvantages: so that, on the whole, the authors consider that the 11 000 V system is better suited to the conditions likely to be met now and in the immediate future. In areas already developed for 6 600 V this voltage would, no doubt, be continued.

Spacing of Centres.

The choice of the most economical spacing of the transforming centres is complex and many mutually dependent factors have to be considered. In the original paper data are assembled in a number of curves showing the effect of various spacings on the total annual cost of distribution per kVA for various load densities. The chief conclusions are: (*a*) the most economical spacing of transforming centres varies from about 0·7 mile at a load density of 1 000 kVA per square mile down to 0·2 mile at a load density of 32 000 kVA, and (*b*) the variation of total costs due to varying these spacings is comparatively small over a wide range. The standard spacings arrived at for the different types of area are set out in Table I:—

Spacings and Outputs of Transforming Centres.

Type of area.	Load density at end of Stage 1. kVA/sq. mile	Spacing of transforming centres at Stage 1. Miles	Corresponding max. output of transforming centre at end of each stage. kVA
A	1 000	0·8	800
B	2 000	0·7	1 200
C	4 000	0·6	1 800
D	8 000	0·42	1 800

In the next section of the paper the authors give a general description of the "standard" distribution system, as already outlined. This assumes only two transformations (1) in the large main stations down to 11 000 for distribution to large power consumers and to the transforming centres, and (2) in numerous standardised transforming centres from 11 000 V to 400/230 V for distribution to domestic and small power consumers. The low voltage distribution systems will each be normally self-contained, but a proportion of the low voltage cables will contain additional copper so as to act as feeders. Continuity of supply will be secured by a duplicate high voltage supply. The high voltage distribution systems will be of a simplified type, reducing switchgear to a minimum, and may be either of the radial, parallel feeder type or a simplified interconnected type, as already described. The low voltage cables will be 4-core paper-insulated and lead covered with cores of equal size and will be armoured (or, in certain areas, unarmoured and waterproofed) and laid direct in the ground. The transforming centres will, where economically possible, be arranged above ground on private property, but in congested areas may be in the basements of buildings or under the footpath or roadways. The size and spacing of the transforming centres will depend on the load density of the area supplied. Each system will be laid out to deal, without modification, with twice the initial load, and with a view to ultimately dealing with eight times the initial load by increasing the transforming centres.

Distribution Costs.

The author next enters upon an analysis of distribution costs, and summarises calculations made for the purpose of deciding the most economical system layout at various stages. The analysis is illustrated in the original paper by a diagram dealing with total annual costs per kVA and total capital costs per square mile. The most important deductions from this analysis are: (*a*) The costs which are independent of the load are very large, the main items being the high cost of excavation for the low voltage distributor cables. Hence the total costs per kVA decrease very rapidly with increasing load density (e.g., they are reduced to one-quarter if the load density is doubled); (*b*) The proportion of the total annual costs represented by the low-voltage system, including the transforming centres, is also high, varying from 80 per cent. at stage 1 to about 75 per cent. at stage 3.

Comparative figures for the cost of distribution per kVA for areas of various initial load densities have also been obtained, and the relation between the cost of distribution per kVA and increasing load density traced. Assembly of these data in diagram form shows that the reduction in cost with growing load is not constant. This is due owing to the assumption here made that the system grows evenly and symmetrically. In practice the growth would in general not be uniform, and an attempt is made in the paper to show the probable course by dotted curves. The authors also present a brief comparison of the cost of the proposed standard system, and one in which the consumer is supplied with direct current. It is estimated that at stage 1 the average overall total annual distribution cost per kilowatt of the d.c. system works out at about 30 per cent. higher than that of the standard system. The comparison would be still more adverse in stages 2 and 3. This is due mainly to the heavy cost of converting sub-stations. One feature of d.c. systems which offers the chief reason for their retention in some American cities is the possibility of using secondary batteries to maintain supply in the event of a failure of the high voltage system. The estimates quoted above do not include the cost of such batteries, which is heavy, and in the authors' opinion is not justified here.

In this country the majority of the city areas are already partially developed, and therefore the complete adoption of the standard system is impossible. But much can be done to incorporate some of the chief features of the standard system and to ensure that this is approached more closely as existing systems develop. The most important feature is the voltage for lighting and domestic consumers, which should be standardised at 230. Fortunately, this is the easiest modification to make. A large proportion of existing systems operate at voltages between 200 and 230. A change over in such cases should not add more than about 5 per cent. to the existing expenditure on distribution. There are a number of systems operating at 100 to 120 V. On d.c. systems it would be necessary to replace or rewind all the motors. On a.c. systems transformers might be supplied. Even in these cases future saving in capital expenditure would largely offset the initial cost of the change over. In various cases examined by the authors it has been found that this cost of raising the system voltage could be recovered in at most two years, for stations having normal growth. A more difficult problem is presented by systems operating at voltages between 230 and 250. It may be necessary for such undertakers, who are in a minority, to delay conversion until the benefits of standardisation have become fully apparent.

The next most important standardisation is the general adoption of a.c. current of 50 cycles. In d.c. areas, where the power load predominates, a complete change over is a very expensive matter. In no case which the authors have considered was it practicable to scrap the existing system entirely. In an area with a rapidly developing power load it does,

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BROADCASTING IN SWEDEN.

Some Notes on the Design of a High-Power Station—Large Crystal Reception Range—Complete Amplification Equipment.

IN a recent issue of "Teknisk Tidskrift" are given some interesting details of the plans now being carried out by the Royal Swedish Telegraph Administration for a 30–45 kW radio broadcasting station. In May of this year the Administration obtained parliamentary sanction to spend £60 000 on the erection of a complete high-power broadcasting station, including land and buildings. The station is to be located in the town of Motala, on Lake Vättern, about 200 km. south-west from Stockholm. The selection of this particular site was governed by the fact that in this way it is hoped to insure a crystal reception radius of about 300 km., thereby covering the most densely populated areas of the country. The Stockholm radio programmes will be transmitted by wire (part of the way in a recently installed long-distance cable) to the new station.

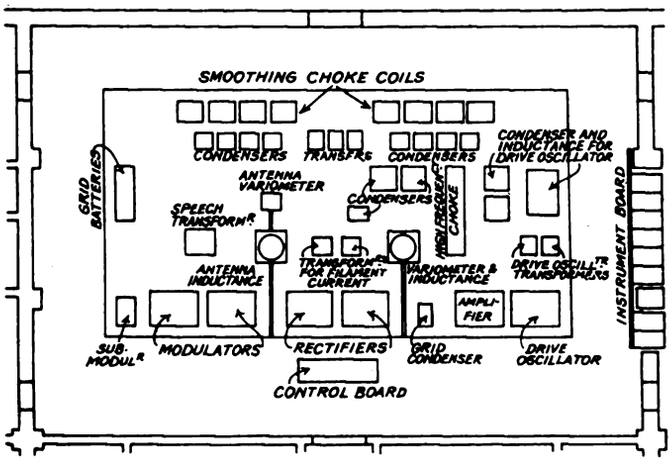

Fig. 1.—Plan of apparatus room (Swedish high power broadcast station).

Two self-supporting towers, each 120 m. high, are being erected at a distance of 240 m. apart, and these towers will support a barrel-type antenna 120 to 130 m. in length. Down-leads from each end will also be of the barrel type. It is interesting to note than in the winter months it is planned to heat the antenna wires electrically to prevent formation of ice.

The one-storey building which is to house the radio equipment is of rectangular shape 19 by 38 m. The centre portion is intended for an apparatus room, where the transmitter equipment proper will be installed, the power supply equipment being housed in adjacent rooms on each side.

The power supply from Motala is at 6 300 V, 50 cycle three-phase, which in the radio station will be transformed down to 380 V and feed three rotary converters of 50 kW each, delivering single phase current at 1 000 V, 300 cycles. This potential will supply the oscillator and modulator tube anodes, the voltage having been transformed up to 12 500 V and then rectified. Two 25 kW rotary converters will serve to give single phase current at 1 200 V, 300 cycles, for the drive oscillator and for heating the rectifying filaments. Three 10 kW rotary converters will be installed to give current at 18 to 32 V for the filaments of the oscillator and modulator tubes.

For the purpose of this description radio equipment may be divided into three main parts :—

(*a*) The rectifying system, which consists of 8 water-cooled tubes each rated at 10 kW at 10 000 V anode potential.

(*b*) The oscillator system comprising the drive oscillator and the amplifiers.

The former comprises one water-cooled tube with 10 000 V on the anode, derived from two air-cooled rectifier tubes.

The energy supplied to the anode of the oscillator tube is 8 kW.

The amplifier system has four water-cooled tubes in parallel, the tubes being of the same rating as the rectifier tubes.

The filament takes 50 A at 20 V.

(*c*) The modulator system will consist of several amplifier circuits arranged in series.

The speech energy from the first (or line) amplifier is fed into an amplifier aggregate, consisting of four LS-5-A tubes, which require an anode potential of 400 V.

The next stage of amplification is the sub-modulator, which consists of one water-cooled tube at 10 000 V anode potential.

The last stage of amplification is a unit of eight parallel-coupled tubes, identical in construction with the oscillator tubes, but with a slightly lower degree of amplification.

Fig. 1 shows a plan of the apparatus room. In front of the control board arranged in a single row are the tube racks. From left to right are racks for :—(*a*) one sub-modulator, (*b*) two modulators (each with four tubes), (*c*) one rectifier with four tubes for the modulator group, (*d*) one rectifier for the oscillator tubes, (*e*) one grid condenser, (*f*) one amplifier and the drive oscillator. At the rear of the room are the choke (smoothing) coils and condensers. One-half of the choke coil has an inductance of 16 henrys. The total capacity of the condensers is 7 microfarads.

Fig. 2 shows the unit on which is mounted four 10 kW water-cooled tubes, the cooling water being supplied from two small tanks shown in the upper part of the picture.

The station is designed to give 30 kW into the antenna. The equipment is so arranged, however, that this can be extended to 45 kW. The energy taken from the mains is 160 kW.

Translated into meter-amperes, the 30 kW effect means this. Assuming the effective height of the antenna to be 84 meters (70 per cent. of the mast height). The radiation resistance for a 1 350 m. wavelength is 6·2 Ω. Other losses are estimated at 1·8 Ω, making the total resistance 8 Ω. This corresponds to 60 A in the antenna, which gives just over 5 000 meter-amperes. The radio broadcast stations in Stockholm, Gothenburg, etc., have between 100 and 200 meter-amperes. The wavelength, which it is hoped will be definitely allocated for this station, is 1 350 m.

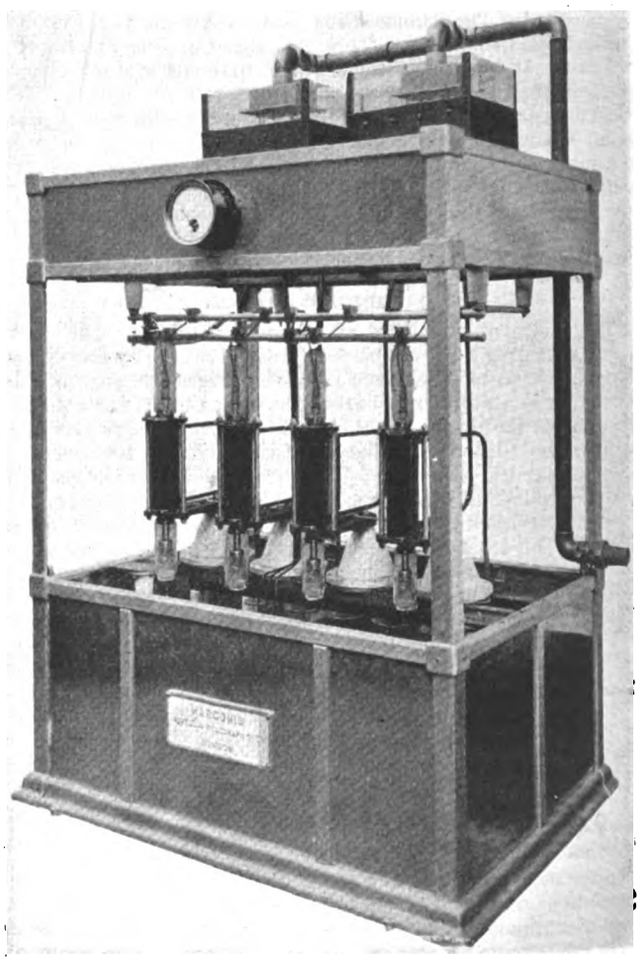

Fig. 2.—Unit on which is mounted four 10 kW water-cooled tubes.

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PHASE ADVANCER PROGRESS.

Their Installation and Operation—Equipment for a Cotton Mill Considered—Field for the Static Condenser—The Losses Factor.

By D. B. HOSEASON, A.M.I.E.E.

(*Continued from page 527*).

IT is the usual practice in all schemes involving power factor improvement to consider the various alternative means of obtaining correction. This is a very necessary procedure since, although the circumstances may show an appreciable saving if the power factor is improved at all, yet one method will give a greater saving in capital outlay than the others under the particular conditions for which it is most suited. Furthermore, not only is it necessary to consider the initial cost of the power factor correcting apparatus but also the additional losses involved and the general cost of maintenance.

In comparing the phase advancer with static condensers two general cases may be considered. Firstly, the single motor group drive of a factory, such as a cotton mill, and secondly, the correction of the power factor of an installation of mixed small and large motors, such as an engineering works.

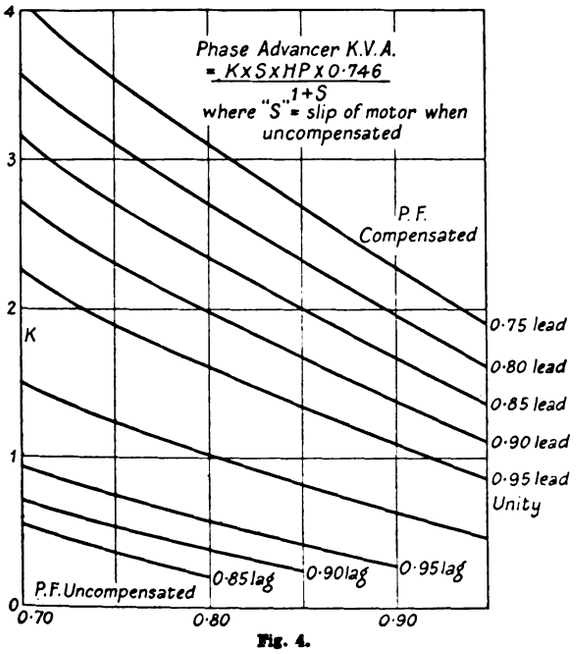

Fig. 4.

In the first case if we consider a 750 H.P. motor operating on a mean load of 600 H.P. at a power factor of 0·82 then as this would be the only load it would not be necessary to raise the power factor above 0·95 lagging.

A motor of this size would operate direct off a high tension supply, probably 3 000 V, and a 180 kVA 3 000 V static condenser would be required to raise the power factor to 0·95. This condenser complete with switchgear might be expected to cost about £450.* The losses in the static condenser would be about 0·55 kW. If the motor operated off a 6 000 V supply it would be necessary to install a transformer to transform down to the static condenser which would increase the initial cost by probably 50 per cent. In addition there would now be the losses in the transformer which would themselves be more than double the original condenser losses.

The 750 H.P. motor would probably have a full load slip of about 1·5 per cent. so that from Fig. 4 a 4·3 kVA phase advancer would be required to be capable of continuous operation with the main motor on full load. This phase advancer complete with its switchgear might be expected to cost about £150. The effect on the losses in the main motor by the addition of the phase advancer would actually be to reduce them. The stator copper loss would be reduced by 25 per cent. due to the improvement in stator power factor while the rotor losses would only be increased by 14 per cent. The final result then, on a machine of this size, would be a saving of about 1·0 kW in the main motor. The losses in the phase advancer, with 600 H.P. load on the motor, would be approximately 1·2 kW, hence the overall losses would be increased by 0·2 kW due to the addition of the phase advancer. It will be seen then, that in the case of the single motor group drive, the cost of the phase advancer is one-third of the initial cost of the static condenser, and that there is 0·35 kW less loss with the phase advancer equipment than with the condenser.

In the case of the installation of mixed large and small motors, it is convenient to take an installation consisting of two 75 H.P. slip ring motors and 100 H.P. of various small squirrel cage motors. Taking into consideration the usual load and diversity factors, such an installation might be expected to operate on a mean load of about 130 kW at 0·70 p.f. To compensate this power factor to 0·95 lagging would require a 90 kVA condenser, which with its auto-transformer and switchgear would cost about £330. The losses in the static condenser and auto-transformer would amount to about 1·2 kW.

Compensation Problems.

In the case of the phase advancers it will be necessary to consider the compensation of one or both of the 75 H.P. slip-ring motors. Normally these would each consume about 40 wattless lagging kVA so that there are available the alternatives of compensating either one motor to draw 50 wattless leading kVA or both motors to draw 5 wattless leading kVA. That is, one motor might be compensated to operate at 0·62 p.f. leading on 60 per cent. load or two motors might be compensated to operate at 0·99 p.f. leading. If the motors were already installed, apart from any other considerations, it would not be possible to compensate one motor to 0·62 p.f. leading on account of the excessive rotor heating which would occur with the rotor current necessary. If a new 75 H.P. motor were just being installed then this in itself could be arranged for 0·62 p.f. on 60 per cent. load but its size would have to be increased and its efficiency would be appreciably lower than that of the standard slipring motor. The best arrangement is to instal two phase advancers to compensate the 75 H.P. motors to 0·99 p.f. leading. These might be expected to cost with their switchgear about £90 each. The losses in the main motors when compensated would be about the same as when uncompensated and the loss in each phase advancer would be approximately 0·80 kW. The phase advancer installation then would cost £180 as compared with £330 for the static condenser equipment but, on the other hand, there would be 0·4 kW more loss in the case of the phase advancers than in that of the condensers. This loss might be expected to cost about £5 per annum with power at 1d. per kWh and 3 000 hours per annum, but the capitalised value of this could hardly make up the difference between the initial cost of the two schemes and the balance is in favour of the phase advancer equipment.

There is, however, a very large field of application for the static condenser in the many installations which exist, consisting solely of small squirrel cage motors, that is to say, machines of less than 40 or 50 H.P. Below this size the phase advancer becomes more expensive than a static condenser.

The salient pole synchronous motor is hardly comparable with the induction motor and phase advancer, since the former has nothing like so good a starting characteristic as the latter and its field of application is limited. In actual practice the decision to be made is more likely to be that of choosing between the synchronous induction motor and the induction motor with phase advancer. There is not usually any necessity for maintaining a constant speed and the matter resolves itself into a consideration of first cost and running cost of the two types of machines.

If the apparatus is already installed it is practically impossible to consider the conversion of standard slip ring motors to the synchronous induction type. The heating of the rotors would be excessive with the exciting current necessary to maintain a reasonable overload capacity. In this case there is no choice but to add phase advancers. The designs of most slip ring motors would permit an increase in the rotor current sufficient to produce unity power factor in the stator and, although it may be necessary to fit brush gear suitable for continuous operation, there are no great difficulties in the way of

* "The Improvement of Power Factor," E. W. Dorey, "Journal I.E.E." vol. 64, page 636.

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compensating existing slip ring motors by means of phase advancers.

Considering new installations and, first, the single motor group drive already discussed in the comparison with static condensers, it will be recollected that a resultant power factor of 0·95 lagging is required. It will also be recalled that a 4·3 kVA phase advancer is necessary.

A Typical Design.

The rotor current with the 750 H.P. motor compensated will be 7 per cent. greater than when uncompensated and the overload capacity of the motor with phase advancer will actually be greater than is the case without the phase advancer. In the case of the synchronous induction motor, if a pull-out torque of 1·8 times normal is to be maintained it would be necessary to make the rotor ampere turns at least 80 per cent. greater than in the ordinary asynchronous motor or alternatively to increase the field strength and strike a balance between increased field strength and increased rotor ampere turns. A typical design might have a 30 per cent. stronger field than the standard slip ring motor and 40 per cent. more rotor ampere turns. Many types of winding have been devised to reduce these increases, but they only affect the result to a minor degree and under the best circumstances with a reasonable overload capacity the synchronous induction motor is from 15 to 25 per cent. larger than the corresponding asynchronous motor. The desired power factor with a synchronous induction motor is a secondary consideration and is obtained by an adjustment of the reluctance of the magnetic circuit. Taking these points into consideration then in the design of the 750 H.P. motor, it is evident that a 20 per cent. larger motor would be necessary and an exciter of from 8 to 12 kW capacity would be required. Hence the initial cost of the synchronous induction motor installation might be expected to be some 20 per cent. higher than that of the phase advancer equipment.

It has already been shown that the addition of a phase advancer increases the overall losses by 0·20 kW. The synchronous induction motor even with allowances made for the add itional material in it due to its increased size would have an efficiency from ½ to 1 per cent. lower than its corresponding slip ring motor and a consumption from 1 kW to 2 kW greater than that of the motor with phase advancer.

In the case of the installation of mixed large and small motors, it will be recalled that in order to obtain the desired power factor either the two 75 H.P. motors can be run at 0·99 p.f. leading or one 75 H.P. motor can be run at 0·62 p.f. leading. In the case of the phase advancer equipment the best arrangement is to run the two motors at 0·99 p.f., under which condition two 1·4 kVA phase advancers would be required so as to be suitable for continuous operation on full load. The extra losses would amount to about 1·60 kW.

With the synchronous induction motor equipment the one motor operating at 0·62 p.f. on 60 per cent. load would be a better proposition than two motors at 0·99 p.f., as the machine woud have to be made large enough to accommodate the extla ampere turns required for the overload capacity and it woruld be a simple matter to adjust the air gap to give a p.f. of 0·62 leading. The motor itself then would be some 25 per cent. larger than its corresponding asynchronous machine and a 3 to 4 kW exciter would be required. The losses in the exciter would amount to about 1 kW and the extra loss in the motor to at least a further 1·0 kW. The extra cost due to the increased size of the main motor and the exciter would just about equal the cost of the second phase advancer, and it will be noted that with the phase advancer installation the iosses are about 0·4 kW less than with the synchronous lnduction motor equipment.

(To be concluded).

Electric Locos for Spain.

THE Oerlikon Co. has just received an order for twenty-two heavy duty locomotives for the Spanish Northern Railway. This company operates a large system in the north of Spain, and has now started to electrify the lines radiating from Barcelona. The 1 500 V d.c. system, with overhead trolley such as is used on the French Midi Railway, is to be employed. The trailing load will be 1 200 tons, and the maximum speed fifty-six miles per hour. The locomotives will be built for an output of 2 040 H.P. at about 20·5 miles per hour. This corresponds to a tractive effort of 16·7 tons (one hour rating) and 12·3 tons (continuous rating).

REVIEWS.

History of the States of Guernsey Telephone System (1895-1925). By ALFRED ROSLING BENNETT. (London: Leonard Parsons). Pp. 139. 5s. net.

This is a very readable little book which, with its local incidents and stories obviously intended primarily for Guernsey people, shows a happy relationship between the various members of the staff and with the Telephone Council, but, at the same time, is full of facts that must impress a much wider audience.

From its somewhat stormy beginnings, with opposition from the late National Telephone Co. and the Post Office, the development of the Guernsey System is traced step by step, and its progress is ever upward. Designed as a possible 300 line system it had at the end of 1925 a total of 3 642 telephones. Without exception it has shown an increase for each year. The telephone density is one telephone to 10·5 of the population (38 200), which is very much greater than exists in any part of the Empire, except the Dominion of Canada.

There was a loss on the first two years' working, but every year thereafter showed a profit, varying between £37 and £811. The total cost of the system has been £107 928, towards which £57 626 was raised by loan and £50 302 was provided from revenue. The 10 per cent. royalty has contributed to the Post Office nearly £20 000. The cost of the line repairs has averaged 2s. 6d. per telephone and the maintenance of the instruments and exchanges has averaged 5s. 6d.

Started as an open wire system, now nearly all junction wires are in underground cables and a considerable proportion of subscribers' telephones, a total of 3 928 miles of metallic circuit (all lines were metallic circuit from the start). There are no party lines, the rates are uniform for any length of line in the island, and the average length per telephone is 1½ miles. Truly a remarkable record.

The system is a "ring-through" one of Mr. Bennett's design, using a generator and primary battery at each instrument. This has given entire satisfaction, proved efficient, and is economical to maintain.

Mr. Bennett is to be congratulated on demonstrating that a popular telephone system can be provided at reasonable rates, which are as follows: A (private house), £2 10s. p.a., with 120 calls, then 1d. per call. A2 (business), £3 p.a., with 240 calls, then 1d. per call. B, £3 p.a. and ½d. per call. C, £6 10s. p.a., with 3 200 calls, then 1d. per four calls.

Mr. Bennett considers the various factors, helpful or otherwise, that affect the exploiting of a telephone system and comes to the conclusion that economical success is almost wholly due to good management.

The reason given for the use of the ring-through system is that it is less liable to trouble than the common-battery system or the automatic. This may have been so when all wires were overhead, but with an underground system it is doubtful if this would hold good. With higher costs of all electrical apparatus to-day, a great saving would be effected by the use of instruments suitable for the latter systems, thus saving a ringing generator, ring-off key and battery per telephone, which would also allow of a very much simpler case being used. These savings would provide an impulse-dial, in one case, and go a considerable way, in the other, towards providing an exchange plant of higher efficiency than that at present in use. However, if a telephone saturation point is being reached and the present plant has still a long life, consideration from this point of view is not urgent, especially as the public and the Council are satisfied with the present service.

W. AITKEN.

First Course in Wireless. By ROBERT W. HUTCHINSON. (London: University Tutorial Press.) Pp. 262. 3s. 6d.

This book is one of a well-known series, and is intended for the man who knows little or nothing about electricity and yet desires to learn something about wireless phenomena. It therefore covers a good deal of ground, and the treatment is naturally scrappy. The information is clearly put and illustrated by a number of excellent diagrams. The author rightly calls attention to the fact that the amateur constructor, to be successful, must have some theoretical knowledge, and if the book does no more than stimulate the readers to search for still more information, it will have served a useful purpose.

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WIRELESS PROGRESS.*

Rugby the Outstanding Development of the Year—Improvements in Receiving and Transmitting Equipment—Future of Broadcasting.

By Prof. C. L. FORTESCUE.

THE outstanding wireless development of the last twelve months has been the commissioning of the Government station at Rugby, which approaches very closely to the engineering ideal. During the past year the broadcasting service has become yet more firmly established. Its value during the general strike was incalculable. Another development of great importance has been the transmission of radio pictures—technically possible for some time, but only recently inaugurated as a regular service. Closely allied to this is the possibility of true " television."

Going back for the last seven years, during 1919 most of the war-time advances became generally known, but little of this knowledge had been applied commercially; broadcasting had not begun and the expert amateur was almost unknown and unprovided for. The spark transmitter still has many uses but few friends. It is inexpensive and relatively foolproof, but causes such serious interference with other systems and that it will probably be ultimately limited to emergency signals or cases where there are no broadcasting interests to be considered. The arc generator is unchanged; the desirability of a coupled circuit was recognised even before 1919 and is essential to a reasonably good wave form. But the use of capacity-coupling has proved to be a real advance. Both the American and French designs of high frequency alternators give complete satisfaction for the purposes for which they were designed. The development of the power valve has followed lines foreshadowed. The development of the silica valve has been fully described. The water cooled valve was rendered possible by the discovery by the Western Electric Co. of a method of making reliable vacuum-tight joints. Replacement of the filament is, however, a costly process. An alternative type is run permanently connected to a high vacuum pump. Opinion is divided as to which of these three types will survive, but the valve is accepted as the only practicable generator where frequencies exceeding 15 000 cycles are needed. The question of the rating of power valves still excites discussion.

Tuning Fork Control.

As regards circuit arrangements, coupled circuits and master oscillators were known before 1919. The use of a harmonic of the tuning fork at Rugby is an innovation likely to become standard, giving a reliable frequency control. A difficulty common to all high power valve sets is a tendency to oscillate at very high frequencies. Various methods of overcoming this are discussed in the original address.

An unexpected advance has been the discovery of the remarkable insulating qualities of good quality American whitewood, which removes serious mechanical difficulties in the construction of inductances of low resistance.

Valve transmitters have passed through the same phrases of development as spark transmitters, now consisting of two or three complete self-contained units, instead of a haphazard collection of parts. The development of short wave transmission for longer ranges and especially for " beam " stations has been a new feature. There are now stations radiating more than 80 per cent. of their energy in a beam having dispersion of only 15 deg. The demand for true rendering for broadcasting has compelled close attention to microphones, land lines and accessory apparatus. The microphones and amplifiers thus developed are unfortunately too complicated for ordinary line telephony, though the results heard by listeners-in will probably result in a demand for equal perfection in the public telephone service.

Turning next to the transmitting medium, the necessity for a reflecting or refracting outer atmosphere was universally accepted in 1919. Subsequent experience has confirmed the general applicability of the Austin-Cohen formula, though several new facts, such as the phenomena of " skip distance " have been observed. According to modern theory the " Heaviside layer " is no longer regarded as a layer, but embraces all the space immediately surrounding the earth, where there are free electrons to have a mean path of at least a few centimetres. This consideration appears to be fulfilled at a height of about 50 km., but the distribution of ionic clouds and their origin is still a matter for speculation. This problem is discussed in the address in some detail. Other effects besides refraction of the upper atmosphere are now known to be involved. Waves starting from an aerial tangential to the earth's surface are accompanied by currents in the conducting surface and consequent wastage of energy; such rays are also subject to some degree of true refraction. The combined effect of these factors is that with long waves the intensity of the direct rays following the surface of the earth does not fall off much more rapidly than the natural decrease to be expected from the increasing circumference of the wave front; but upward rays are quickly refracted back to the earth, and the lengths of the paths of these two rays are different. This accounts for the observation of interference effects and there may be variable zones of high and low resultant field strength.

Short Wave Problems.

With progressively shorter waves the direct ray tends to die out more rapidly and the refracted waves return to the earth's surface at a greater distance. At a wavelength of about 50 m the direct rays falls off to an unobservable small magnitude before the refractive rays return to the earth's surface and the phenomenon of " skip distance " appears. The whole subject of the bending of wireless waves is one where the mathematical physicist, the geo-physicist and the wireless engineer are closely collaborating, and this combined effort will doubtless lead to more accurate knowledge.

The receiving station and receiving instruments have been improved in detail during the past seven years, but there have been no great innovations. The very long Beverage aerial is under trial and appears to give good results although its theory is somewhat uncertain. There has been no extensive change in either the practical or theoretical aspects of amplification. The intensity of the prevailing atmospheric interference still imposes the lower limit to the signal strength for satisfactory reception. Earlier conclusions on this subject have been confirmed. Oscillograph records show a variety of wave forms, all having the common characteristic of being heavily damped. Many efforts have been made to devise apparatus that would not respond to these damped waves, but to-day the only solution still seems to be to increase the power of the transmitter, as is being done at Rugby, Daventry and elsewhere. So far as any frequency can be associated with atmospherics, this frequency appears to be low and of the order of 1 000. This agrees with the established fact that atmospherics do not seriously interfere with short wave reception.

The manufacture of small receiving valves has so developed under the stimulus of broadcasting that the possible production in Europe and America is now at least 100 times greater than in 1919. This is due mainly to improvements of manufacture, including the application of chemical means for absorbing the last traces of gas. Low temperature filaments with surface layers of high emitting power are now universally used, and a life as long as 10 000 hours is a matter of routine experience. A modern filament requires only 0·25 W as compared with 2 to 2·5 W required by the earlier types. Further developments in the design of receiving valves may still be expected. The worry and unreliability of accumulators and primary batteries point clearly to the need for adopting some simple means of obtaining power from the supply wherever available.

Loud Speaker Progress.

Much work has been done on loud speakers and many claims for improvements have been made. Nevertheless there is still no loud speaker in existence which gives a true rendering of both speech and music. Amplifiers are often a source of distortion and this can be remedied. But no expenditure within reason can avoid the defects of the loud speaker itself, and it is a serious reflection on the ingenuity of our profession that this should be the case.

Turning to radio frequency measurements, Prof. Fortescue alluded to recent measurements at the N.P.L. leading to an accuracy of 1 in 100 000. This is not in excess

* Abstract of the Chairman's address to the Wireless Section of the Institution of Electrical Engineers.

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CORRESPONDENCE.

ELECTRICITY SUPPLY PROGRESS.

[To the Editor.]

Sir,—The critics of electricity supply in this country are fond of saying that we are very backward as compared with other countries. This is not the case if all conditions are taken into account. It is a fact that, at the present time, the progress of electricity supply, despite depressed trade, is proceeding at a very rapid rate. Some figures of progress may be interesting.

During the war, under Government control and to meet munition requirements, the amount of power in the principal generating stations in this country was increased from one million kW to two millions.

In 1919 the Electricity Commissioners were appointed, one of their duties being to see that no inefficient generating station were established or extended, and under their control, according to the official reports which they have issued, the amount of generating plant was extended in six years from two million kW to five millions, or 2½ times the amount available at the end of the war.

During the last five years the sale of electricity in this country has doubled and that at a time of increasing trade depression.

The domestic supply of electricity is proceeding by leaps and bounds at an unprecedented rate.

It may be said with certainty that so soon as trade revives in this country there will be another substantial jump in the use of electricity, and all this is proceeding without the aid of the Goverment Bill to establish a bureaucratic body whose duty it will be to expend large sums of money to indulge in State trading and to control the management of other people's businesses at the other people's risk. Surely, as a result of the financial catastrophe consequent on the coal strike, the Government will pause before they rush this Bill through, and will give an opportunity to those in the industry who oppose it to put their views forward.—I am, etc.,

W. B. Woodhouse.

Leeds.
November 2nd.

"ORTHODOX"—"CONVERSE"—AND "————"

[To the Editor.]

Sir,—I see from Mr. Sayers's letter in The Electrician of November 5th that he is still troubled about *words* and preserves an open space for which he has not yet found an appropriate expression.

In a sense I quite sympathise; there should be a suitable designation for all officials, experts and good conservatives who are afflicted with principles that may not harmonise with a cold-blooded view of the case from an engineering or commercial standpoint.

Mr. Sayers complains that my article might lead a reader to suppose thus and thus. In reply, I would point out that the Weir Report is public property and that at the worst I can only be accused of stating what I think it means. It is the meaning of such figures as cited in my letter to The Electrician, November 5th, that creates so much difficulty, and if those who are in a position to explain them refuse to do so, they are thereby injuring the cause they advocate.—I am, etc.,

J. Rutherford Blaikie.

Bedford,
November 8th.

NOTES ON WIRELESS MATTERS.

[To the Editor.]

Sir,—In "Notes on Wireless Matters" of September 10th and October 8th, Mr. Turner has made the tacit assumption that the form of the signal is sinuisoidal. Although it is probable that no perfect sinuisoidal wave has yet been made, I believe that the practice in wireless theory of assuming that the waves are sinuisoidal is explained by the fact that any true alternating quantity can be represented by a "series" (Fourrier) of sinuisoidal forms.

Even if we ignore the difficulties that (*a*) it is known, in certain cases, that the differential of the Fourrier series does not correspond to the differential of the original function, e.g., the recurring triangle, (*b*) the difference between "represented by" and "identical with."

Surely it is an assumption of some magnitude to assume a sinuisoidal (or sinuisoidal $\times \epsilon^{x}$) form for an alternating quantity of irregular form and amplitude.

Perhaps Mr. Turner will show the accurate method of tackling these problems and the magnitude of the error which is liable to arise.—I am, etc.,

R. L. H.

Faraday House Old Students' Dinner.

The annual dinner of the Faraday House, Old Students' Association was held at the Hotel Cecil on October 29th. Mr. L. J. Kettle, M.I.E.E., Electrical Engineer to the Dublin Corporation, being in the chair.

The toast of "Faraday House" was proposed by Prof. W. H. Eccles, F.R.S., who pointed out that this country had considerable leeway to make up before its electrical development equalled that of its rivals. The new government scheme should open the way to a much greater use of applied electricity, but progress in this direction could only be made if a large supply of able and competent junior engineers, such as those turned out by Faraday House, was always available.

In reply, Dr. Alex. Russell, F.R.S., mentioned that the number of students at Faraday House was now 280, and that they had a record entry this term. During Mr. Kettle's year of office the numbers of the old students had increased by nearly 20 per cent. and was now approaching 800.

Sir Philip Dawson, in replying for "The Guests," said he had no fear for the future of this country. Given equal opportunities he thought that the English engineer was at least as clever as any of his rivals. He mentioned the good work that was done by Faraday House in turning out men admirably qualified to help the engineering industries.

Distribution and Standardisation.

(*Concluded from page* 559.)

however, pay to superimpose a new standard system to deal with new loads, though it may be some years before the eventual undoubted economy balances the heavy initial cost. In areas where only a slow growth of power may be expected, the complete limitation of the growth of the existing d.c. system cannot be justified, though much can be done by gradually superimposing a standard system as opportunity occurs. A change over is comparatively easy where the power load is small, and in many cases such changes have been effected during the last few years.

There remains the question of standardisation of type of system, e.g., when it is desired to convert a d.c. three-wire system into the standard three-phase four-wire system. Such cases can best be dealt with by adopting a modified standard system utilising single phase three-wire. Single phase two-wire systems which it would be uneconomical to scrap can be dealt with by continuing the single phase supply, but grouping the cables so that they can be fed from a skeleton three-phase four-wire network.

In conclusion, the authors urge that not only is the adoption of a standard system a vital matter to electricity supply undertakings, but much more can be done than is commonly supposed towards the modification of existing systems. These conclusions are based on consideration of the interests of supply undertakings; but from the manufacturer's standpoint the advantages of standardisation are equally great. The advantages of mass production are so evident that it would pay them to co-operate in a vigorous effort to bring about standardisation, e.g., by offering consumers some special inducement as regards the purchase of standard apparatus.

Wireless Progress.

(*Concluded from page* 563.)

of practical requirements. International agreement on the allocation of broadcasting wavelengths demands that the frequencies of two distant stations shall be so accurately adjusted that there shall be no audible heterodyne beat between them even when their frequency is 1½ millions. Thus the difference from the reputed frequency should not be less than 50 cycles.

In the final section of the address Prof. Fortescue emphasised the great development of broadcasting as one of the "marvels of modern science."

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NEWS IN BRIEF.

A New Electric Power Station for Brisbane—Another Electric Greyhound-Racing Track—Sydney Municipal Plant Contract Secured by Metropolitan-Vickers Co.

ST. Mary's Church, Reading, is to have an electric light installation, at a cost of about £300.

It is expected that the first automatic telephone exchange in Dublin will be opened early next year.

A deputy city electrical engineer is required by Bradford Corporation, at a salary rising from £750 to £1 000.

It is reported that Brisbane City Council proposes to erect and equip an electric power station at a cost of £357 000.

United States electrical exports in August were valued at $1 019 621 less than in the corresponding month last year.

A syndicate, presided over by Mr. Harry Day, is negotiating for a site of an electric greyhound-racing track in the vicinity of London.

Further donations to the "Fleet Street Week for Barts." include £10 10s. resulting from a collection in the offices of the Edison Swan Electric Co., Ltd.

Last Wednesday the Greater London Division of the Electricity Supply Commercial Association held an enjoyable dance at the Cannon Street Hotel.

The Melbourne High Court has decided that the Commonwealth Shipping Board has no power to compete with private firms in the manufacture of electrical machinery.

A London traders' organisation protests against the alleged action of Hoover, Ltd., in giving the sole agency for their vacuum cleaners in Hackney to the Electricity Department.

On Monday a special meeting was held of the Electrical Section of the Newcastle and Gateshead Chamber of Commerce. It is understood that the Electricity Bill was further discussed.

On Wednesday, Miss Anna Holm, of the Newcastle-upon-Tyne Electric Supply Co., addressed the North-East Area of the E.D.A. on "A Domestic Subject." Mr. J. Rosen was in the chair.

The first branch of the Electrical Association for Women—the Glasgow District branch—will celebrate its first birthday on November 29th, when a public luncheon will be held. Lady Cowan, the Association's vice-president, has promised to attend.

The second of a series of Individualist Luncheons will be held at the Criterion Restaurant, London, on November 24th, when the chairman will be Sir Charles Mallett and the speaker Mr. Harold Cox. Tickets (5s. each) are obtainable from the Individualist Bookshop, 40, Marsham Street, Westminster, London, S.W.1.

Sydney City Council is recommended to agree to the transfer of the contract for turbines and other plant for the Bunnerong power house from the Commonwealth Shipping Board to the Metropolitan-Vickers Electrical Co., Ltd., at a price not to exceed £644 105.

Members of the Elliott Social Association (Elliott Brothers (London), Ltd.) and their friends held their annual social evening and dance at the Borough Hall, Greenwich, on November 1st. One of the features of an enjoyable evening was the performance of the "Century Works Orchestra," which is composed entirely of members of the firm.

Representatives of the American telephone companies are now in this country for the purpose of arranging the final details of the telephone service between England and America. Test calls are being transmitted at the rate of fifty or sixty per day, and it is not considered impossible that the service may be open for commercial use early in the new year.

At last week's meeting of the Electrical Association for Women, Mr. W. S. Jeary delivered an address on "The A B C of Electric Lighting," gave practical demonstrations of the best methods of making adjustments and repairs in a household electrical installation, and strongly deprecated the practice followed by one of his hearers who mended her fuse with a hairpin.

A joint meeting of the members of the Institution of Engineers-in-Charge and the National Association of Supervising Electricians, was held last Wednesday at Magnet House, Kingsway, W.C.2. An address was given by Mr. N. E. Barber, on "Domestic and Small Commercial Refrigeration," with particular reference to the new "Magnet" type of refrigerating machine.

The French Postal Department has established a system of autograph telegrams, the signature of the sender being reproduced at the foot of the message.

Gratifying interest is being shown in Walsall in the activities of the Electrical Association for Women, and in the development of electricity generally. Recently the Town Council voted a sum of £100 to the Electrical Development Association, and last week a meeting was held, under the auspices of the Birmingham and Midlands branch of the Electrical Association for Women, which attracted a large attendance of ladies.

Manchester Notes.

Lectures on Illumination Greatly Appreciated.

[FROM OUR OWN CORRESPONDENT.]

THE work of the new Lighting Service Bureau, at 4, Fountain Street, Manchester, is proceeding well, and the fortnightly lectures on illumination are now regularly attended by about one hundred persons. The actual number registered is eighty-nine, and the secretary, Mr. Pryor, of Siemens and English Electric Co., 196, Deansgate, Manchester, asks me to state that the next meeting will be at 7 p.m., on November 25th, and that all members of the trade will be welcomed.

Mr. S. L. Pearce, the late chief engineer and manager of the Manchester Corporation Electricity Department, is to have the honorary degree of Doctor of Science conferred upon him by the Manchester University on November 17th.

Another important contract for a turbo-alternator has been received by the Metropolitan-Vickers Electrical Co. from the Bristol Corporation in connection with the extensions at its Feeder Road generating station. Vickers, Ltd., are doing the boiler house extensions, and the cooling towers will be erected by Film Cooling Towers, Ltd.

Robust Telephone Plant.

Remarkable Vitality of a P.A.B.X. Equipment After Flooding.

A REMARKABLE instance of the ability of modern telephone equipment to withstand the most severe conditions is described in the "Post Office Electrical Engineers' Journal," which tells how a P.A.B.X. equipment installed by the Relay Automatic Telephone Co. in the basement of a cotton mill was inundated by floods following a severe thunderstorm, and how this apparatus was restored to service after a lengthy immersion.

The room was flooded to a depth of about 4 ft., and besides being soaked with water the apparatus was covered with a film of slime and rubbish. When the flood had subsided the apparatus was dried, and within a few days the installation, as it stood, was restored to service.

Some 600 relays, one set of secondary cells, one charging machine, one ringing machine and the associated wiring and cabling were submerged, but, with the exception of a choke coil and three transformers in the ringing equipment and eight relays and four condensers in the automatic switching equipment, the whole of the equipment was salved and is still in use.

Accrington's Electric Houses.

Success of a Recent Experiment—Increased Apparatus Sales.

ACCRINGTON Corporation's recent experiment with an all-electric house scheme—a condition being that the occupiers used neither coal nor gas—has been justified by results, states an ELECTRICIAN correspondent. At the special price arranged consumers pay 6s. 7d. per week for lighting, heating and cooking, but the coal strike will increase this item by about 4s. per week. On the other hand, the coal strike has given a tremendous impetus to the sale of electrical apparatus in the Burnley area.

Accrington's municipal electricity showrooms are not yet completed, but it is hoped to have them ready for an exhibition before the end of the year.

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THE NATIONAL REGISTER.

Third Instalment of the Latest "Registractors" List.

FOR the information of those who desire to place contracts for electrical installation work with registered contractors we continue below the publication of the latest list issued by National Register:—

Croydon.—G. T. Bellamy and Co.; F. Blanshard and Son; Arthur E. Cook; Kingsdown Electrical Co.; J. and T. Robinson; P. C. Skinner; Wenham and Fowler; Exors. of S. R. Whyte; W. D. Willson; Frederick Wingfield.

Darlington.—E. and H. Glover.

Dartmouth.—Urban Electric Supply Co., Ltd.

Darwen.—W. V. Fairhurst.

Dawlish.—Dawlish Electric Light and Power Co., Ltd.

Derby.—Batterby and Hefford; W. J. Furse and Co., Ltd.; Hulme and Son; Newton Brothers (Derby), Ltd.; Taylor and Briggs.

Doncaster.—W. Skewes and Co., Ltd.

Dorking.—Dorking Electricity Supply.

Dover.—E. Arthur Pinto.

Durham.—T. Henderson; Kelly and Co.; J. Laidler and Sons.

Dursley.—T. J. Holmes.

Eastbourne.—H. Beney and Son; Page and Miles, Ltd.; R. H. and J. Pearson, Ltd.

Eccles.—E. Beal and Sons.

Egham.—V. G. Badois.

Epsom.—H. Pengilly.

Evesham.—Booth and Bomford, Ltd.

Felixstowe.—East Anglian Electric Supply Co., Ltd.

Fleetwood.—R. Barron, Ltd.

Folkestone.—T. C. Gilbert and Co., Ltd.

Frinton-on-Sea.—Walter H. Smith.

Frome.—Frome Electricity Supply.

Gateshead-on-Tyne.—H. W. Aldrich; Charles Doyle; Embleton and Barker, Ltd.; R. J. Shaw and Co., Ltd.

Glossop.—Urban Electric Supply Co., Ltd.

Gloucester.—L. Cadogan Mitchell and Co.; Parsons Brothers.

Godalming.—Urban Electric Supply Co., Ltd.

Goodmayes.—F. W. Ryland.

Grantham.—Urban Electric Supply Co., Ltd.

Gravesend.—S. G. Allen and Son.

Grimsby.—Electric Service Co.; F. T. Habershaw; L. Hancock; Matt Jennison, Ltd.; Northern Electrical Co.

Guildford.—Electrical Installations, Ltd.

Halifax.—Gath Electrical Engineering Co.; F. S. Jackson; Lewin and Murray; Thomas and Akroyd; W. Warburton and Co., Ltd.

Harrogate.—Barnwell and Fallon; Reginald Falshaw; George Newby; Topham Brothers, Ltd.; Thomas Wray.

Harrow.—Harrow Electric Light and Power Co., Ltd.

Hartlepool.—Edgar Philips, Ltd.

Hastings.—George Tester.

Havant.—G. W. Bentley.

Haywards Heath.—H. J. Galliers.

Hebden Bridge.—W. A. Harwood.

Hereford.—William Rowberry.

Hetton-le-Hole.—E. W. Gardiner; John Thompson.

Hexham-on-Tyne.—T. J. Long and Sons.

Heywood.—C. Hargreaves Coupe.

High Wycombe.—E. H. Milner; Wycombe (Borough) Electric Light and Power Co., Ltd.

Hollingwood.—Hollingwood Electric Light and Power Co., Ltd.

Horsham.—H. Saunders and Son.

Houghton-le-Spring.—Alexander Gordon.

Hove.—H. J. Galliers; Albert Geall; Holfords.

Hoylake.—C. E. Price.

Hucknall.—General Engineering Co.

Huddersfield.—J. R. Dunkley and Co.; J. W. and R. Graham; Guy V. Laycock and Co., Ltd.; J. H. Taylor and Co.; Reginald Wood and Co.

Hull.—John Blenkin; William Broady and Son; R. Cranmer Brown, Ltd.; City Electric Co.; Clark and Graham; W. L. Harrison, Ltd., Humber Electrical Engineering Co.; H. Hyde and Co.; King and Co., Ltd.; Ernest Langdon; Napier and Wheeldon; W. G. Padgett and Sons; Charles F. Pardoe; E. M. Parsons; Porte Bros. and Co.; Wilfrid Taylor and Co. [redacted]

IN PARLIAMENT.

Report Stage of the Government's Electricity (Supply) Bill.

THE Electricity (Supply) Bill was considered on Report in the House of Commons on Tuesday.

A new clause, moved by Mr. D. Herbert, to provide that certain powers of the Electricity Commissioners should be exercised by the Central Electricity Board was withdrawn, after the Attorney-General had objected to the proposal on the ground that it would subordinate the Commissioners entirely to the Board. He promised, however, to insert in Clause 18 words to ensure that, in determining whether to give consent, the Minister of Transport or the Commissioners should have regard to the provisions of the scheme.

Sir J. Nall moved a new clause proposing the appointment of a central tribunal, to which anybody affected by a scheme might appeal. The Attorney-General said the Bill provided that everybody should have an opportunity of making representations, which would be considered by the Board, and, anybody on whom any obligation was imposed might appeal to an arbitrator selected from a panel set up by the Lord Chancellor. The clause was rejected.

In regard to section 23 of the Act of 1909, which prohibits unauthorised undertakers from competing with statutory undertakers, Sir J. Nall moved an amending clause to the effect that the section should not prevent any company or person whose business was not primarily that of the supply of electricity to consumers, and who had not installed or provided or was not using any greater amount of plant or machinery for the generation of electricity than was reasonably necessary for such business from supplying any electricity to any other company or person.

The Attorney-General said the position proposed by the new clause would be unworkable, as it would be extraordinarily difficult for anyone to determine whether any particular machinery was more than was reasonably necessary for the generation of electricity for the business concerned. The clause was negatived.

Mr. H. W. Looker moved a new clause to enable all local authorities who were authorised to manufacture and sell electricity to the public also to sell electrical fittings, on such terms and conditions as might be agreed on. He said that the clause provided the only avenue by which it was possible to bring the benefits of electricity to thousands of the smaller householders. The only way to give such people facilities was by the extension of the hire-purchase system, through the local authorities. The clause—which, as exclusively stated in THE ELECTRICIAN recently, had the support of practically every electrical trade organisation except the E.C.A. of Scotland—was agreed to without a division.

On Clause 1 Mr. D. Herbert moved an amendment providing that the Central Electricity Board should be appointed or elected from time to time in accordance with a scheme (to be prepared by the Minister of Transport) which should be as analogous as possible to the statutory provisions regulating the appointment and election of members of the Mersey Docks and Harbour Board. This was negatived without a division.

Mr. D. Herbert moving an amendment to insert in Clause 2 words making it the duty of the Board to consider and adopt schemes under section 4.

The Attorney-General said the Government did not propose that a large body of people should be employed in the generation of electricity by the State or the Board. They proposed that the generation should continue to be in the hands of the owners of the selected stations. The amendment was negatived, as was a further amendment moved by Mr. S. P. Viant, to omit the provision in subsection 1 of Clause 2 that the Central Electricity Board should not, save as hereinafter expressly provided, themselves generate electricity.

An amendment was then moved by Mr. P. J. H. Hannon, providing that the Board should not delegate any of their powers in respect to selected stations without the consent of the owners of those stations. He said that the object of the amendment was to protect the London and other areas on which, under recent Acts of Parliament, certain rights had been conferred. This was agreed to.

The Attorney-General said he could not accept at short notice an amendment proposed by Mr. P. J. H. Hannon to safeguard the rights of certain London companies and municipalities conferred on them under the two Acts passed in 1925. The amendment was withdrawn.

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"WIRING THE HOMES OF BRITAIN."—XI.

Birmingham Opens its Third Electric House—Leicester Contractors Enthusiastic—London and Home Counties Progress.

DESPITE the very bad weather which prevailed, Birmingham's two W.O.B. demonstration houses were visited by a large number of people during the first few days, and the numbers increased later on. When an ELECTRICIAN representative visited the houses last Saturday afternoon, he found the demonstrators much too busy conducting people through the houses to do anything else. It was interesting to watch the visitors and to hear their expressions of opinion as they saw the various applications of electricity in the home. They were delighted with what they saw, and it was evident that many of them had previously a very inadequate idea of the many ways in which electricity could be made to serve, and, above all, how cheaply it could be made to perform the various tasks. It was pleasing to note that the visitors were mainly of the genuinely interested type, who come first to see, and then, in all probability, to buy. Incidentally, the house at King's Heath was sold very soon after it was opened.

Birmingham's demonstration house is at King's Heath. It is floodlighted at night by the projector seen by the fence facing the door.

The other house is at Northfield, not at King's Norton, as previously stated, but it is very near the boundary, and an effective piece of advertising is carried out at the King's Norton railway station, where big posters are displayed directing people to the house.

Birmingham's third house was opened at the beginning of this week. It is in Chester Road, Erdington, and is similar to the other two. It is fully equipped with apparatus loaned by Birmingham firms and staffed by competent demonstrators. It is conveniently near the tram and 'bus routes, and is open each day from 2 p.m. till 9 p.m. It is being advertised by circular letters from the Birmingham Electricity Supply Department, by handbills, display posters and local press advertising, and by slides in the local cinemas.

Good progress is reported from Leicester. Here the local circle committee is endeavouring to get a demonstration house opened at an early date. The contractors have contributed a sum of £230 towards the local expenses of the campaign, and as there are only 23 of them this speaks well for their enthusiasm. The Leicester Electricity Supply Department is to contribute a like amount. The names and addresses of the local contractors are appearing under the advertisements of the E.D.A., and the committee is meeting regularly and at frequent intervals under the chairmanship of Mr. J. Orringe.

Evesham (Worcestershire) is a small town, but big things are anticipated there from the campaign, states an ELECTRICIAN correspondent. A local committee has been formed under the chairmanship of Mr. Chalmers, the district engineer of the Shropshire, Worcestershire and Staffordshire Power Co., and the local contractors are giving their fullest support to the campaign. At Worcester the local committee is very active.

From all circles in the South Midlands area good reports are received, and the local circles will do good work long after the campaign is over.

Latest inquiries in Plymouth trade circles by the representative of THE ELECTRICIAN indicate that the W.O.B. scheme is making good progress. In all, considerably over 1 000 competition books have been distributed locally, and the total will be still further augmented now that Messrs. Axworthy and Co. and Mr. Hodge are providing their canvassers with them. The number of inquiries regarding the cost of electrical service and of additional apparatus which are being received by the local electrical contractors shows that the advertising methods adopted are having their effect.

With their characteristic energy, North country members of the trade are continuing their strenuous efforts for the W.O.B. campaign. Extensive newspaper advertising has brought the campaign to the notice of people living in all parts of the area, and the three demonstration houses at West Hartlepool, Gosforth and Burnopfield have been visited by large numbers of visitors. There are now 17 active circles in the N.E. area, and in addition to the demonstration houses already opened plans are being brought to fruition by several circles for opening further local demonstration dwellings.

Keen interest in the campaign has materialised into action at York, where local electrical interests have fitted up a house in Moorgate, Acomb Road. Demonstrators are on duty daily, and there has been large numbers of visitors.

Another correspondent in the North-East Coast area reports that, following the monthly meeting of the W.O.B. No. 7 Area Committee it is stated that 20 out of the 22 circles planned for the area have now been formed, and that in addition to the demonstration electric houses already opened at West Hartlepool, Gosforth and Anfield Plain it is proposed to inaugurate similar houses at Bishop Auckland, Gateshead, Whitley Bay and Alnwick.

The Newcastle-upon-Tyne Electric Supply Co. has disposed of over 7 000 competition booklets to members of the public.

In Scotland the various Electrical Circles have raised nearly £1 400 for local campaign work, £750 of this sum having been provided by the Electrical Contractors' Association of Scotland.

Last Thursday Edinburgh's first demonstration electric house was opened at 3, Sydney Terrace, Portobello Road, and will remain open until November 27th.

The London and Home Counties Area is now forging ahead and forming further Circles, but even now many more Circles are urgently needed. Mr. W. Ball, the district officer, is making an extensive tour of Kent, Surrey and Sussex, and his visits will undoubtedly lead to a big growth of campaign enthusiasm. In one London suburb great difficulty has been experienced in efforts to find a suitable house for demonstration purposes, but the electrical interests concerned are talking of having one specially built for the purpose.

Another stimulating example comes from Aylesbury, where Mr. W. A. Turnbull, pending the arrangement of a suitable demonstration house, has a stall in the market place on Saturdays, from which competition booklets and other campaign literature are distributed.

Owing to unforeseen delays (THE ELECTRICIAN's Manchester Correspondent states) the demonstration electric house at 40, Balmoral Drive, Denton, will not be opened until the early part of next month. The equipment is to be very complete.

On Tuesday a demonstration electric house was opened at 45, Loch Road, Paisley, for a period of three weeks. The house has been loaned by the Paisley Corporation.

The second Birmingham demonstration house is at Northfield. A third was opened this week at Erdington.

Readers are reminded that the latest issue of "Home Lighting News," to be published this week, will contain valuable information on increasing campaign contact with the public. Copies are obtainable free of charge from the E.D.A.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

MR. Henry Coates, electrical engineer, has been re-elected a member of Watford Town Council.

Mr. L. S. Christy, electrical engineer, has been re-elected a member of the Chelmsford Town Council.

Clitheroe T.C. has appointed Mr. A. R. Bleazard, clerk of works in connection with the electricity scheme.

Mr. John Walsh, electrical contractor, has been re-elected, unopposed, a member of Blackburn Town Council.

Senator G. Marconi has been unanimously elected an honorary member of the Institution of Electrical Engineers.

Mr. F. A. Greet, of Messrs. Toomer, electrical contractors, of Newbury, has been re-elected to the Newbury Town Council.

Mr. A. J. Ostler has been compelled to resign the honorary secretaryship of the I.E.E. Western Centre, owing to the pressure of other work.

Our sympathy is extended to Mr. T. Westmacott, engineer at the power station at Sandhurst, Berks, on the death of his son, Mr. F. Westmacott, who was lost with the ill-fated H.M.S. "Valerian."

Mr. Paul S. Clapp has been appointed managing director of the National Electric Light Association of America, in succession to Mr. M. H. Aylesworth, who has become president of the new National Broadcasting Co.

Lord Reading, Sir Hugo Hirst, Mr. J. de Rothschild, Mr. Bernard Baron and Dr. A. H. Railing have been elected directors of the Palestine Electric Corporation. Lord Reading is to be chairman, and Mr. P. Rutenberg, managing director.

Mr. J. F. Kayser, who has just joined the staff of James Neill and Co. (Sheffield) Ltd., Composite Steel Works, Sheffield, has had extensive experience in the manufacture of magnet steel.

Mr. R. E. Hellmund, formerly engineering supervisor of development, has been appointed to the newly created office of chief electrical engineer of the Westinghouse Electric and Manufacturing Co., and Mr. A. M. Dudley, formerly manager of the automotive equipment engineering department, has been appointed engineering supervisor of development.

Hackney (London) Borough Council has appointed Mr. Herbert A. Kraseman (shift charge engineer) as assistant power station superintendent, in the place of Mr. E. K. Wilkinson, who has become power station superintendent. The salary attaching to Mr. Kraseman's new position is in accordance with Grade 6 of the National Joint Board, equal at present to £461 16s. per annum.

A complimentary dinner was given at the Black Boy Hotel, Nottingham, last Saturday, in honour of the appointments of Mr. G. H. Lake and Mr. F. Nicholls, as borough and deputy borough electrical engineers, respectively, at Derby. The dinner was held under the auspices of the Electrical Power Engineers' Association, Mr. J. N. Waite, M.I.E.E. (chairman of the Midland Division) presiding. Mr. Lake and Mr. Nicholls were the recipients of presentations from the members of the Derby and District Section, in which they have both held office for some years. Mr. Lake was given a spirit tantalus, and Mr. Nicholls a silver silver.

Mr. S. B. Joel, Mr. E. R. Peacock, the Hon. Arthur Asquith, and Mr. Gordon Leith, have been appointed directors of the Underground Electric Railways Co., of London. Baring Bros. and Co., of which firm Mr. E. R. Peacock is a managing director, have been appointed financial agents to the Underground Co. Lord Newton, who is on the board of the parent company, has been appointed a director of the Central London Railway; and Sir Ernest Clark has joined the boards of the Metropolitan District Railway, London Electric Railway, City and South London Railway, Central London Railway, and London General Omnibus Companies.

Obituary.

The following deaths are reported :—

MR. WILLIAM JONES, aged 42 years. He was in business as an electrical engineer in High Street, Cobham, Surrey.

DR. MIGUEL LACROZE, aged 52 years. He was a director of the Buenos Ayres Lacroze Tramways and of the Buenos Ayres Central Railway.

CAPT. A. W. SIRETT, in his 56th year. Executive engineer of the Preston Section of the G.P.O. Engineering Dept., he had been 36 years' with the Post Office engineering service.

E.T.B.I. FUNDS.

Arrangements for Increasing Contributions at the Newcastle Ball.

AS previously announced in THE ELECTRICIAN, the eighth annual ball organised by the North East Coast Section of the Electrical Trades' Benevolent Institution is to be held in the Old Assembly Rooms, Westgate Road, Newcastle-upon-Tyne, on Friday, December 10th, and everything points to an even more enjoyable and profitable evening than that last year, when the ball and a ballot competition between them produced £180 towards the funds of the E.T.B.I.

A novel scheme for swelling the funds of this deserving charity has been arranged. A well wisher of the Institution has presented a valuable gold watch to the Committee, and this watch will be wound by a member and placed in a box, which will be sealed and locked in a safe. The box will be opened at the ball, and the person holding the coupon showing the nearest time after which the watch stops can purchase the watch at the extraordinarily low price of 1s.

The coupons are given to donors of 6d. in aid of the E.T.B.I. fund, and each such donor is given a coupon bearing a certain time in hours, minutes and seconds. Readers who have not already secured a supply of coupons should make early application for them, either to members of the North East Coast Committee or to the Editor of THE ELECTRICIAN.

Owing to the state of his health, Sir Hugo Hirst, the E.T.B.I. President, will be unable to attend the Newcastle ball, but Mr. J. Y. Fletcher will be there in his stead.

Forty Years Ago.

Brief News Extracts from "The Electrician," November 12th, 1886.

IN our issue dated November 12th, 1886—just forty years ago—it is stated that :—

There were eighty electric railways and tramways in existence.

* * *

In its second year the Brighton Electric Light Co. made a profit of £516.

* * *

As the Incandescent Electric Lighting Co. had taken no steps to give a supply of electricity in the town, Birmingham Town Council decided to ask the Board of Trade to revoke the Provisional Order granted to the company in 1883.

* * *

A telephone instrument which, from its description, appears to have been an early forerunner of the laryngaphone, was introduced.

* * *

Electrical apparatus for giving an alarm in cases of premature burial was installed in an Ohio cemetery.

* * *

Prof. Dolbear introduced an apparatus "for telephoning between two given points without wire," and claimed that it could be successfully employed over distances exceeding half a mile.

Books Received.

"Die Elektrischen Maschinen." By Dr.-Ing. M. Liwschitz. (Leipzig : B. G. Teubner.) Pp. viii+336.

"Alternating Current Rectification." By L. B. W. Jolley. (London : Chapman and Hall.) Pp. xxii+472. 30s. net.

"Pitman's Electrieal Educator." Part 30. Edited by J. A. Fleming, F.R.S. (London : Sir Isaac Pitman and Sons.) 1s. 3d. net.

"Successful Crystal and One Valve Circuits. By J. H. Watkins. (London : Sir Isaac Pitman and Sons.) Pp. xi + 104. 3s. 6d. net.

"Executors and Administrators—Their Functions and Liabilities, or How to Prove a Will." By G. F. Emery. Pp. 180. (London : Effingham Wilson). 3s. net.

"Die Ebene Vektorrechnung und ihre Anwendungen in der Wechselstromtechnik." By Dr. Ing. H. Kafka. (Berlin : B. G. Teubner.) Pp. viii+132. R.M. 7.60.

"Science Abstracts." Sec. A and B. Vol. 20, Part 10, No. 346. (October 25th). Issued by the Institution of Electrical Engineers. (London : E. and F. N. Spon.) Single Nos., 3s. ; annual subscription, 30s. ; both sections, 50s.

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LEGAL INTELLIGENCE.

An Alleged Faulty Crystal Glass Chandelier —Judgment for Defendant.

IN Whitechapel County Court, on November 5th, Mrs. H. Katz sued Hiller Bros., 52, Whitechapel Road, Whitechapel, E., electrical engineers, to recover £6 6s. as damages for breach of warranty on the sale of a crystal glass chandelier, or alternatively damages for negligence.

Judge Cluer said there was no ground for the action, and he would find for the defendants, with costs.

Claim for Accountants' Charges.

In the Mayor's and City of London Court, before Mr. Registrar Dell, on November 4th, a claim was made by Mr. W. R. Gaff, 54, New Broad Street, London, chartered accountant, against E. Harrison and Son (Southend), Ltd., 95, Princess Street, London Road, Southend-on-Sea, electrical contractors, for £10 10s. for professional services rendered.

Judgment was entered for the plaintiff for the amount claimed, payable by two instalments.

Damages for False Imprisonment.

Before the Lord Chief Justice and a special jury last week, Mr. J. F. Prendergast, electrical engineer, 122, Wigmore Street, London, W.1, claimed damages from Mr. G. H. Ellis, —with whom he had formerly been associated in business— for false imprisonment. It appeared that defendant, missing a "Megger" from stock and seeing plaintiff carrying one of these instruments (which, it was later established, had been borrowed from an electrical firm in Kingsway) caused plaintiff to be taken into custody for the alleged theft of the instrument. After the plaintiff had been charged defendant said he had changed his mind and preferred to bring a civil action.

Defendant denied that he had authorised the imprisonment.

The jury returned a verdict for £500 and costs in favour of plaintiff, and judgment was entered accordingly.

A Title for Contractors.

Further Search being Made for Suitable Appellation for Registered Contractors.

AS we surmised when publishing the results of THE ELECTRICIAN'S competition for a suitable descriptive title for registered electrical installation contractors, the question is still occupying the minds of many of the competitors and of other members of the trade, and we hope these further efforts will prove successful.

A reader who adopts the pseudonym "O. I. Hadsome-Buttons," gives his views in the following playful lines:—

You ask for a name for electric contractors;
To help solve this task one must study these factors:
Can one give them exams to sift out the actors
From those whom we might call the sheiks?
Can one get them to wire a cottage or castle?
Can one try their skill packing lamps in a parcel?
Or wire up a gadget for electrical Marcel?
Or find out a series of leaks?

No. One can't put their skill to test or to measure,
Nor find how much time they're devoting to leisure;
But I'm sure it will give a few of us pleasure
To give *some* contractors new names.
One would be known in the plumbing fraternity,
One painter or plasterer, and for a certainty
Should carry his new name into eternity
Or have it consumed in the flames.

Incidentally, a contemporary modestly attempts to claim the distinction of having first suggested, in its issue of July 16th last, the words "electractor" and "registractor. These names, together with the word "registrician," it will be recollected, were chosen by the National Register of Electrical Installation Contractors as being the three best words offered by readers of THE ELECTRICIAN; and as Mr. Harry Moss, of Bradford, was the only competitor to submit all three, the prize of £5 5s. was awarded to him. In this connection it is interesting to note that these suggestions were in our hands ten days before our contemporary published its inspirations, and that one of the clearly stated conditions of the competition was that no member of the staff of any electrical paper would be eligible for the prize.

IN LIGHTER VEIN.

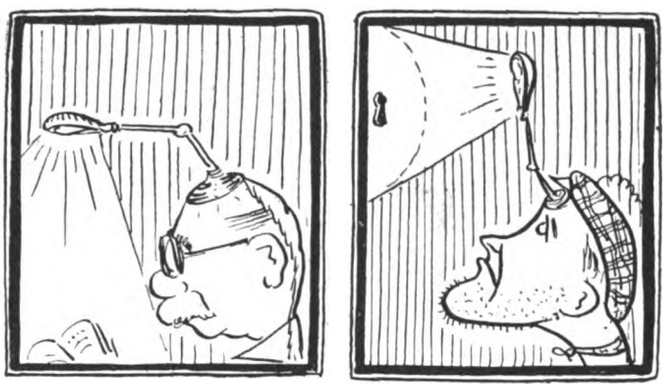
A Novel Electrical Appliance Suitable for Christmas Gifting.

THE Christmas season is now rapidly bearing down on us, so that, like the artists' models, who are now shivering in bathing costumes, posing for the summer splashes, we must prepare a little in advance. Electrical presents will be popular this year, and there is a wonderfully wide range from which to choose.

* * *

One of the most useful and acceptable gadgets offered to the public for the first time this year is the Blimpet. A good lamp, like a good wine, needs no Bush, but as there are many original features in the Blimpet, without beating about the Bush, here's the description (without a blush). It is a small portable lamp which has innumerable uses. At the base is a dished rubber washer, which grips any object by suction, and so "stays put." The standard model, which is nickel-plated, is made with a universal joint, so that the light can be directed just where desired.

* * *



The Blimpet, exclusive details of which are given on this page, is adaptable to a variety of uses. To the left it is seen in use as a reading lamp. On the right its value to the burglar is demonstrated.

For a reading lamp it cannot be excelled, particularly for bald-headed men. Stuck in the middle of the head, it directs a powerful beam of light on to the book. This is not all. Oh no! The Blimpet is a scientific thingumajig. Every one is familiar with the phenomenon—persistence of vision—not to be confused with double vision; one is caused by a bright light and the other by a bright night. Moving the eye from a brilliantly illuminated area to a dark area causes eye-strain. Unless the whole of a room is evenly illuminated, which is not always possible or desirable, it is impossible, in the ordinary way, to remove this trouble.

* * *

But consider the Blimpet. It sticks like a limpet. When the wearer turns his head, round goes the Blimpet with it. He is therefore always looking at a brightly illuminated area. Always in the right spot, no waste, no eyestrain—that's the Blimpet.

* * *

A special model, which can be connected to a battery carried in the pocket, has already a large sale among cat burglars. Designed by a prominent member of the light-fingered profession, it has proved invaluable on many nocturnal expeditions. The lamp is worn on the front of the head, held by suction, so leaving both hands free for climbing, lock and jemmy work and truncheon manipulation. There are plenty of openings where the introduction of this lamp would enable things to be seen in a different light. A dimming switch is fitted for use when passing policemen.

* * *

STOCK EXCHANGE NOTES.—Accumulators have been very active, and have risen two points, but Frequencies remain unchanged. After a slight fluctuation, Volts settled down to a steady 230, but Amps remained firm.

Bulbs are brighter, Emitters dull and Resistances variable.

There was a sudden demand for Watts. This was quickly reflected on Breakers, which opened at 395 and closed at 320.

Steel hardened, but Coppers remained soft. Fittings have gone up, but Pendants have dropped. Plugs were withdrawn at 3 points.

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BUSINESS OPENINGS.

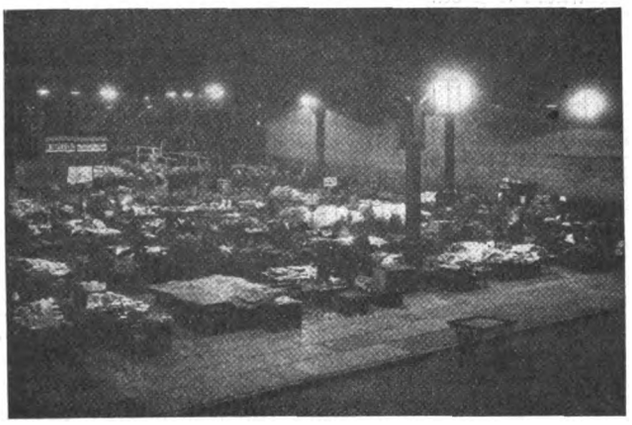
Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given.

GUILDFORD CORPORATION.—Electric motors and pumps for sewage pumping station.

WORKING MEN'S CLUB AND INSTITUTE, ABERAVON.—Electric light wiring. Specifications, etc., from the Secretary, Working Men's Club and Institute, Talbot Street, Aberavon, Port Talbot; deposit £1 1s.

MAYO COUNTY BOARD OF HEALTH, November 12th.—About 600 yards of overhead line between the Mental Hospital and the County Hospital (Infirmary) at Castlebar. Specifications, etc., can be seen at the office of the Secretary, County House, Castlebar.



From an untouched photograph of one of the Preston market places, now lighted electrically by the Electricity Department with Siemens 500 and 750 W gasfilled lamps in dispersive type steel reflectors.

DUBLIN BOROUGH COMMISSIONERS, November 13th.—One year's (*a*) supply or (*b*) supply and erection of transformers, for the Electricity Department. Specifications from the City Electrical Engineer, Fleet Street, Dublin; deposit £1 1s.

EVESHAM CORPORATION, November 15th.—Electrical installations at the public hall and town hall. Particulars from Mr. J. Abbott, borough surveyor.

PLYMOUTH CORPORATION, November 16th.—Cast-iron pipes, for the Electricity Department. Specification, etc., from Mr. E. G. Okell, borough electricity engineer, Prince Rock, Plymouth.

LEEDS GUARDIANS, November 17th.—Electric light installation at Block 4, St. James' Hospital, Beckett Street, Leeds. Specification from Mr. J. H. Ford, Poor Law Offices, South Parade, Leeds.

WALTON-ON-THE-NAZE URBAN DISTRICT COUNCIL, November 17th.—Supply of about 2 300 yards of l.t. paper insulated cable, jointing compound, and feeder pillars. Specification, etc., from Mr. C. W. Close, Electricity Works, Walton-on-the-Naze.

AUCKLAND, SHILDON AND WILLINGTON JOINT HOSPITAL BOARD, November 18th.—Electric wiring and fitting of Helmington Row Isolation Hospital. Particulars from the Clerk, Union Offices, Bishop Auckland.

DUBLIN BOROUGH COMMISSIONERS, November 18th.—Electric wiring of 59 houses at Fairbrothers Fields. Particulars from the City Treasurer, Lord Edward Street, Dublin; deposit £1 1s.

TYNE IMPROVEMENT COMMISSION, November 18th.—Six or twelve months' supply of electrical accessories and incandescent lamps. Form of tender (No. 22) from the Secretary, Bewick Street, Newcastle-on-Tyne.

AYRSHIRE EDUCATION COMMITTEE, November 19th.—Electric light installation at the higher grade school, Dalmellington. Particulars from Mr. W. Reid, Master of Works, Education Offices, Ayr.

DUNDEE CORPORATION, November 19th.—Supply of arc lamp carbons. Specifications, etc., from Mr. D. H. Bishop, General Manager and Engineer, Electricity Supply Department, Dudhope Crescent Road, Dundee.

GREAT WESTERN RAILWAY, November 19th.—Supply of stores, including (Form 18) telegraph instruments; (Form 19) electrical apparatus (insulators), etc.; (Form 20) electrical wires and cables; (Form 21) telegraph ironwork and tools; and (Form 22) telegraph drysalteries. Specifications and forms of tender from the Stores Superintendent, Swindon.

LEYTON CORPORATION, November 19th.—Electric light installation at Knott's Green Special School. Specifications from Mr. J. H. Jacques, 61, West Ham Lane, Stratford.

MANCHESTER CORPORATION, November 19th.—Industrial electric motors (specification 170); and starting switches for d.c. motors and star-delta switch starters (specification 171). Specifications from Mr. H. C. Lamb, Electricity Department. Town Hall, Manchester; £1 1s. deposit for each.

CARDIFF CORPORATION, November 22nd.—(1) Water tube boiler, mechanical stokers and forced draught plant; (2) steel chimney and grit collecting plant; (3) induced draught plant. Particulars and specification from the City Electrical Engineer, The Hayes, Cardiff. Orly members of the King's National Roll are invited to tender.

WORTHING CORPORATION, November 23rd.—Installation of complete fire alarm system in the borough. Forms of tender, etc., from the Borough Surveyor.

RICHMOND (SURREY) CORPORATION, November 24th.—Overhauling and maintenance of fire alarm, fire telephone and firemen's call bell systems. Specifications from the Borough Engineer and Surveyor, Town Hall, Richmond.

BRIGHTON CORPORATION, November 25th.—Supply and erection at Southwick power station of 15 625 kW turbo-alternator, with condensing plant and auxiliaries. Specifications from the engineer, Mr. John Christie; deposit £3 3s.

CROYDON CORPORATION, November 26th.—(*a*) 10 complete bodies for electric tramcars; (*b*) 10 complete sets of maximum traction bogie trucks; (*c*) magnetic track and wheel brake equipments for 10 tramcars; and (*d*) 10 complete sets of electrical equipments for tramcars, with assembly of 10 car bodies, trucks, electrical equipments and brakes into complete tramcars in readiness for service. Specifications, etc., from the Tramways Manager, Tramway Offices, Thornton Heath; deposit £2 for either (*a*), (*b*), (*c*) or (*d*).

HAMMERSMITH (LONDON) BOROUGH COUNCIL, November 26th.—Two water tube boilers, each capable of supplying 45 000 lbs. of steam per hour, mechanical stokers, feed pumps, piping, conveyors, bunkers, etc. Specifications, etc., from Mr. F. Hill, Electricity Works, 85, Fulham Palace Road, W.6.

HASTINGS CORPORATION, November 30th.—Pumping plants in two pumping stations, including turbine or centrifugal deep well pumps driven by electric motors, with all electrical equipment and connections inside buildings. Specifications, etc., from Mr. G. Midgley Taylor (John Taylor and Sons), Caxton House, Westminster, S.W.1; deposit £5.

DUBLIN PORT AND DOCKS BOARD, December 1st.—Supply and erection of a 4-ton level luffing electric portal crane. Specification from the Engineer of the Board (Mr. J. Mallagh), East Wall, Dublin.

PRESTATYN URBAN DISTRICT COUNCIL, December 6th.—Underground cables, overhead lines, transformers, e.h.t. and l.t. switchgear and sub-station equipment. Specifications, etc., from Mr. J. Lloyd Hughes, Clerk of the Council; deposit £2 2s.

METROPOLITAN WATER BOARD, December 6th.—Two steam driven electric generators (one 100 kW and one 50 kW), switchboard, piping, etc., for Kempton Park Pumping Station. Specification, etc., will be supplied on deposit of £1 1s. with the Accountant, 173, Rosebery Avenue, London, E.C.1.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trades (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

SYDNEY CITY COUNCIL, November 15th.—Supply of 33 000 V cable and pilot cable. Specification (No. 1 047) from the Constructional Engineer, Electricity Department, Town Hall, Sydney.

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POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 16th.—Supply of timing clocks for indicating the duration of telephone trunk line calls. (Reference B.X. 2 827.)

LATVIAN POST AND TELEGRAPH ADMINISTRATION, November 20th.—High frequency telephone equipment. (Reference B.X. 2 993.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 23rd.—Lightning arresters and transformers. (Reference B.X. 2 792.)

PORT ELIZABETH MUNICIPALITY, November 25th.—Supply and erection of duplicate electrically driven automatic float-controlled centrifugal sewage pumps, etc. (contract 24, Mill Park). (Reference A.X. 3 680.*)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 26th.—Primary battery material.

SYDNEY CITY COUNCIL, November 29th.—High and low tension cables (contract 1 057). (Reference B.X. 2 959.)

SYDNEY CITY COUNCIL, November 29th.—Three-phase oil-immersed induction voltage regulator. (Reference B.X. 2 936.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 30th.—Supply of 110 kW transformers. (Reference X.B. 2 874.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT. November 30th.—Two tons of galvanised building wire. (Reference A.X. 3 721.)

BELGIAN MINISTRY OF NATIONAL DEFENCE, December 1st.—Supply of 458 portable accumulator batteries of 150 Ah capacity for the Signalling Section of the Army. Particulars (Cahier des Charges Special, No. 709), from 15, Rue des Augustins, Brussels; charge 4½ francs.

EGYPTIAN MINISTRY OF THE INTERIOR, December 1st.—X-ray apparatus (Reference B.X. 2 999.)

SOUTHLAND ELECTRIC POWER BOARD, INVERCARGILL, N.Z., December 1st.—Supply of a 3 000 H.P. horizontal Francis turbine and 2 350 kW generator. (Reference B.X. 2 822.)

SYDNEY CITY COUNCIL, December 1st.—Tungsten filament electric lamps. (Reference B.X. 2 995.)

VICTORIAN RAILWAY COMMISSIONERS, December 1st.—Rotary converter or rectifier set, with switching equipment for its automatic operation.

EGYPTIAN MINISTRY OF THE INTERIOR, December 2nd.—Supply and erection of four pumps, filters, electric motors, etc., at the Sembellawein Waterworks. (Reference A.X. 3 764.)

EGYPTIAN MINISTRY OF THE INTERIOR, December 5th.—Electric motors and accessories. (Reference B.X. 2 996.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, December 6th.—Key switches. (Reference B.X. 2 962.)

STATE DLECTRICITY WORKS, MONTEVIDEO, December 6th.—Diesel-electric generating sets.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 7th.—Three-phase induction regulator for Waikato electric power scheme (section 206.) (Reference B.X. 2 935.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 10th.—Electric motors. (Reference B.X. 2 861.)

JOHANNESBURG MUNICIPALITY, December 11th.—High tension cable (contract 714). (Reference B.X. 3 017.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 14th.—Sub-station cables and cable boxes for Arapuni (section 188). (Reference B.X. 3 010.)

KEETMANSHOOP (SOUTH AFRICA) MUNICIPALITY, December 15th.—Supply and delivery of material for an electric lighting scheme for the town. (Reference B.X. 3007.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 15th.—Switchgear, cable, motor-generator sets, junction boxes, etc., for Hutt Valley Locomotive Workshops. (Reference B.X. 2 949.)

VICTORIAN ELECTRICITY COMMISSION, December 15th.—Water tube boiler, with superheater, economiser, etc., for Yallourn power scheme. Specification (No. 28/82), from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.2; deposit £3 3s.

EGYPTIAN MINISTRY OF EDUCATION, December 16th.—Five a.c. motors and switchboard for Assiut model workshops. (Reference B.X. 3 016.)

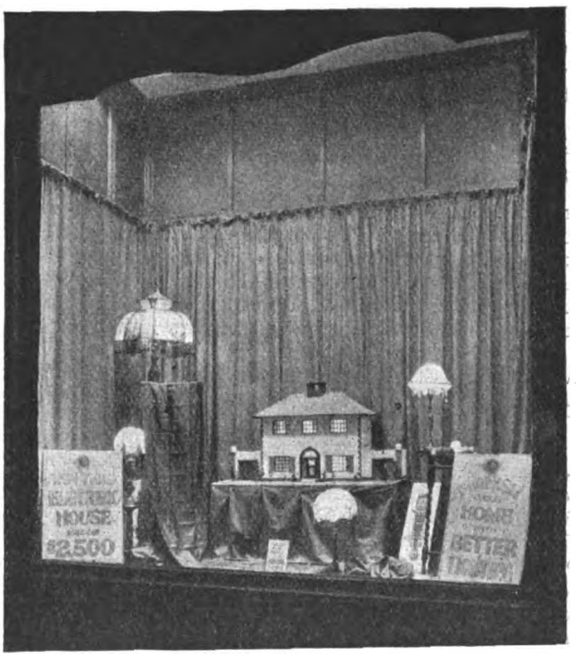
INDIA STORE DEPARTMENT, December 21st.—Supply and erection of overhead transmission line, 110 000 V, about 280 miles in length. Specification (5s.) from the Director-General, Branch 14, Belvedere Road, London, S.E.1.

INDIA STORE DEPARTMENT, December 21st.—About 280 miles of overhead transmission line (110 000 V). Specifications 5s. each) from the Director-General, Branch No. 10, Belvedere Road, London, S.E.1.

VICTORIAN RAILWAY COMMISSIONERS, December 22nd.—Supply of a wheel lathe, with electrical and other equipment. (Reference A.X. 3 735.)

INDIA STORE DEPARTMENT, November 23rd.—Eight overhead travelling electric cranes (10 ton and 25 ton). Specifications (5s. each) from the Director-General, Branch No. 10, Belvedere Road, London, S.E.1.

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 1st.—Supply and erection at site of Seru pumping and power station, of four Diesel engine alternator groups, three pumps and accessories. Specification (10s. 6d.) from Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1.



An attractive W.O.B. window display at the new B.T.-H. showrooms in King's House, King Street West, Manchester.

INDIA STORE DEPARTMENT, January 4th.—Supply and erection of overhead equipment (1 500 V) and steel structures for about 140 miles of railway route, in connection with the great Indian Peninsula Railway electrification. Specification (£2) from the Director-General, Branch No. 10, Belvedere Road, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 4th.—Supply of switchgear and transformers for Waikaremoana electric power scheme. (Reference B.X. 2 872.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 4th.—Bells and buzzers (schedule C147). (Reference B.X. 2 984.)

CHINA, January 15th.—Turbo-generators, condensers, boilers, switchgear, transformers, etc. Tenders are invited by a Chinese company holding a concession for water and electricity supply (Reference B.X. 2 998.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 18th.—Transmission line steel towers for Waikaremoana electric power scheme (section 31.) (Reference A.X. 3 732.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 18th.—Switchboard cable (schedule C. 151). (Reference B.X. 3 013.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, January 19th.—Electric bells and tumbler switches. (Reference B.X. 3 011.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, January 20th.—Electric railway car equipments, including motors, control equipment, air compressors, etc. Specification (No. 1 065) from the Chief Mechanical Engineer, Wilson Street, Redfern, N.S.W.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 25th.—Telephone transmitters and parts. (Reference B.X. 3 012.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 1st.—Storage battery and booster for Waikaremoana Electric Power Board (section 28). (Reference B.X. 2 937.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 15th.—Transformers, for Waikato (section 207). (Reference B.X. 2 985.)

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ELECTRICITY SUPPLY.

Alloa Electricity Undertaking to be Sold—Electric Lighting on the Island of Mull—Inauguration of Electricity Supply at Rhuddlan.

WINDERMERE U.D.C. has decided to adopt electric lighting in place of gas in the Council buildings.

Ashton-in-Makerfield U.D.C. has applied to the Electricity Commissioners for a loan of £4 000 for mains and services, and £200 for meters.

Cookham and District Electricity Corporation, Ltd., has informed Marlow U.D.C. that the charges for electric lighting cannot be reduced at present.

Beckenham U.D.C. has applied to the Electricity Commissioners for a loan of £33 000 for a 3 000 kW turbine, accessories, cooling tower and boiler.

The local gas company has lodged an objection to the application of Seaham Harbour U.D.C. for a Special Order to supply electricity in the district.

Croydon Proposes Easy-Payment Wiring.

Croydon Corporation General Purposes Bill includes provisions to authorise the electric wiring and fitting of consumers' premises on a deferred payment system.

A proposal is on foot to establish an electricity generating plant at the Old Mill, Deddington, Oxfordshire. It is hoped that by the use of water power, energy will be supplied at a comparatively low rate.

Weymouth T.C. is applying to the Electricity Commissioners for a Special Order to supply electricity in the urban district of Portland and in the rural districts of Weymouth, Dorchester, and Wareham and Purbeck.

Coventry T.C. has decided to seek powers to extend the area of supply so as to include the parishes of Binley, Keresley, Stoke Heath, Walsgrave, Willenhall, Wyken, Allesley, Berkswell, Coundon, Baginton and Stoneleigh.

Dulverton R.D.C. decided last Friday to consent to the application by the Dulverton Electric Lighting Co. for a Special Order to supply electricity in the Council's district and in Wiveliscombe urban district and Milverton.

At a meeting of Alloa T.C. last Friday, a recommendation by a special committee that the Council dispose of the town's electricity undertaking to the Scottish Central Electricity Power Co. for the sum of £100 000 was unanimously adopted.

It is estimated that the electric lighting of the streets in the Kelty special lighting district will be £341 4s. 0d. in excess of the present cost of gas lighting. The Dunfermline District Committee has decided to leave the matter to the Kelty Local Committee.

Skegness U.D.C. has received offers from the Skegness Electricity Co., Ltd., and the Skegness Pier Co. for the supply of electricity for the new bathing pool and orchestral piazza. The latter company proposes to lay down electrical plant for the pier before next Easter.

Tobermory is to be lighted by electricity by about Christmas. Some difficulty has been experienced in erecting the poles for the light, for Tobermory is built on rock, but these engineering obstacles have been overcome. The town, which is on the island of Mull, is at present lighted by oil lamps.

Monks Kirby R.D.C. has decided to offer no objection to the application of the Leicestershire and Warwickshire Electric Power Co. for a Special Order to supply electricity to Monks Kirby, Wibtoft, Willey and Copston Magna, provided the company undertakes to supply on a reasonable demand in the district.

Stoke-on-Trent Extension Commenced.

A beginning has been made of the construction of the foundation for the extension of the Stoke-on-Trent Corporation's central station which will increase its capacity from 15 000 to 25 000 kW. The scheme will cost £160 000, and will include, in addition to a new 10 000 kW turbo-alternator, condensing plant, two boilers, a large cooling tower, etc.

Canterbury City Council has asked the Kent Electric Power Co. and the East Kent Electric Power Co. whether it is their intention to give a supply of electricity to the parishes of Fordwich, Sturry, Westbere, St. Stephen's, Harbledown, and a portion of Blean, and, if not, whether they would oppose an application by the Council for an order to include those parishes in its area of supply.

The latest guarantees which the Treasury has given under the Trade Facilities Acts include guarantees to the Teignmouth Electric Lighting Co., Ltd., £12 500; East Suffolk Electricity Distribution Co., Ltd., £20 000; Electricity Distribution of North Wales and District, £50 000 (in addition to a previous guarantee of £100 000); and North Wales Power Co., Ltd., £300 000 (in addition to previous guarantees of £1 500 000 and £200 000).

The inauguration of an electricity supply for the parish of Rhuddlan took place last Saturday. The Rhuddlan Parish Council is the first authority of its kind in North Wales to have its streets lit with electricity. The supply is taken from the North Wales Power Company's works at Dolgarrog, and the distributors are Electricity Distribution of North Wales and District, Ltd. The current was switched on by Mrs. R. C. Thompson, wife of the chairman of the Parish Council.

At a recent Preston Corporation meeting Coun. Rainford said when the Corporation took over the electricity undertaking the total income of the Department was £60 000 per annum; to-day that figure was being paid by five customers alone. Coun. Rhodes mentioned that the Electricity Department had saved considerable sums by buying pithead instead of foreign coal. Compared with other stations, their expenditure on fuel had only been a quarter of the general average.

Isle of Man Local Government Board has intimated that it would like the advice of another expert before deciding on the application of Douglas T.C. to borrow £83 000 for electricity extensions. An inquiry was held recently, but the Board desires further expert opinion as to the proposal to substitute steam plant for the oil-driven plant originally recommended by Mr. Dykes, and also in regard to the likelihood of the life of the present plant on the Quayside being equal to the period of the loan.

Electrical Distribution of Yorkshire has secured powers for the supply of electricity in the Wetherby area, and it is expected that the supply will be available before the end of the year. The proposed charges are 6d. per kWh for lighting and 1½d. to 1d. for heating, cooking and other domestic purposes, or an all-in tariff of 12s. per room per annum plus 1½d. to 1d. per kWh. It is stated that the company will put into operation next year a scheme for easy-payment wiring and the hiring of apparatus.

Proposed New Generating Station in Lancashire.

On the recommendation of the Engineering Advisory Committee, the South-East Lancashire Electricity Advisory Board has resolved that, in order to enable the Engineering Advisory Committee to complete its report to the Board on the proposal of the Lancashire Electric Power Co. to erect a new generating station at Kearsley, the Committee be instructed to approach the Corporations of Salford, in respect of Agecroft; Manchester, in respect of Barton; and Oldham, in respect of Chadderton; and ask them if they would be willing to extend their stations to meet all or any of the demand which it is proposed should be met by the Kearsley station; and upon what terms and conditions they would be prepared to furnish all or any of such demand.

The supply of electricity in the borough of Richmond (Yorks) has just been inaugurated. In 1924 a committee was formed to deal with the question. The committee met and expressed their intention to propose the erection of a generating station at Richmond; but the Electricity Commissioners were not agreeable to the project, and suggested that a bulk supply might be obtained from a neighbouring power station and transformed for town use. Subsequently the Council applied to the War Office for permission to obtain a power supply from the power station at Catterick Camp. After some delay, the Commissioners consented to the proposal, and the Council entered into the necessary agreement with the War Department. Johnson and Phillips secured the contract for carrying out the scheme. The power is transmitted from Catterick by means of an overhead cable which, however, goes underground after reaching the borough boundary. The current is transformed down from 3 000 V to 250 V. The present charges are 8d. per kWh for lighting and 4d. per kWh for power. The Corporation intends to use electricity for street lighting, and already it is being used for lighting the market cross, the town clock, the town hall and the market hall. The Mayor is of opinion that there will be a great number of applications for installations after the residents have seen the advantages of electricity.

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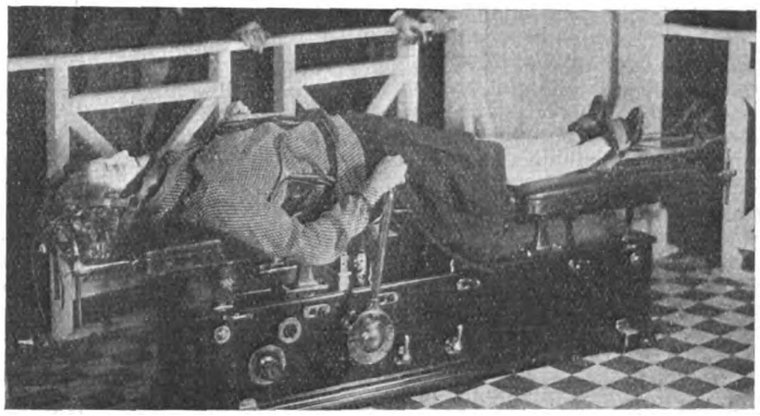
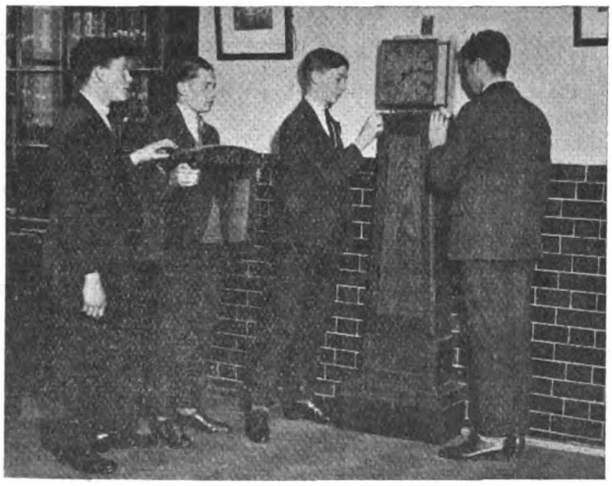
ELECTRICAL NEWS IN PICTURES

The message on this hoarding on the Newcastle Electric Supply Co.'s new building serves as an example of the consideration shown by this undertaking to the public which it serves



Many novel electrical devices are being shown at the Electrical Exposition at the Grand Central Palace, New York, including a vacuum cleaner said to be small enough to fit in the palm of the hand ! There is an electrical stretching machine for stretching short people and broadening those who are too slim.



The four pupils of a London school with the electric clock which, as reported in THE ELECTRICIAN, they have made themselves as a gift to the school.

During their tour of this country, the Dominion Premiers visited the Rugby wireless station, where this group was taken, and the Metropolitan-Vickers works.

GOVERNMENT CONTRACTS.

Recent Orders for Electrical Machinery, Apparatus and Material.

THE following contracts have been placed recently by British Government Departments :—

ADMIRALTY (CONTRACT AND PURCHASE DEPARTMENT).—*Cable, Electric :* British Insulated Cables, Ltd. ; Enfield Cable Works, Ltd. ; St. Helens Cable and Rubber Co., Ltd. ; General Electric Co., Ltd. ; Johnson and Phillips, Ltd., and W. T. Glover and Co., Ltd. *Caps, Valve Protecting :* Bullers, Ltd. *Fans, Ship :* Newton Dynamo Works. *Fans, Table :* General Electric Co., Ltd., and Veritys, Ltd. *Heating Plant :* Greenwood and Batley. *Lamp Fittings :* General Electric Co., Ltd., and McGeoch and Co., Ltd. *Panels, W/T :* H. W. Sullivan, Ltd. *Plugs and Sockets :* Edison Swan Electric Co., Ltd. *Starters and Resistances :* Watford Electric Manufacturing Co.

WAR OFFICE.—*Cable, Electric :* Johnson and Phillips, Ltd. *Drums, Cable No. 9 and Stands :* Ruston and Hornsby, Ltd. *E.L. Fittings :* Cable Accessories Co., Ltd. *Generating Set :* Ruston and Hornsby, Ltd., *Mercury Arc Rectifier Equipment :* Hewittic Electric Co., Ltd. *Switches, E.L. :* General Electric Co., Ltd. *Installations : Electric Light :* Gravesend Barracks, Burch and Verture.

AIR MINISTRY.—*Accumulators :* Chloride Electrical Storage Co., Ltd. *Internal Wiring (Suttons Farm) :* G. E. Taylor and Co. *Underground Cable (Flowerdown and Worthy Down) :* Walshams, Ltd. *Delco Ignition Spares, Repair of :* Delco-Remy and Hyatt, Ltd. *Magnetos and Spares :* Scintilla, Ltd. *Sparking Plugs :* Robinhood Engineering Co., Ltd. *Telephone-Telegraph Installations (Persian Gulf) :* Marconi's Wireless Telegraph Co., Ltd. *Transmitters :* Gambrell Bros., Ltd., and Johnson and Phillips, Ltd.

POST OFFICE.—*Cable—Manufacture, Supply, Drawing-in and Jointing :* Glasgow-Paisley : Johnson and Phillips, Ltd. ; Caerphilly-Hengoed : Callender's Cable and Construction Co., Ltd. *Switchgear, E.H.T., D.C. :* Rugby Radio Station : General Electric Co., Ltd. *Telephone Exchange Equipment :* Carlisle : Siemens Bros. and Co., Ltd. ; East Finchley : General Electric Co., Ltd. ; Sub-Contractors : D. P. Battery Co., Ltd., for Batteries ; Crompton and Co., Ltd., for Machines. —Streatham ; Tottenham : Standard Telephones and Cables, Ltd., Weston-super-Mare : Automatic Telephone Manufacturing Co., Ltd. ; Colne (Lancs) : Ericsson Telephones, Ltd., Droylsden Industrial Co-operative Society, Ltd. (Manchester) ; United Dairies, Ltd. (W.2) ; W. Crawford and Sons, Ltd. (Liverpool) ; International Combustion, Ltd. (W.C.2) ; Barrow, Hepburn and Gale (S.E.1) ; Castner-Kellner Alkali Co., Ltd. (Runcorn) : Relay Automatic Telephone Co., Ltd. *Telephonic Repeater Station—2-wire Repeater Equipment—Installation, etc. :* Catterick ; Leeds : Standard Telephones and Cables, Ltd. *Apparatus, Telephonic :* Automatic Telephone Manufacturing Co., Ltd. ; Ericsson Telephones, Ltd. ; International Electric Co., Ltd. ; Peel-Conner Telephone Works (General Electric Co., Ltd.) ; Standard Telephones and Cables, Ltd., and Sterling Telephone and Electric Co., Ltd.

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ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

YORK Tramways Committee recommends the Council to apply for sanction to an extension of the trackless trolley system from East Parade, Heworth, to Tang Hall.

The Passimeter system of booking will shortly replace the old-fashioned booking office at Victoria (London) Underground Station. The three booking booths will contain 20 high-speed automatic ticket-issuing machines, each of which can book 1 000 passengers per hour.

The Blackpool and Fleetwood authorities have agreed to a scheme for the reconstruction and improvement of the tramway track (for which Blackpool T.C. is responsible) in the Fleetwood area. The span wire system is to be substituted for the centre pole system.

It was mentioned at the last meeting of West Hartlepool Corporation that the Ministry of Transport had imposed alterations in the Council's railless trolley bus equipment which would cost £937. It is stated that the new system should be in operation at the beginning of next year.

Allerton Welfare Council has lodged a protest against a proposal of Bradford Tramways Committee to substitute railless trolley vehicles for the tramway service to Allerton. It is estimated that the railless trolley equipment would cost £37 000, compared with £67 000 for relaying the tramway track.

Mr. R. S. Pilcher, manager of the Edinburgh Tramways, addressing members of the Royal Scottish Society of Arts last week, on "Some Present-Day Transport Problems," said that for heavy traffic and frequent service the tram had advantages over the bus, especially as it could be operated at a less cost and provide greater accommodation.

The Southern Railway has in contemplation a development scheme which will involve the widening by an average of 20 ft. of the six-mile section of the line between Peckham Rye and Shortlands. Later the widening of the line to a similar extent as far as Tonbridge is to be considered. It is understood, however, that this further scheme will not be started for a year or two.

Not a single accident to passengers was entailed through the working of the London "Underground" trains in 1925. In all 319 000 000 passengers were carried and 14 182 000 train miles were run. This result may be attributed to the efficacy of the electric-pneumatic system of signalling, which permits of intensive train operation—certain sections of the Underground have the highest frequency service of any railway in the world—with an infinitesimal chance of mishap.

At a meeting last week Cardiff Tramways Committee considered reports in reference to the proposal to acquire Dragon Buildings, Paradise Place, as offices for the tramways department. This later scheme was considered in conjunction with the Frederick Street scheme for the erection of offices for the tramways and electricity departments, and the acquisition of a number of houses to effect a public improvement. The two schemes were referred to a joint committee for consideration and report.

WIRELESS NEWS.

From Gaol to Broadcasting Station.

The steady improvement in Irish conditions is reflected in the announcement that Standard Telephones and Cables, Ltd., have been commissioned by the Irish Post Office to supply a broadcasting station for Cork, and this will be located in the gaol, now fortunately no longer required.

Wireless News in Brief.

It is reported that at the end of June last there were 125 047 radio licences issued in Australia, equal to 2·1 per cent. of the population. Of these licences 63 494 were held in Victoria and 36 292 in New South Wales.

The Wireless League calls attention to the fact that it is estimated that by the end of the current year £900 000 will have been retained by the Post Office out of the fees paid for wireless licences and suggests that it is of great importance that more than this amount should be spent for the benefit of the listener instead of being used by the Government for the relief of taxation.

WORK IN PROSPECT.

Trade Possibilities for Electrical Installation Contractors.

ABERYSTWYTH.—Housing scheme (50), Penparke. Particulars, the Borough Surveyor.

AMESBURY (HANTS).—Additional housing scheme (58). Particulars, the Surveyor.

BEXHILL-ON-SEA.—Housing scheme, Sidley. Particulars, the Borough Surveyor.

CHERITON (KENT).—Houses (18), for Folkestone and District Building Co., Ltd.

CHERTSEY.—Houses (24). Particulars, the contractors, H. Lacey and Sons.

CHILBOLTON AND WHERWELL.—Schools. Particulars, the Director of Education, Mr. D. T. Cowan, Winchester.

CHRISTCHURCH.—Schools (225 places). Particulars, the Director of Education, Mr. D. T. Cowan, Winchester.

DOVER.—Extensive dock warehouse, for Southern Railway Co.

DUSTON (NORTHANTS).—Church, for Congregational Trustees. Particulars, the pastor, Mr. C. H. Battle.

EAST ELLOE.—Houses. Particulars, the contractor, Mr. C. H. Cruise, Holbeach.

EPPING.—Houses (100), Bower Road, for Mr. Basil Scruby.

FAREHAM.—Girls' secondary school. Particulars, the Director of Education, Mr. D. T. Cowan, Winchester.

GUILDFORD.—Houses, Shere. Particulars, the contractor, F. H. Wood and Son, Albury.

IRLAM (LANCS).—Additional 40 houses. Particulars, the Surveyor.

MALDON.—Houses (120), for Crittall Housing and Investment Society, Ltd.

ONGAR.—Housing scheme (14). Particulars, the surveyor, Mr. P. Pearce.

PITSEA (ESSEX).—New Railway Hotel, for Ind, Coope and Co., Ltd., Romford.

RAMSGATE.—Additional 100 houses, Margate Road. Particulars, the Borough Engineer.—Sports pavilion (£2 000). Particulars, the architect, Mr. W. E. Healey.

SPENBOROUGH (YORKS).—Additional 116 houses. Particulars, the Surveyor, Cleckheaton.

ST. HELENS (LANCS).—Additional 62 houses. Particulars, the borough engineer, Mr. A. W. Bradley.

STOURBRIDGE.—Alterations and additions to Turf Hotel, High Street, for Mr. W. Cranage.

TONBRIDGE.—Additional housing scheme (40). Particulars the Surveyor.

TORQUAY.—Houses (13), Shipway Lane, for Mr. J. Stoneman.

TWICKENHAM.—Houses (52), Colne Lodge Estate. Particulars, the contractors, F. D. Hidden and Co., Ltd.

WHITTINGHAM.—Extensions to Mental Hospital (£10 500). Particulars, the Clerk, Lancs Asylums Board, Preston.

WILTON.—Houses. Particulars, the contractor, Mr. R. Moulding.

WINCHESTER.—Housing scheme (18), Stoke Park. Particulars, the Surveyor.

WORKINGTON.—Additional 100 houses. Particulars, the Borough Surveyor.

YORK.—Public lavatories. Particulars, the city engineer, Mr. F. W. Spurr.

Trade Publications.

Details of Catalogues and Dealer-Helps Issued by Manufacturers.

In addition to their usual motor and dynamo stock list, Higgs Motors, Witton, Birmingham, are sending out a leaflet (A–8A) giving a description and prices of star delta series parallel and direct starting switches.

A neat boklet (00045) has been issued by Hans Renold, Ltd., Burbage Works, Didsbury, Manchester, dealing with the firm's standard drives; special attention is called to the increased range up to 10 H.P. and to reductions in prices.

Ericsson Telephones, Ltd., 67–73, Kingsway, London, W.C.2, are issuing to dealers an artistic show card depicting one of the company's wireless receiving sets and bearing the inscription "Apparatus of Good Taste."

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COMPANY NEWS.

Decline in Prices of Electrical Securities—Madras Electric Supply Corporation and Shropshire, Worcestershire and Staffordshire Co. Propose to Increase Capital.

THE electrical share market has drooped since we last wrote, a prominent weak spot being Johnson and Phillips shares, which, after considerable fluctuations, show a decline of 5s. Despite the maintenance of the interim dividend rate, Siemens shares have weakened 7½d., and Henleys are unchanged by the increase in theirs from 5 to 7½ per cent. British Insulated Cables ordinary and Callender's "B" preference are each 1s. 3d. down. Exceptionally, Thomson-Houston debenture stock is a point higher, and Ferranti 1st preference are 6d. better. In the supply section, Brompton and Kensington and City and County of London are all 1s. 3d. lower, and London Electric Supply shares show a decline of 1s. West Riding of Yorkshire Tram shares are 1s. up. Eastern Telegraph ordinary stock has risen a point.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
	Electricity Supply.				
10	Brompton & Kensington Ord. ..	30/-	31/3	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	90	90	100	67
15	Charing Cross Elec. Ord. (£1) ..	47/6	47/6	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	48/1½	49/4½	52/6	20/3
6	,, ,, 6% C.P. ..	23/-	23/-	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	61/3	62/6	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	17	17	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	35/6	36/6	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	40/7½	40/7½	41/6	8/-
4½	,, ,, 4½% C.P. ..	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	22/6	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord. (£5) ..	18½	18½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	41/3	41/3	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
6	,, ,, 6% C.P. ..	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	144½	143½	123	24
6	,, ,, 6% Pf. Stk. ..	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69	69	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	77½	77½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	52½	52½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	76½	76½	89	65
4	Lon. Un. Trams. 1st Deb. ..	40½	40½	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	65½	65½	101½	49
5	,, ,, 5% Deb. ..	66½	66½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	59½	60	84½	19
3½	,, 3½ Pf. Stk.	63½	63½	88½	40½
3½	,, 3½% Deb.	69½	69½	92½	51
3½	Met. Dis. Ord. Rly. Stk. ..	54	54	58	12½
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb. ..	68	68	73½	48½
¶5	Yorks. (W.R.) Trams. Ord. ..	12/6	11/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	67/6	68/9	62/-	26/6
6	,, ,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	22/6	22/6	23/4	19/7
7	,, ,, ,, 7% Deb.	104½	103½	107½	92
10	Brush Electrical Ord.	26/3	26/3	29/-	10/-
‡15	Callender's Cable Ord.	65/-	65/-	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref.	25/-	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)	12/9	12/9	28/9½	1/1
7½	,, ,, 1st Pref. ..	22/6	22/6	26/-	5/-
10	Elec. Construction Ord. ..	31/10½	31/10½	30/4	6/7
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	14/-	14/-	29/3	7/3
6	,, ,, 6% C.P. ..	17/6	17/6	21/3	10/6
—	Ericsson Telephones 7% Pref.	21/10½	21/10½	21/-	12/7
6	Ferranti 6% Pref.	19/3	18/9	18/6	16/9
7	,, 7% 2nd Pref. ..	18/-	18/-	19/-	13/9
7½	General Elec. Ord.	20/-	20/-	59/-	13/6
20	W. T. Henley's Ord.	80/-	80/-	86/6	23/3
17½	Johnson & Phillips Ord. ..	58/9	63/9	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	23/9	23/9	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	46/3	46/3	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	28/1½	28/9	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	29½	29½	56/2/6	19
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	74½	74½	87½	60
10	Eastern Ord. Stk.	180½	179½	213½	113/2/6
3½	,, 3½% Pref. Stk. ..	66½	66½	84/17/6	49
4	,, 4% Deb.	78½	78½	103½	60
10	Eastern Extension Ord. (£10) ..	18	18	21½	10/12/6
4	,, ,, 4% Deb. ..	78½	78½	97½	60
22	Gt. Northern Telegraph (£10) ..	27	27	42/12/6	19
‖10	Indo-European (£25)	48	47½	59½	25
—	Marconi's Wireless T. Ord. ..	16/3	16/3	9/16/3	20/9
7½	,, Int. Mar.	22/6	22/6	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	17¾	17¾	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	78½	78½	10	60/2/6

‡ Plus share bonus. ¶ Plus 3 p.c. in respect of 1921. ‖ Including bonus.

UNITED RIVER PLATE TELEPHONE CO., LTD.—Intm. div. 3 p.c. on ord. shs., tax free, payable November 1st.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD.—Intm. div. on ord. shs., 1s. 6d. p. sh., less tax, payable December 1st.

NATIONAL TELEWRITER CO., LTD.—Pft. for year ended June 30th, 1926, £1 456, against £1 863, making credit balance £6 609. Div. of 1 p.c. on pfd. ord. shs. proposed.

MADRAS ELECTRIC SUPPLY CORPORATION, LTD.—To provide addit. cap. required for extensions, it is proposed to increase cap. to £800 000 by creation of 146 400 new ord. sh. of £1 each, and to issue, in first instance, 110 000 of these for subscription by ord. shareholders.

SHROPSHIRE, WORCESTERSHIRE AND STAFFORDSHIRE ELECTRIC POWER CO.—A mtg. will be held on November 16th to consider resolutions to create 140 000 £1 shares and to authorise the issue of same together with the 10 000 unissued B ord. shs. on such terms as the directors think fit.

AMERICAN LIGHT AND TRACTION CO.—It is reported from New York that it is proposed to issue $50 000 000 6½ p.c. prior pref. non-voting shs., to reduce the 6 p.c. pfd. stk. from $25 000 000 to $14 236 000, and to exchange the latter for the new prior pref. shs. on a share for share basis.

ELECTRIC SUPPLY CO. OF VICTORIA, LTD. — Rev. for 1925-6 £159 707, agst. £158 101, gross profit, £57 904, agst. £50 020, plus £44 613 brt. in. After provision for int. on debs. and 5-year notes, placing £10 000 to res. for redemption of latter, and writing £8 757 off formation and preliminary expenses, blce. is £69 852. Proposed pay pref. div. for year amtg. to £10 500, and div. at rate of 10 p.c. on ord. shs.; fwd., £46 852.

CAPE ELECTRIC TRAMWAYS, LTD.—Pft. for year ended June 30th, £77 929, plus £9 576 brt. in. After provision for int. and redemption, balance was £68 084. To res. £20 000, and to staff benefit fund, £25 000, leaving £45 584. Fin. div. 4 p.c., making 7 p.c., tax free, fwd. £11 199. Arrangements are in course of completion for taking from the Municipality the whole of electric supply necessary for running tramways in Cape Town, and arrangement has been concluded for supply of current by Port Elizabeth Municipality to supplement output of co.'s Port Elizabeth station.

WEST LONDON AND PROVINCIAL ELECTRIC AND GENERAL TRUST, LTD.—At mtgs. of holders of pref. and ord. shs. last week resolutions carried unanimously approving (1) agreement made between co. and pref. shareholders, and (2) proposal to consolidate pref. and ord. shs. into one class of ord. shs. Resolutions also approved at subsequent mtg. of both classes of shareholders. Mr. Harry Kahn (chairman) said the Chiswick Electricity Supply Corporation, all the shares of which were held by the Trust, had up to present shown even better results than for same period last year. Altogether prospects of Trust were bright.

Company Meetings.

BRUSH ELECTRICAL ENGINEERING CO., LTD.—At an extraordinary meeting on Monday, resolutions for the adoption of the co-partnership scheme (of which particulars were given in our last issue) were adopted unanimously.

JOSEPH LUCAS, LTD.—Ald. H. J. Sayer, presiding at the meeting last week, said the company announced at the recent motor show at Olympia their unique magneto guarantee covering all electrical and mechanical breakdown, burning of contact breaker points, and all wear and tear for a period of two years.

A. J. STEVENS AND CO. (1914), LTD.—Mr. E. E. Lamb, presiding at the meeting on Monday, said the profit for the past year was £44 891, plus £265 23 brought in. It was proposed to pay 7½ per cent. dividend on the preference and 12½ per cent. on the ordinary shares, to place £10 000 to general reserve and carry forward £28 136.

INTERNATIONAL LIGHT AND POWER CO., LTD.—Sir F. M. Voules, presiding at the meeting on Monday, said the income from subsidiaries had sufficiently expanded to cover debenture interest, Note interest and preference dividend. A substantial balance was carried forward, but, as much of this surplus would be required for the development of the various undertakings, the directors could not yet recommend any distribution beyond the preference dividend. In Mexico the demand

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for electricity supply was growing and persistent, and the directors had therefore felt justified in ordering a substantial addition to the generating equipment. At Curetyba it was found difficult to cope with the demand for industrial power. In Parana (Argentine) the year had been characterised by steady growth of business, and additional tramway rolling stock and another gas engine for the power house had been ordered.

LOEWENSTEIN DEVELOPMENTS.—The "Financial Times" contains a report of a meeting of bondholders of the Barcelona Traction, Light and Power Co. and the Brazilian Traction, Light and Power Co., which was held in Brussels last Saturday and at which Mr. A. Loewenstein made some remarks on the various public utility companies in which he is interested. Mr. Loewenstein recalled the offer recently made to holders of shares in the Mexican enterprises for conversion into Sidro ordinary and fractions of founders' shares. In place of each Mexican share valued 650 francs, holders had now securities worth about 3 000 francs at current quotations. His group had undertaken to make over to the Hydro Electric Securities Corporation the following holdings:—£360 000 Mexican Tramways 6 p.c. second bonds, 4 688 7 p.c. $100 Mexican Power preference shares, £135 040 '5 p.c. second bonds of Mexican Power, £400 000 5 p.c. Rio de Janeiro Tramway bonds, and 167 500 Brazilian Traction ordinary shares. The authorised capital of the Hydro Electric Securities Corporation, which has been incorporated in Montreal, was $50 000 000 in 6 p.c. cum. pref. shares, with participating rights. There would be 2 000 000 ordinary shares of no par value. After their fixed dividend the preference shares would be entitled to a further dividend of 20 per cent. of the total sum distributed to the ordinary shareholders. There would also be an issue of $25 000 000 5½ p.c. bonds. The pending issue of International Holdings shares would be made to shareholders on the basis of four new shares for each one held and the issue price would be 15s. per share. The offer made at the meeting to holders of Barcelona Traction 5½ p.c. first mortgage bonds was (1) £10 in cash or £11 in a new 5½ p.c. security of International Holdings and (2) three free shares of the same company. Holders of Rio de Janeiro Tramway 5 p.c. bonds of 1908 were offered for each 500 franc bond $60 in a prior charge of the Hydro Electric Securities Corporation, in addition to one-fifth of an ordinary share. Holders of Brazilian Traction $100 ord. shares were offered $75 in 6 p.c. cum. participating pref. shares of the Hydro Electric Securities, plus one ordinary share.

New Companies.

VERLOC, LTD.—Cap., £1 000. Metal workers, wireless apparatus etc. Reg. office: 49, De Beauvoir Road, Kingsland, London N.E.

NEWHAVEN AND SEAFORD ELECTRICITY CO., LTD.—Cap., £5 000. To carry on business of electric light and power company. Reg. offices: 424, Salisbury House, London Wall, London, E.C.2. (Public company.)

INVENTUM ELECTRICAL APPLIANCES, LTD.—Cap., £500. Manufacturers of electrical appliances, electricians, insulated wire and cable manufacturers, etc. Reg. office: 3, Chase Estate, Willesden Lane, London, N.W.10.

WEST CORNWALL ELECTRICITY SUPPLY CO., LTD.—Nominal cap., £20 000. To carry on business of an electric light and power company. Reg. office: Broad Sanctuary Chambers, Westminster, S.W.1. (Public company.)

FREED-EISEMANN RADIO OF GREAT BRITAIN, LTD.—Cap., £2 500. Manufacturers of, and dealers in, wireless and other telegraphic and telephonic apparatus, instruments and equipment, etc. Reg. office: 91, Regent Street, London, W.1.

WELLINGTON DISTRICT ELECTRICITY CO., LTD.—Cap., £5 000. To carry on in the U.K. or elsewhere the business of an electric light and power company. Reg. office: 424, Salisbury House, London Wall, London, E.C.2. (Public company.)

T.S.F., LTD.—Cap., £200. To act as sole agents for the import and sale in France and the French Colonies of headphones, loud speakers and any other radio products manufactured by Brandes, Ltd. Reg. offices: 28, Sicilian House, Sicilian Avenue, London, W.C.2.

PRESSLAND PRODUCTS, LTD.—Cap., £100. To manufacture and deal in the articles and appliances covered by certain patents granted or to be granted to C. Pressland, and to carry on the business of electrical engineers and contractors, suppliers of electricity, manufacturers of, and dealers in, wireless apparatus, etc. Reg. office: Old Drill Hall, London Road, Hampton-on-Thames.

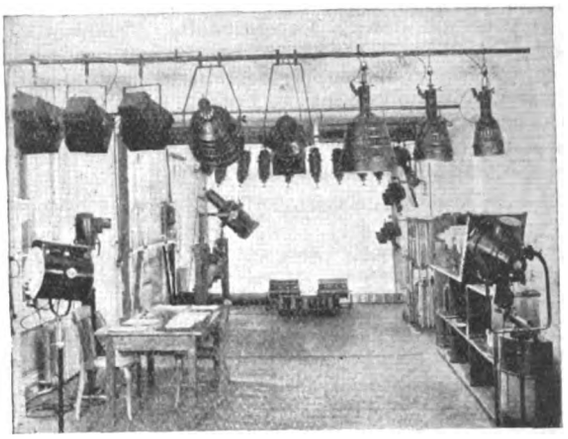
BRITISH TELEGRAPHONES, LTD.—Cap., £100. To acquire any invention relating to telegraphy and telephony by wire, wirelesss or otherwise, time, voice and sound recording machines, and the production, treatment, storage, application, distribution and use of electricity, and any apparatus therefor, etc. Solicitors: Kenneth Brown, Baker, Baker, Lennox House, Norfolk Street, London, W.C.2.

BUSINESS ITEMS.

Changes of Address, Representatives, and other Developments.

R. Millett and Sons announce that they are devoting their premises at 55, King Street, Ramsgate, to wireless, electrical engineering and lighting.

Bruce, Peebles and Co., Ltd., have appointed Sellar and Fraser, of 144, St. Vincent Street, Glasgow, as their agents for the West and North of Scotland.



A view in the new stage lighting showrooms opened by the G.E.C. at Central House, Kingsway, London.

Mr. W. Hamilton Wilson, manufacturer of high-tension generators, etc., for wireless telegraphy, has removed to new works at 125 and 127, Red Lion Road, Tolworth, Surbiton.

The General Electric Co., Ltd., has augmented the existing telephone service at Magnet House, Kingsway, London, W.C.2, by the addition of further lines. Regent 7050 has now 61 lines.

The London Electric Wire Co. and Smiths, Ltd., have appointed Mr. Robert Garmany, Union Chambers, 1, Union Street, Belfast, sole agent for Lewcos products in Northern Ireland.

Wm. Geipel and Co., Vulcan Works, St. Thomas Street, London, S.E.1, announce that they have been appointed sole agents for the United Kingdom and the British Colonies for the Rutgerswerke Aktiengesellschaft Abteilung Planiawerke, Hardenbergstrasse 43, Charlottenburg 2, Berlin, Germany, for arc lamp, cinematograph, battery and medical carbons, carbon brushes and welding carbons.

Metal and Chemical Prices.

TUESDAY, November 9th.

		Price.	Inc.	Dec.
***Copper*—**				
Best Selected	per ton	£63 10 0	—	£1 10 0
Electro Wirebars	,,	£66 5 0	—	15s. 0d.
H.C. Wire, basis	per lb.	9 5/16d.	—	1/16d.
Sheet	,,	9¾d.	—	—
***Phosphor Bronze*—**				
Wire (Telephone) basis	per lb.	1s. 0 3/16d.	—	1/16d.
***Brass* 60/40—**				
Rod, basis	per lb.	7½d.	—	—
Sheet, basis	,,	10½d.	—	—
Wire, basis	,,	10½d.	—	—
***Pig Iron*—**				
Cleveland Warrants	per ton	£6 5 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 0 0	—	—
***Lead Pig*—**				
English	,,	£30 10 0	—	5s. 0d.
Foreign or Colonial	,,	£29 0 0	—	5s. 0d.
***Tin*—**				
Ingot	,,	£303 5 0	£9 5 0	—
Wire, basis	per lb.	3s. 10d.	1½d.	—
Aluminium Ingots	per ton	£112 0 0	—	—
Spelter	,,	£32 17 6	—	15s. 0d.
Mercury	per bottle	£17 0 0	—	—

Sulphur* (Flowers)**—Ton £11 10 0 ***Sodium Chlorate—Per lb. 3d.
,, (Roll-Brimstone)—,, £10 5 0 ***Sulphuric Acid* (Pyrites, 168°)**
Copper Sulphate— ,, £25 to £25 10s. per ton, £6 15 0
Boric Acid* (Crystals)** ,, £37 ***Sodium Bichromate—Per lb. 3½d.
***Rubber*—Para fine, 1s. 7½d.; plantation 1st latex, 1s. 8¼d.**

The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BRITISH ELECTRIC SUPPLIES, 70, Charlotte Street, W., electrical engineers. £15 3s. October 5th.

GREEN, Charles, 37, Orchard Road, Crossgates, Leeds, electrical agent. £11 10s. 10d. September 28th.

LEWIS (A. G.) AND CO., LTD., 7, Pembroke Terrace, Cardiff, wireless dealers. £22 7s. 8d. September 20th.

RICHARDSON, C., AND SONS, 194, Vauxhall Bridge Road, S.W., electricians. £13 16s. 4d. September 10th.

Receiverships.

AUTO MECHANICAL RECTIFIERS, LTD. R. S. Andrews, of 488, Strand, W.C.2, was appointed receiver and manager on October 28th, under powers contained in mortgage debenture dated July 8th, 1926.

GIL-RAY TRADING CORPORATION, LTD. S. B. Saunders, of 26, Park Row, Nottingham, accountant, was appointed receiver and manager on November 3rd, under powers contained in debenture dated May 20th, 1926.

MIDLAND RADIO TELEPHONE MANUFACTURERS, LTD. C. Furber, of Amblecote House, Brierley Hill, Staffs, was appointed receiver and manager by Order of the Court, dated October 19th, 1926.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

CITY WIRELESS CO., LTD., Liverpool.—Registered October 16th, £500 debentures, to P. E. Beaver, 70, Edge Lane, Liverpool, wireless factor; general charge.

ELECTRICITY FINANCE AND DISTRIBUTION CORPORATION, LTD., London, E.C.—Registered October 18th, £5,000 debentures; general charge. *Nil. December 31st, 1925.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Companies Winding-up Voluntarily.

AGRICULTURAL ELECTRIC DISCHARGE CO., LTD. By special resolution October 14th, confirmed October 20th, W. F. Newman, incorporated secretary, 51, Great Charles Street, Birmingham, appointed liquidator. Meeting of creditors at 51, Great Charles Street, Birmingham, Monday, November 15th, at 12 noon.

Bankruptcy Information.

BATT, Edwin George, 20, Iverna Gardens, Kensington, electrical engineer. Receiving order, November 2nd. Creditor's petition. First meeting, November 16th, 11 a.m., and public examination, January 26th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

BROCK, Reginald Lewis, trading as R. L. BROCK AND CO., 5, Bedford Row, Tavistock Road, Plymouth, electrical engineer Receiving order, November 2nd. Creditor's petition.

HEANEY, W., 12, Market Place, Henley-on-Thames, Oxon, electrician. Receiving order, November 1st. Creditor's petition.

WELLS, Arthur Jack, lately trading with William Bashford, 52, Princess Street, Luton, electrical engineers, under the style of Wells and Co. Receiving order, November 6th. Debtor's petition.

Notice of Dividend.

CARR, John Frederick, 89, Aston Avenue, Fallowfield, Manchester, electrical goods agent. First and final dividend, 3¼d. per £, payable November 17th, Official Receiver's Offices, Byrom Street, Manchester.

Bankruptcy Proceedings.

BRITISH ELECTRIC VEHICLES, LTD., 36-7, Old Jewry, London, E.C. In this compulsory liquidation the Official Receiver has issued a summary of the company's statement of affairs, and this discloses liabilities £33 023, of which £12 191 are returned as expected to rank, and assets £20 831, the whole of which are absorbed in the payment in full of preferential claims and in part of those of the debenture holders, which amount to £26 333. With reference to the shareholders, a total deficiency of £13 191 is disclosed. The Official Receiver, in his accompanying observations, reports that the company was promoted by Copley with a view to the acquisition and development of the business of a manufacturer of and dealer in motor bath chairs and other small vehicles propelled by electricity, carried on at Southport by one William Bleakley in association with James E. Stott, a nephew of Copley. Bleakley was the sole agent in the United Kingdom of an American manufacturer for the sale of electric bath chairs, and had himself made improvements in the construction of electrically propelled vehicles. Copley, at Stott's request, had agreed to provide finance for the business. On October 30th, 1916, the directors appointed Stott as works manager and Bleakley as sales manager. The latter died on September 2nd, 1917. Shortly after its formation, and in view of the war, the manufacture of motor bath chairs was abandoned by the company, and steps were taken to introduce small electric motor vehicles such as trollies and trucks. Subsequently much larger vehicles, including electric locomotives, were manufactured by the company. Except during the year ended March 31st, 1920, when a profit of £1 332 was made, the company's business was carried on at a loss, and on March 31st, 1922, the accrued loss amounted to £4 225. A receiver was appointed on September 5th, 1922. Shortly afterwards a petition for the winding-up of the company was presented to the Court. The making of a winding-up order at this time was opposed by a large body of the Company's unsecured creditors, and in the result the petition was dismissed in October, 1922. The company's business was carried on by the receiver, with the approval of the trustees for the debenture holders, from the date of his appointment (September 5th, 1922) until shortly after the date of the winding-up order (April 27th, 1926). The business was continued in the hope that it might become profitable, and that the debts owing to unsecured creditors might be paid in full. In the result, however, heavy losses were made, the amount due for debenture interest at 8 per cent. was increased from £1 333 to £8 500, and the assets representing the debenture holders' security were depleted.

ROBINSON, Henry, 41, Wigan Lane, Wigan, electrician and wireless dealer. The public examination of this debtor was held recently at the Court House, Crawford Street, Wigan. The statement of affairs showed gross liabilities of £450. Debtor stated that he had had experience of the electric trade, but not of the cycle business. In May, 1925, he commenced his present business with £210 capital, but the concern was never successful, and about two months later he borrowed £100 from his sister to buy stock. He began to sell cycles on weekly payments, but he had not sufficient capital with which to carry on, as customers did not keep up their payments. He became aware of his position when the coal strike started. The examination was closed.

SEGAL, Jacob, gas and electrical accessories merchant, 2, Vine Street, Tooley Street, London, S.E. Under a receiving order made in this case on September 2nd, on the petition of Barclay's Bank, Ltd., the statutory first meeting of the creditors was held last week at Bankruptcy Buildings, Carey Street, W.C. It appears from statements that have been made by the debtor that he came here from Russia in 1900, and a few years ago took out papers of naturalisation. Throughout his business life he has been connected with the gas and electrical trades, either on his own account or in a private capacity or as a director or shareholder of limited companies. At the present time he is acting as buyer to a limited company which was formed some twelve months ago in order to take over the assets and liabilities of the business of a gas and electrical accessories merchant which he had conducted at the above address. This had related to the wholesale trade. His remuneration was fixed at £500 a year, and his liabilities consist of guarantees which he has been called on to liquidate, the chief being to the petitioning creditors for a sum of £2 000. This guarantee he had given jointly with another person, the petitioners being secured by a mortgage for £4 000 on a house which had been valued at £5 000, the purchase price. It has, however, recently been sold for only £3 000, and he and his co-guarantor has been called on to make good the deficiency. He alleges that he received no notice of the calling in of the mortgage. In addition, he is liable in respect of bank overdraft amounting to £800 in favour of another person who has carried on business at Birmingham as a gas burner manufacturer. This person has, however, disappeared, having realised his business, and the creditors, so far as he (debtor) knows, had been paid a composition of 3s. 4d. in the £. Nothing has, however, been received by the bank. The debtor, who roughly estimates his liabilities at £2 000, attributes his failure to his liability as guarantor, and he has, in the shape of assets, a few shares in a limited company. The meeting passed a resolution for the appointment of Mr. C. Latham, certified accountant, 78, New Oxford Street, W.C., as trustee of the debtor's estate.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

232 201 NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPEN FABRIEKEN. Incan descent cathodes for discharge tubes. (8/4/24.)
232 972 SIEMENS SCHUCKERTWERKE GES. Protective arrangement for alternating-current generators. (24/4/24.)
244 981 G. V. DOWDING and K. D. ROGERS. Electric insulators. (28/4/25.)
235 858 WAYGOOD-OTIS, LTD. Floor-levelling devices for electric elevators. (18/6/24.)
236 198 METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Electric motor control apparatus. (24/6/24.)
238 194 INTERNATIONAL GENERAL ELECTRIC CO., INC. Electric oil-switches. (8/8/24.)
245 008 S. D. ANGELO. Electric lamps. (18/6/25.)
245 010 F. HASNIP. Inductance coils for use in wireless systems. (20/6/25.)
239 491 BRITISH THOMSON-HOUSTON CO., LTD. Electric protective devices for the discharge of high potentials. (5/9/24.)
245 016 NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPEN FABRIEKEN. Electric discharge tubes. (28/1/25.)
245 018 H. W. SPOONER. Timing-device for operations controlled by electric switches. (2/3/25.) (Divided application on 244 958.)
237 262 SIEMENS SCHUCKERTWERKE GES. Electric dust-precipitating installations. (16/7/24.)
237 600 C. G. KOPPITZ. Electrical switch mechanism. (24/7/24.)
237 284 HACKLANDER AND CO. Electroscopic testing devices. (18/7/24.)
240 877 BRITISH THOMSON-HOUSTON CO., LTD. Transformers. (6/10/24.)
241 209 INTERNATIONAL GENERAL ELECTRIC CO., INC. Alternating-current rectifying installations. (8/10/24.)
245 051 STANDARD TELEPHONES AND CABLES, LTD. (formerly WESTERN ELECTRIC CO., LTD.). Electrically-maintained vibrating forks. (17/9/24.) (Divided application on 244 814.)
218 643 KLEINSCHMIDT ELECTRIC CO., LTD. Telegraph typewriters. (5/7/23.)
245 170 SEAL CO. (LONDON), LTD., I. JASCOURT, H. D. PATTINSON, and J. ROSE. Electrolytic process for the removal of rust and scale from metals. (30/3/25.)
245 171 W. DUBILIER. Wireless telephony. (30/6/24.)
218 675 HAZELTINE RESEARCH CORPORATION. Method of an apparatus for converting electric power. (5/7/23.)
245 175 E. C. R. MARKS (MORKRUM CO.). Synchronous telegraph systems. (30/7/24.)

Applications for Patents.

October 11th.

25 252 AKT.-GES. FUR STICKSTOFFDUNGER. Transmission of polyphase currents from transformer to electrothermic furnaces, etc. (14/10/25, Germany.)
25 276 D. E. BARNETT. Terminal connectors, etc.
25 264 R. I. DENHAM. Aerials for wireless receiving sets.
25 282 O. HAPPEL. Cooling apparatus for electric transformers.
25 291 INTERNATIONAL GENERAL ELECTRIC CO., INC. Electric arc furnaces. (9/10/25, Germany.)
25 259 C. PRISKORN. Induction coils.
25 261 J. ROBINSON. Wireless transmission and reception.
25 237 D. S. S. STEUART. Receivers for telephones, etc.
25 226 H. WEICHSEL. Alternating current motors.
25 326 WESTINGHOUSE BRAKE AND SAXBY SIGNAL CO., LTD., and W. WOODHOUSE. Electric welding apparatus.

October 12th.

25 403 D. E. BARNETT. Electrical connectors, etc.
25 390 A. E. J. BOSCHE. Rotary electric switch. (12/10/25, France.)
25 412 J. L. EVE. Electrical connectors.
25 435, 25 436 A. E. HUGHES, LIVERPOOL ELECTRIC CABLE CO., LTD., and W. A. SLOANE. Electric junction boxes.
25 437 LIVERPOOL ELECTRIC CABLE CO., LTD., and T. H. TWEEDLE. Surface wiring of electrical distributing systems.
25 368 G. F. MACKAY and TELFORD, GRIER AND MACKAY, LTD. Electric kettles, etc.
25 355 R. B. MATTHEWS and W. H. R. PIKE. Radio receiving sets.
25 423 SOUDRE AUTOGENE FRANCAISE. Electric arc welding. (30/10/25, France.)
25 425 E. W. WILDEY. Electric hair combs.

October 13th.

25 506 BRITISH THOMSON-HOUSTON CO., LTD., and H. DREGHORN. Electric motors.
25 532 F. J. DIETZ and E. HIROU. Electric batteries. (29/3/26, Germany.)
25 505 ENGLISH ELECTRIC CO., LTD. Induction motors.
25 502, 25 504 H. E. HUMPHRIES and SIEMENS BROS. AND CO., LTD. Automatic etc. telephone systems.
25 503 SIEMENS BROS. AND CO., LTD., and W. G. PATTERSON. Automatic, etc., telephone systems.
25 525 T. H. MCQUINN and H. M. SARGOOD. Electric urns, etc.
25 528 E. SIEG. Electric accumulators. (22/10/25, Germany.)
25 497 A. V. TOMLINSON (HAEFELY ET CIE). High tension electric transformers.
25 498 R. A. L. VOLET. Commutators for electrical machines. (3/11/25, Belgium.)

October 14th.

25 650 AKT.-GES. BROWN, BOVERI ET CIE. Detecting and cutting out in a high-tension network. (14/10/25, Germany.)
25 651 AKT.-GES. BROWN, BOVERI ET CIE. Means for detecting earth leakage in high-tension cables. (14/10/25, Germany.)
25 652 AKT.-GES. BROWN, BOVERI ET CIE. Means for selectively cutting out a rectifier. (27/11/25, Germany.)
25 634, 25 635. AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and A. J. RAY. Telephone systems.
25 648 E. B. DILLOW and EASTERN TELEGRAPH CO. Electric telegraph signalling system.
25 606 ELECTRIC FIRES, LTD., and F. L. NEWHOUSE. Electric hot plates.
25 655 J. E. OSTLINE. Telephone systems.
25 591 H. A. PUTNAM. Wireless apparatus.

October 15th.

25 728 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and R. W. TARRANT. Electric relays.
25 690 E. BARKER. Dynamo electric machines.
25 722 BRITISH THOMSON-HOUSTON CO., LTD., and W. J. POOL. Means for controlling speed of electric motors.
25 723 BRITISH THOMSON-HOUSTON CO., LTD. Electroplating. (15/10/25, United States.)
25 764 DETEX DISTRIBUTORS, LTD., and R. EISLER. Electric switches.
25 674 W. H. HAYDOCK. Electrically-operated igniter for Bunsen, etc. burners.
25 758 M-O VALVE CO., LTD., and M. THOMPSON. Thermionic cathodes.
25 680 R. NETTL. Electric lampholders.
25 686 T. SAMPSON. Variable electric condensers.
25 741 SIEMENS AND HALSKE AKT.-GES. Electrolytic separation of chromium from aqueous solutions. (16/10/25, Germany.)
25 759 STANDARD TELEPHONE AND CABLES, LTD. (WESTERN ELECTRIC CO.). High-frequency amplifying systems.
25 744 G. T. THURNEYSSEN. High-tension generators. (16/10/25, France.)
25 755 C. J. VOGEL DRAHT- UND KABELWERKE AKT.-GES. Connecting leads for electrical apparatus. (9/7/26, Germany.)
25 675 H. WADE (NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN). Resistance-coupled amplifiers.

October 16th.

25 859 BRITISH THOMSON-HOUSTON CO., LTD., L. GRIFFITHS and A. G. HENTON. Timing devices for magneto-electric machines.
25 860 BRITISH THOMSON-HOUSTON CO., LTD., and H. S. PETCH. Protective devices for electric circuits.
25 861 BRITISH THOMSON-HOUSTON CO., LTD., and C. J. MORTON. Electric head-lamps, etc.
25 803 H. J. BURNEY. Thermionic valve filaments, etc.
25 857 DYSON AND CO., ENFIELD (1919), LTD., and H. R. GARNETT. Electric head-lights for vehicles.
25 876 E. R. GILL. Alternating current rectifiers.
25 849 HANOVIA CHEMICAL AND MANUFACTURING CO. Polarisation of ultra-violet rays. (1/5/26, U.S.)
25 875 W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., E. MOOR and W. H. NICHOLS. Electric switches.
25 836 T. HINDLE. Wireless receiving apparatus.
25 840 A. G. JEFFERIES. Wireless receiving apparatus.
25 864 D. E. REES. Protection cap for electric meters, indicators, etc.
25 879 E. SCHATINER. Electric switches.
25 831 F. THOMAS. Electric heaters.

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Friday, November 12th (To-day).

UNIVERSITY OF LONDON.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Lecture VI by Dr. J. A. Fleming, F.R.S., on "Surges and Pressure Rises." 5.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (IRISH CENTRE, DUBLIN).—Physical Laboratory, Trinity College. Paper by Mr. R. Borlase Matthews on "Electro-Farming." 6.45 *p.m.*

BIRMINGHAM ELECTRIC CLUB.—Grand Hotel, Colmore Row. Lecture by Mr. A. C. Baker, on "Electrical Tramways." 7 *p.m.*

MANCHESTER ASSOCIATION OF ENGINEERS.—Engineers' Club, Albert Square. Paper by Mr. J. Smith on "Steel Works Machinery." 7.15 *p.m.*

JUNIOR INSTITUTION OF ENGINEERS.—39, Victoria Street, Westminster. Annual general meeting. 7.30 *p.m.*

Sunday, November 14th.

THE GUILDHOUSE.—Eccleston Square, London. Address by Dr. E. E. Fournier d'Albe on "Eyes and Ears of the Future." 3.30 *p.m.*

Monday, November 15th.

INSTITUTION OF ELECTRICAL ENGINEERS (TEES-SIDE SUB-CENTRE).—Cleveland Technical Institute, Middlesbrough. Chairman's Address by Mr. J. Rosen. 7 *p.m.*

ROYAL SOCIETY OF ARTS.—John Street, Adelphi, London. Lecture by Prof. H. L. Callender, F.R.S., on "Recent Experiments on the Properties of Steam at High Pressure." (Lecture I.) 8 *p.m.*

Tuesday, November 16th.

ROYAL INSTITUTION OF GREAT BRITAIN.—21, Albemarle Street, London. Lecture by Dr. G. W. C. Kaye on "The Acoustics of Public Buildings." 5.15 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (EAST MIDLAND SUB-CENTRE).—Leicester. Paper by Mr. L. M. Jockel on "Boiler Plant." 6.45 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH MIDLAND CENTRE).—Hotel Metropole, King Street, Leeds. Chairman's address by Mr. W. W. E. French. (To be followed by a smoking concert.) 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH-WESTERN CENTRE).—Engineers' Club, Albert Square, Manchester. Paper by Mr. J. R. Beard and Mr. T. G. N. Haldane on "The Design of City Distribution Systems and the Problem of Standardisation." 7 *p.m.*

PAISLEY ASSOCIATION OF ELECTRICAL ENGINEERS.—Town Hall, Paisley. Lecture on "Electric Lighting for Motor Buses." By Mr. N. Allan May. 7.30 *p.m.*

ELECTRICAL SOCIETY OF GLASGOW.—30, Gordon Street, Glasgow. Lecture by Mr. E. C. McKinnon on "Common and Uncommon Troubles Experienced in the Maintenance of Storage Batteries and the Rectification of Same." 7.30 *p.m.*

Wednesday, November 17th.

ELECTRICAL ASSOCIATION FOR WOMEN.—Visit to stage lighting at the Coliseum St. Martin's Lane, W.C.2. 12 to 1 *p.m.* E.L.M.A. Lighting Service Bureau, 15, Savoy Street, Strand, London. Lecture by Miss M. Partridge, "A Talk on Tariffs." 3 *p.m.*

UNIVERSITY OF LONDON.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Lecture VII by Prof. J. A. Fleming on "Electrochemistry and Metallurgy." 5.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS (NORTH MIDLAND CENTRE, SHEFFIELD SUB-CENTRE).—Royal Victoria Hotel, Sheffield. Paper by Mr. H. Rainford on "Flameproof Mining Electrical Apparatus." 7.30 *p.m.*

SOCIETY OF TECHNICAL ENGINEERS (MANCHESTER AREA).—Milton Hall, Deansgate, Manchester. Address on "Impressions of Industrial Conditions in U.S.A." by Mr. S. Ratcliffe. 8 *p.m.*

Thursday, November 18th.

INSTITUTE OF TRANSPORT.—Hotel Cecil, Strand London. Annual Dinner.

INSTITUTION OF ELECTRICAL ENGINEERS.—Institution, Savoy Place, Victoria Embankment, London. Ordinary meeting. Lecture by Dr. A. Ekstrom on "The Applications of Electricity to Agriculture"; exhibition of a film entitled "American Agriculture and Farmhouse Electrification," by Mr. J. W. Beauchamp. 6 *p.m.*

ELECTRICAL CONTRACTORS' ASSOCIATION (LIVERPOOL BRANCH).—Ordinary meeting. 6 *p.m.*

SHEFFIELD ILLUMINATION SOCIETY.—Paper by Mr. G. A. Percival on "Two Thousand Years of Lamps." 7.30 *p.m.*

Friday, November 19th.

POLYTECHNIC.—Regent Street, London. Lecture on "Artificial Production of the Human Voice," by Sir R. Paget, Bart. (In aid of King Edward's Hospital Fund for London.) 5 *p.m.*

INSTITUTION OF MECHANICAL ENGINEERS.—Institution, Storey's Gate, St. James's Park, London. Paper by Mr. T. A. F. Stone on "Electric Locomotives: A Method of Classifying, Analysing and Comparing their Characteristics." 6 *p.m.*

ELECTRICAL TRADES COMMERCIAL TRAVELLERS' ASSOCIATION.—St. Bride's Institute London. Annual general meeting. 7 *p.m.*

ELECTRICAL DEVELOPMENT ASSOCIATION.—Royal Society of Arts. John Street. Adelphi, London. Conference on "Shop Window Display." Speaker, Mr. E. Willson. 7.30 *p.m.*

EFFICIENCY CLUB.—Vernon House, Park Place, St. James's Street, London. Discussion on "The Relative Fields and Merits of Gas and Electricity." 7.30 *p.m.*

JUNIOR INSTITUTION OF ENGINEERS.—30, Victoria Street, Westminster. Lecturette on "Short Wave Wireless Communication." By Mr. B. J. Axten. 7.30 *p.m.*

UNIVERSITY OF LONDON.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Lecture VIII by Dr. J. A. Fleming, F.R.S. on "Electric Measurement." 5.30 *p.m.*

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THE ELECTRICIAN

ESTABLISHED 1861.

THE OLDEST WEEKLY ILLUSTRATED JOURNAL OF

Electrical Engineering, Industry, Science and Finance.

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The Electrician.

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ANOTHER STEP.

ON Friday last the Electricity (Supply) Bill 1926 was read a third time in the House of Commons by 201 votes to 70, after four full days had been devoted to its consideration. We are interested, both as electrical engineers and as journalists, to see the reaction of our lay contemporaries to the proceedings. "The Times" describes them as curious. "The Outlook," more daring, remarks that the electricity problem is one that members could not be expected to understand and asks plaintively "Who could cheer a kilowatt, or perorate over an ampere?" We think, if our contemporary will consult Hansard, it will find that both are possible, and, to continue the metaphor, that a large amount of wattless power was generated and that the eddy current losses were considerable. We agree, however, with another journal which found the proceedings "not exhilarating."

As readers of THE ELECTRICIAN are aware, the two main changes made in the original draft of the Bill in Committee were that the new scheme is now to be prepared by the Commissioners and submitted to the Central Board for adoption, after which the latter body will be entirely responsible for it and that wider rights of appeal by undertakings who held themselves to be adversely affected by any changes that might be made were given. In addition, non-selected stations may be closed compulsorily instead of being allowed to "fade out," but they are amply protected before such an order can be enforced.

At the beginning of the report stage attempts were made to increase the powers and scope of the appeal tribunal, not, those concerned were careful to explain, with any intention of wrecking the Bill. The ATTORNEY-GENERAL, however, thought otherwise, and the attempt failed. A new clause dealing with the trading powers of municipal authorities was, as we mentioned last week, inserted and will, we hope, once and for all settle this vexed question. A good deal of time was spent on both the first and second days of the Report stage in discussing the powers of the Central Board, but the Government manfully and successfully withstood the attacks both of those who wished the Board to have no powers and those who wished it to have all. It therefore remains an organising body concerned with transmission, but not concerning itself directly with either generation or distribution.

A long, acrimonious and sometimes personal discussion took place on an amendment moved by the ATTORNEY-GENERAL that the interest and sinking fund on money borrowed for purposes of carrying out the standardisation of frequency should be spread over the whole of the revenue derived by the various undertakers for the sale of electricity. Mr. PHILIP SNOWDEN'S original idea was, it will be remembered, that this charge should be met by the nation. In the original draft of the Bill the Central Board was to pay for it out of their own funds and the final change is the result of a promise made in Committee. In equity, of course, an undertaking that is obliged to change its frequency should not be forced to pay the whole cost of the alteration; on the other hand an attempt was made to ensure that undertakings which had already changed their frequency should be permitted to contract out of the present scheme. These changes were, however, it appeared, made voluntarily, so that those concerned will not escape the pleasant task of helping the others.

For the rest, the debate on this stage resolved itself into a long drawn out attempt by the Conservative die-hards to delay the progress of the Bill. In this they were rather half-heartedly assisted by certain Labour members, who in debate showed that they better understood what may be called the "ideal" of the measure than many of those on the other side of the House. The malcontents were, however, not courageous enough to force many divisions, with the result that the progress made exceeded expectations. In the main, therefore, the Bill passed the report stage with very few fundamental alterations.

After three days spent in a microscopic and ineffective criticism of details it was a relief to come back to broad principles in the third reading debate. A high tone was set by Lieut.-Col. MOORE-BRABAZON in his opening speech. The Board's work in the future was, he said, to do what everybody wanted to do, to build up a scheme of interconnection between the generating stations of the country on the model of what had been done on the North-East Coast. It was absurd to contend that the standardisation of frequency would not be an advantage, because it would both assist inter-connection and decrease the price of equipment. If such a step were not taken now it would soon be impossible. In a word, the Bill was a measure of far-reaching consequence, whose effects would be increasingly beneficial as time went on. To this the Labour Party replied by an amendment complaining that the Bill perpetuated private ownership, and the Conservative malcon-

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tents by reiterated complaints that it ruined private enterprise. The Liberal party faintly blessed it, but, as we have already indicated, the debate generally did not show the House at its best. To this there was one honourable exception. Sir PHILIP DAWSON, in supporting the Bill, believed it would be productive of greater efficiency in the control and management of industry and of general benefit all round in the shape of a more abundant and cheap supply of electricity. He was convinced that the Bill would result in a very material improvement in the supply and general use of electricity in this country and would greatly benefit those people who to-day had to pay outrageous prices or get no electricity at all. His speech shows that there is, after all, an advantage in having engineers in Parliament, when it comes to dealing with engineering matters.

The result is then that, in spite of the attempts which have been made to wreck the Bill by those who see in it merely a screen for socialism or who feel that it will interfere with vested interests, the Bill has emerged from the House of Commons stronger and more capable of doing the work which it is designed to do than when it entered. It still has to run the gauntlet of the House of Lords, where it received a first reading on Tuesday. That has formed a fatal stumbling block on more than one occasion. Whether history will repeat itself we do not know. But the gilded Chamber is a nucleus round which the forces of reaction crystallise, and it is not likely that those noble lords who have expressed their disapproval of the measure in the Press will be less eloquent in speech when the time comes for its detailed consideration. The critics are, in fact, continuing their efforts undismayed. On the other hand, the supporters of the Bill with a few notable exceptions have been silent. They must not, however, fail to work less strenuously than they have done. It would be a bad thing if the Bill were thrown out for reasons which we have already given. It would be a still worse thing if it were so emasculated so that while apparently leaving the Commissioners and the Board in a position to perform the duties imposed upon them, in reality it will deprive them of all power to carry out the reorganisation, which the history of the past five years has shown to be abundantly necessary.

Current Topics.

Beggars and Benevolence.

OF the many services rendered to the electrical industry by Sir HUGO HIRST none is more praiseworthy than his interpretation of the duties of President of the Electrical Trades Benevolent Institution this year. In the first place he was able to announce at the Institution's Festival Dinner last week that the record total of £6 151 had been subscribed to the benevolent fund. When it is recalled that in past years the figure has never been much over £3 000 the extent of the work which he and members of the great manufacturing organisation over which he presides has done for this deserving charity will be appreciated. But Sir HUGO does not think this is enough. He rightly deprecates the existence of a system whereby the charitable organisation of one of the greatest and most prosperous industries of the country is dependent for its funds upon begging appeals. We are in entire agreement with his plea that the fund should be put upon a sound and properly organised basis. The regular weekly or monthly contribution, however small it may be, is the thing that counts, and THE ELECTRICIAN, as previously stated, is endeavouring to stimulate these all-the-year-round collections by providing a novel form of collecting box for use in electrical works and offices. We are prepared to supply one of these boxes to any and every responsible applicant, but as they will have to be specially made for the purpose it is essential that we should have, as soon as possible, some idea of the number required. Will all who are willing to help on the good work please send us a postcard intimating their willingness to take charge of a collecting box?

The Broadcasting Commission.

THE draft Royal Charter of Incorporation of the British Broadcasting Corporation declares that in view of the widespread interest which is "shown to be taken by Our People in the Broadcasting Service and of the great value of Service as a means of education and entertainment, We deem it desirable that the Service should be developed and exploited to the best advantage and in the national interest." The document goes on to deal with the objects and organisation of the new body on lines which the report of Lord CRAWFORD'S Committee led us to expect. The weak point is the actual personalities of governors of the new Corporation, upon whose capacities much will depend. With the exception of Lord GAINFORD, the vice-chairman, they have had no experience of broadcasting except perhaps as listeners. Fortunately Mr. J. C. W. REITH is nominated as the chief executive officer and is to be entitled the Director-General, and we hope he will see that no drastic changes are made in the existing technical and non-technical staffs. As regards information, the Commission has powers to appoint committees and those committees sub-committees, but if all this increases the inertia of the machine it will not altogether be an advantage. The POSTMASTER-GENERAL reserves the right to take over the service in a national crisis or emergency. He is also to exercise censorship, though at the same time every Government department can broadcast matter free. We are glad to learn that the Post Office is to hand over a larger proportion of fees, for after 12½ per cent. has been deducted, the percentage paid over will vary with the number of licence holders and range from 90 down to 60 per cent., when there are four million licence holders.

In Trouble Again!

THE "Electrical Review" is annoyed with THE ELECTRICIAN and shows that annoyance by throwing the "Pocket Oxford Dictionary," 1925, at our head. We are glad it is not a larger volume. Our contemporary objects to our criticism of those who hold that the Central Board will be an "expensive bureaucracy." They for their part contend that the Central Board will cost a large sum of money and that that cost must necessarily be passed on to the consumer. We hold (we know we are very foolish) that the reduction in cost brought about by the policy which the Bill envisages and the Board is to carry out will much more than compensate for the working expenses of the Board. It is pure business to spend something to get a better return. Our contemporary does. Its all too infrequent special numbers mean additional cost which they have to pay. If the expenditure is not worth while, we hail them as philanthropists. Apparently we are also to blame for agreeing with the "Electrical Review" that "the correct policy must be the gradual pushing out of the supply into existing electrified areas and postponing the erection of national trunk lines until conditions allow it." Perhaps, therefore, we may be praised for disagreeing that "neither the grid nor the wholesale standardisation of frequency is a necessary factor in the reorganisation of electricity supply." In our view the "grid" will be a plant of slow growth, each rod of which will sprout when it is required. It is, however, a future necessity. But frequency standardisation should be undertaken immediately because only thus can a real national system ever be achieved. In this connection it is a little strange that our contemporary should have forgotten that electrical manufacturing interests support standardisation, both of frequency and voltage, on the firm grounds that it will cheapen their products. This might be one way of paying for the expensive Central Board.

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False Clocks.

WE propound the riddle: When is a clock not a clock? and the answer is, when it is placed outside a public building in the City of London. It may tell the right time, but as a little research will show, the chances are against it, since it differs from all the others in the neighbourhood. Incidentally, the enterprising may thus prove the truth of the Einstein principle of relativity, for it is quite possible to leave this office and arrive at Farringdon Street station before one has started, thus showing that there is some basis for the philosophic dictum that time is non-existent, or even negative. This discrepancy has been pointed out over and over again, and numerous enthusiasts, notably Mr. F. HOPE-JONES, have suggested schemes of synchronisation, but nothing has been done, possibly because Londoners regard their clocks as one of the sights of the city like the pigeons outside St. Paul's. They are at least just as much of a nuisance. We hope, however, for some change, especially now that various justly infuriated correspondents have written to the papers to call attention to the confusion of sound which was noticed during what was supposed to be the two minutes' silence on Armistice Day. This is obvious when clocks are out of phase by as much as three minutes. Now the average outside clock is simply an advertisement. It should be a condition of its display that it is synchronised.

Southend's Electricity.

"THERE is danger of eminent front rank consultants being unwilling to lend their services to the town," said Alderman R. TWEEDY-SMITH in resigning the chairmanship of the Southend-on-Sea Electricity Committee as a protest against the attacks that have been made on Mr. J. H. RIDER. We do not suppose readers of THE ELECTRICIAN are close students of recent electrical history in that borough, and we do not propose to deal with the subject here except to recall that two parties exist, one of whom considers that the electrical needs of the area can best be met by continuing to use a number of small stations equipped with Diesel engines, and the other that a modern steam station capable of supplying a considerable district should be erected. It is not surprising that the various consultants, of whom Mr. RIDER is the latest, that have been called in from time to time should have supported the latter view, but there does not seem to have been sufficient enthusiasm on the Council to get it adopted. On the other hand, considerable political differences exist which crystallise round the electricity undertaking, generating a disproportionate amount of heat. Mr. RIDER, it appears, has added fuel to the flames by suggesting that the wisest course would be to take a bulk supply from Barking.

Encouraging Export Figures.

THE seriousness of the position in many of our industries owing to the coal stoppage is clearly shown in the Board of Trade Returns for October, but although this depression must tend to affect the domestic electrical market it is extremely gratifying to see the remarkable progress that is made by the British electrical industry on the export side. Not only is the industry holding its own, but it is increasing the value of its exports to such an extent that the October total of £1 684 842 stands as the second highest monthly figure since June 1925, when the exports were valued at £23 529 more. Compared with October last year the total under review shows an increase of £321 360. That the improvement is not spasmodic is shown by an examination of the grand totals for the ten expired months of 1925 and 1926, which are, respectively, £14 639 014 and £14 746 076, leaving the current year with an advantage of £107 062; no small achievement in a year crowded with labour troubles. Side by side with this export expansion is a notable shrinkage in the imports of electrical goods over which the exports at the moment show an excess of more than £10 000 000.

"Trade Survey."

THE effect of the coal stoppage on the electrical industry is dealt with in the first issue of "Trade Survey," a publication which the B.E.A.M.A. are issuing quarterly. The aim of this publication is to examine the trade situation in Great Britain, both from the standpoint of the manufacturer and the user of electrical goods, to compare industrial progress in Great Britain with that in the main competitive countries, and to survey developments in the prices of the raw materials used in electrical manufacture. The cost of the coal stoppage is placed at £500 000 000, and it is pointed out that the increase in the price of electricity imposed by it is about 0·4d. per kWh. Assuming that the period of dear coal lasts for eight months the total cost to the consumer will be in the neighbourhood of £10 000 000. At the same time highly electrified industries will not be so badly affected by this change as those using coal direct. The increase in the cost of iron and steel brought about by the coal stoppage will probably cause an increase of at least 10 to 15 per cent. in the cost of electrical manufactured goods, so that our competitive power will be reduced. This is probably the worst aspect of the stoppage. Fortunately there has been an international lull in trade and the electrical manufacturing industry has not been seriously affected by the coal stoppage. Orders for generating plant have been in excess of those in 1925, but progress overseas has slowed down and delay in passing the Electricity Bill has had its reflection on orders at home. At the same time the consumption of electricity goes on increasing, the coal shortage has stimulated interest in electrical equipment, so that, granted better financial conditions, the demand might well be strengthened. "Trade Survey" is a most useful publication. It represents the results of an exhaustive economic research, which is just as necessary to the well-being of the industry as that which is usually termed scientific. It should be a valuable guide to the forecasting of the market which is so essential a part of the industrialists' work. It certainly deserves close study by electrical traders, and we shall look forward to further issues with interest.

The Coal Dispute.

WHETHER the voting on the Government proposals for a settlement of the coal dispute is in favour of adoption, as seems likely, or not, it is evident that this disastrous trade stoppage is by now nearly over. Certain facts are significant. The Scottish coalowners are protesting that the operation of the coal permit system is preventing them from securing outlets for available output. Until the last few weeks the flow of coal on the London and North Eastern Railway was in the opposite to the normal direction, i.e., northwards, but within the past few days the regular traveller has had the gratification of observing a reversal take place and a satisfactory increase in the number and length of coal trains from the mining districts to London. The South Wales and Monmouthshire Coal Owners' Association are asking that the embargo on the export of coal be removed on the ground that the supply of steam coal exceeds the demand. And in spite of the fact that in most cases men at work are not allowed to vote, there is every indication that the majority of the districts will follow their leader's recommendations and accept the Government's proposals. If this is so, we hope that the removal of rationing will quickly follow, and especially that there will be some relaxation of the order forbidding display lighting, at any rate during the Christmas season. While it is nice to know that some sort of a formula has been devised which will permit the strike to be regarded as finished, we have a suspicion that further legislation and another national body now to be created are only in fact the seeds of further trouble. That trouble may, however, be worth while, if it cause the futility of political interference in business matters to be more generally realised than it is to-day.

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PHASE ADVANCER PROGRESS.

Arrangements for Compensating Existing Motors—Commutation Conditions—Some Oscillogram Records.

By D. B. HOSEASON, A.M.I.E.E.

(*Concluded from page* 562).

WHEN it is proposed to compensate an existing motor by means of a phase advancer the latter can be arranged to be belt driven off any convenient line shaft or off the main motor coupling. Alternatively a separate small driving motor can be installed and the whole arranged as a motor-generator set. In all these cases where there is a risk of the driving power to the phase advancer being removed, such as by a belt breaking, it is advisable to fit an overspeed tripping device. The Miles Walker phase advancer is essentially a series wound generator and if not driven will run in the opposite direction as a series motor. If there is any appreciable load on the main motor and there is nothing to retard the acceleration of the phase advancer the latter may run away in a similar manner to an unloaded d.c. series motor. When the phase advancer is direct coupled to its main motor this risk does not occur and no overspeed tripping device is required.

The usual switchgear employed with the phase advancer is a triple pole change-over switch to connect the slip rings of the main motor to the rotor starter during the starting period and to the phase advancer when up to speed. If the rotor starter is arranged so that the star point of the resistances is available, then no switchgear at all is necessary and the phase advancer can be connected in this star point. Fig. 6 shows a typical diagram of connections for a belt driven phase advancer arranged with full interlocks on all the control gear so as to ensure the correct sequence of operations during the starting period. Certain of these interlocks could be dispensed with according to the reliability of the men handling the apparatus.

The commutation of a Miles Walker phase advancer is indistinguishable from that of a low voltage d.c. exciter. As the voltage per commutator bar is low and since the machine is compensated for armature reaction the commutation is as perfect as it is possible to obtain. The transformer e.m.f. induced in the coil undergoing commutation which gives so much trouble in other a.c. commutator apparatus is negligible here on account of the low frequency at which the machine works. In one particular case of a set of brushes on which measurements were taken over a period, it was found that working the usual day shift hours the brushes would last over 15 years; working 24 hours per day and 365 days per annum the set was good for 5 years' life.

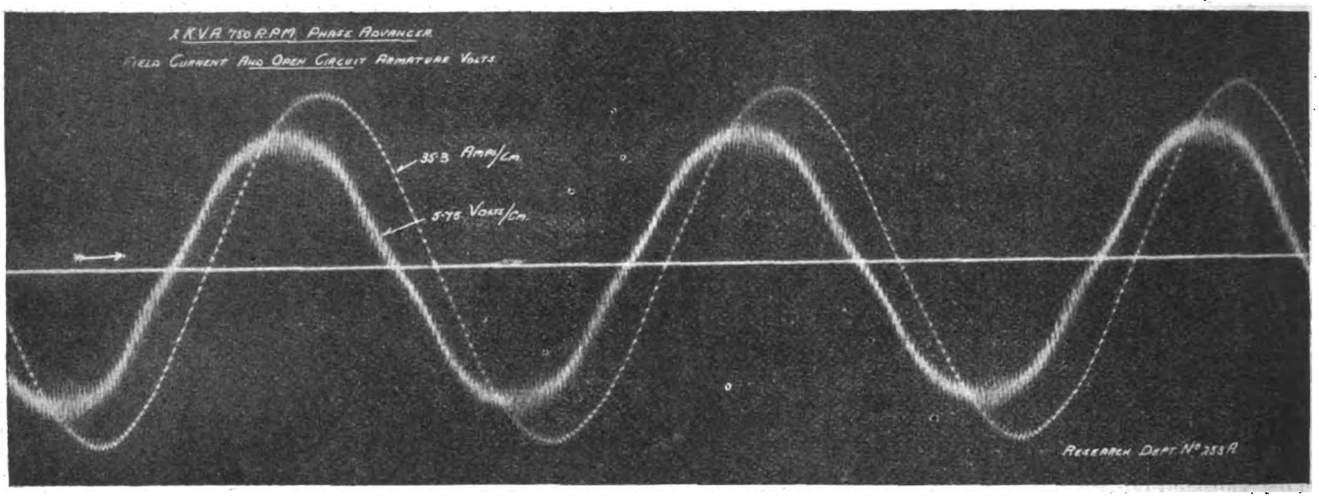

Fig. 5 (a).

The oscillogram in Fig. 5 (a) shows the relation between the field current and generated armature volts on open circuit. It will be noted that the generated volts lead the current by 30 deg. The oscillogram was obtained by disconnecting the main field winding from both the compensating winding and the armature, and star connecting three of the ends. The three remaining ends were connected to the slip rings of a convenient motor which was loaded up until sufficient current circulated around the field coils of the phase advancer while this was separately driven at the correct speed. Three resistances of very high value were star connected across the brushes and used to obtain the e.m.f. wave form of the

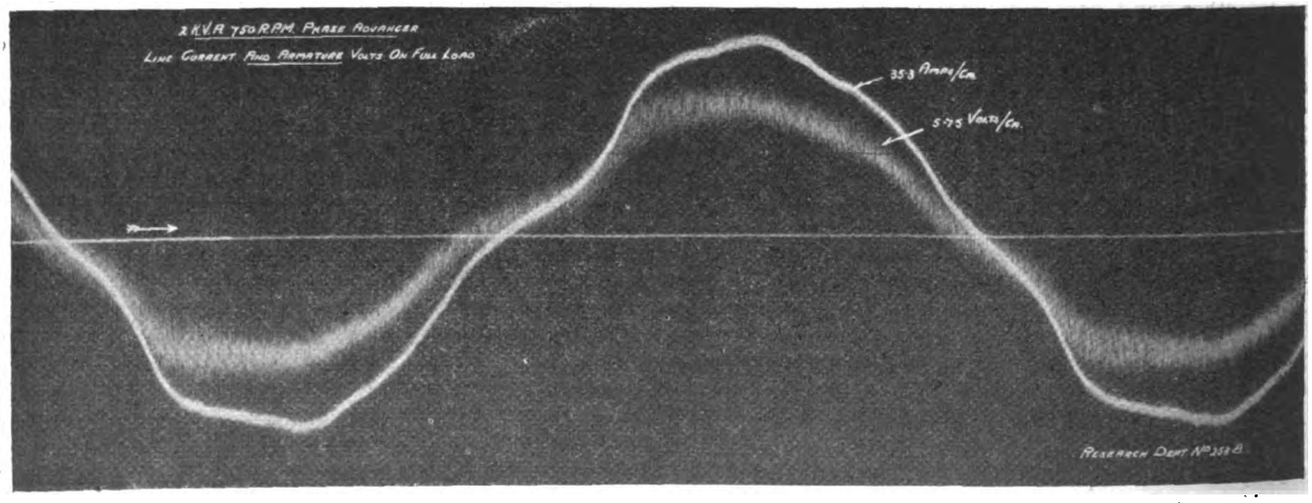

Fig. 5 (b).

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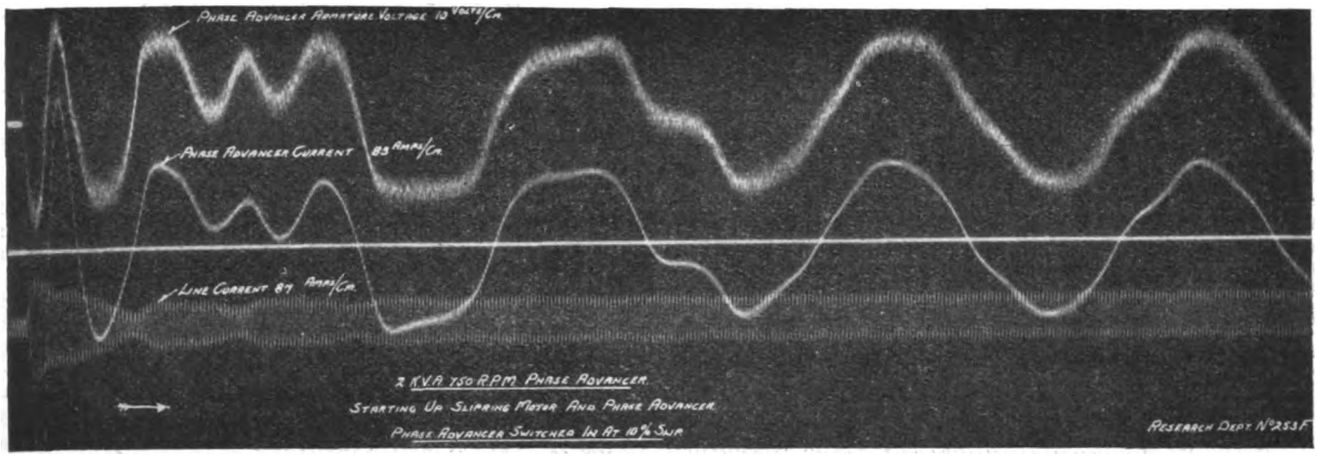
PHASE ADVANCER ARMATURE VOLTAGE 13 VOLTS/CM.
PHASE ADVANCER CURRENT 83 AMPS/CM.
LINE CURRENT 87 AMPS/CM.
2 K.V.A. 750 R.P.M. PHASE ADVANCER.
STARTING UP SLIPRING MOTOR AND PHASE ADVANCER.
PHASE ADVANCER SWITCHED IN AT 10% SLIP
RESEARCH DEPT. N°253F

Fig. 5 (c).

"equivalent star" phase by connecting the oscillograph across one leg of these resistances. The high frequency ripples on both the current wave and the e.m.f. wave originated in the main motor.

Fig. 5 (b) shows the wave form of the current and "equivalent star" voltage with both the compensating winding and armature now in circuit. The machine tested was under-compensated for armature reaction and the resultant phase shift is quite noticeable when comparing 5 (b) with 5 (a). The under-compensation also accounts for some of the distortion of the wave forms shown in 5 (b).

Fig. 5 (c) shows the effect of switching in the phase advancer before the main motor is completely up to speed. In this instance the changeover switch was operated with the motor running at about 10 per cent. slip, the phase advancer current rose to three times normal while the current drawn from the supply reached approximately twice normal. No appreciable sparking took place on the phase advancer commutator and there was not the slightest indication of trouble after the tests had been repeated many times. Figs. 5 (d) and 5 (e) show the effect of disconnecting the motor from the supply in order to shut down. The motor was operating with a leading power factor and when the stator switch was tripped the terminal voltage increased, due to the over excitation of the rotor by the phase advancer. In the case of 5 (d) the phase advancer was direct coupled to the motor and slowed down with the latter. Oscillogram 5 (e) is of particular interest as the phase advancer was separately driven by its own driving motor and, as would

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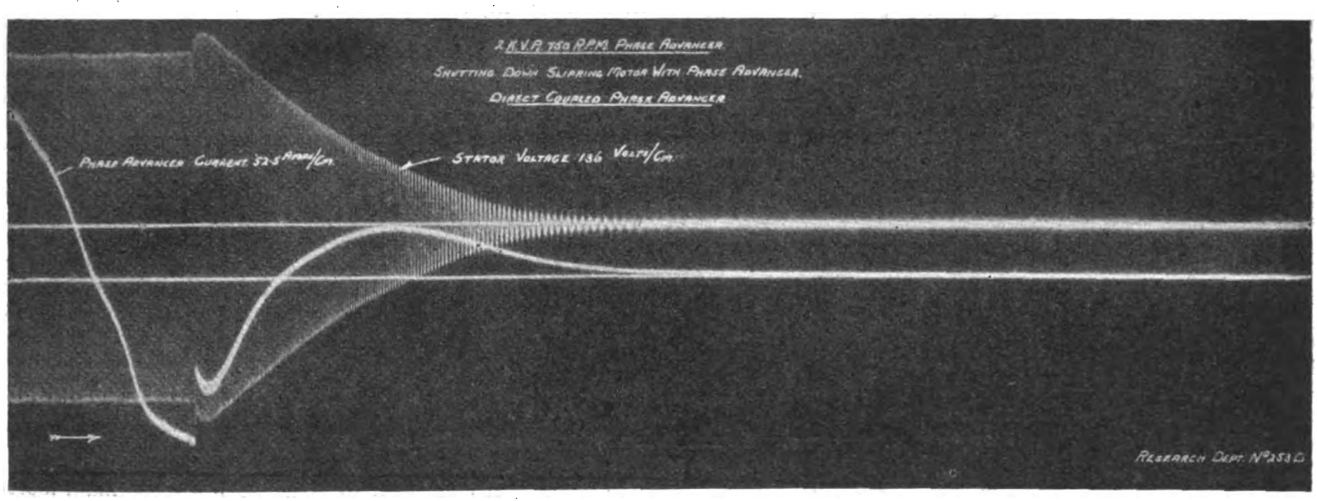
2 K.V.A. 750 R.P.M. PHASE ADVANCER.
SHUTTING DOWN SLIPRING MOTOR WITH PHASE ADVANCER.
DIRECT COUPLED PHASE ADVANCER
PHASE ADVANCER CURRENT 52·5 AMPS/CM.
STATOR VOLTAGE 136 VOLTS/CM.
RESEARCH DEPT. N°253D

Fig. 5 (d).

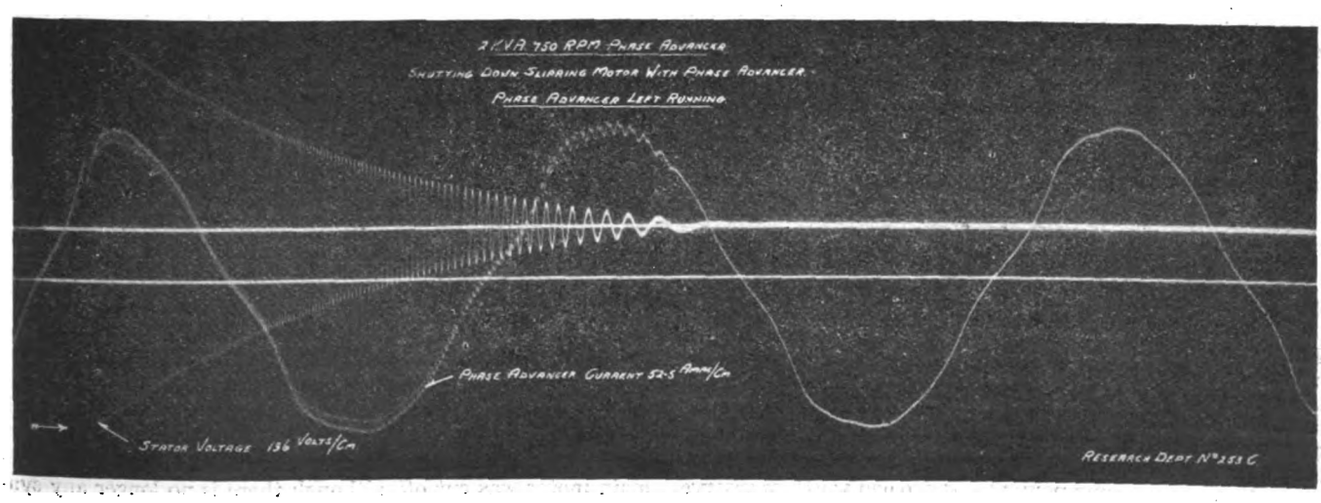
2 K.V.A. 750 R.P.M. PHASE ADVANCER.
SHUTTING DOWN SLIPRING MOTOR WITH PHASE ADVANCER.
PHASE ADVANCER LEFT RUNNING.
PHASE ADVANCER CURRENT 52·5 AMPS/CM.
STATOR VOLTAGE 136 VOLTS/CM.
RESEARCH DEPT. N°253C

Fig. 5 (e).

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HARD DRAWN COPPER.

Its Mechanical Properties—Useful Data.

THE characteristics of copper which has been subjected to cold work, have formed the basis of several extensive researches. It is known that the hardness of the metal increases as the diameter decreases, but the relationship between these functions has been very variously described. As a result of this, specifications covering supplies of material were widely different until the British Engineering Standards Association formed a Committee to produce sufficient standard specifications to govern the whole of the material for conductor purposes. This work, so far as copper is concerned, is now completed, there being four standard specifications for copper conductors.

Naturally, the standardisation of a value for resistivity is of first importance. The B.E.S.A. value is that prescribed by the International Electrotechnical Commission, so falling into line with all countries actively engaged in production of conductors. This resistivity value, in its most practical form, is expressed in B.S.S. No. 7—"Annealed Conductors for Light and Power"—in the following manner:—

"The resistance of a solid conductor of standard annealed copper at 60 deg. F., 1 000 yd. in length, and of a uniform cross-sectional area of one square inch, is 0·0240079 ohm."

This is qualified by a statement that the co-efficient for the variation of resistance with temperature is 0·0022221 per deg. F. For hard-drawn wires, where the resistance is known to increase directly with the hardness, the amount of increase permitted is covered by the expression $P = \frac{T}{10}$, P being the resistivity increase per cent., T the tensile strength in tons per sq. in. The tensile test is without doubt the most accurate method of ascertaining the amount of work that has been given to the wire. Whilst some investigators claim that the relationship is more complex, it is found that a series of tests on various sizes of wire give an expression that is very closely a straight line curve. Although B.E.S.A. give no hint of this in their tables of permissible minimum tensile strengths, the values given in the Tables have been carefully analysed, and show very small deviation from such an expression. For the assistance of those who wish to interpolate sizes not specifically covered by the B.E.S.A. the following are the expressions derived from the various specifications.

B.S.S. 125 (H.D. Transmission Line Materials.)
Above 0·215 in. dia. $T = 30·92 - 20·78D$.
Below 0·215 in. dia. $T = 31·31 - 23·76$ D.
B.S.S. 174 (Telephone and Telegraph Line Material.)
$T = 31·37 - 19·51$ D.
Municipal Tramways Association (Round Trolley Wire.)
$T = 27·61 - 10·00$ D.
" " " (Grooved Trolley Wire.)
$T = 26·61 - 10·00$ D.

The tensile strength of soft wire varies from 14 to 16 tons per sq. in., whilst a cast wire bar gives but 8 tons per sq. in. The elongation of a soft wire is about 45 per cent. on a length of 10 in., but this value also is dependent on the wire diameter. In the hard state, at 0·4 in. diameter, 3 per cent. is a frequently prescribed minimum value, but at 0·1 in. diameter, 1 per cent. only is obtained. Annealed wire has a yield point at 30 per cent. of its ultimate load, but this is increased by drawing to 75 per cent. The value of Young's modulus varies from 11 by 10^6 lb. per sq. in. in the soft wire, to 18 by 10^6 lb. per sq. in. in fully hard wire. On the Brinell scale, the hardness number for soft copper is 45, and for hard, 95. Scleroscope values, with the special magnifier hammer, are 11 and 50.

The data given in this article have been supplied by Messrs. British Insulated Cables Ltd., whose wire mills at Prescot, are amongst the most important in this country.

Advantages of Interconnection.

A booklet somewhat flamboyantly entitled "Getting Down to Cases in Electric Interconnection," has just been issued by Bonbright and Co., New York. It gives details of sixteen actual cases in which interconnection resulted in actual savings of dollars and cents. In one case, for example, an investment of less than $25 000 saved power worth more than $100 000 annually; another $60 000 annually was saved through an investment of $150 000; in another the interconnection gave earning power to $1 250 000 worth of reserve equipment usually idle.

B.E.S.A. MEETING

Unsatisfactory Financial Position.

AT the annual general meeting of the British Engineering Standards Association, Sir Archibald Denny, the chairman, reported that whilst the general work of the Association was in a most healthy condition, the finances, he regretted to say, were not. It could not, of course, be expected that this industrial work would be unaffected by such a devastating cessation of activity as the coal strike, and the Association had done its utmost to introduce still further economies in addition to taking precautions for the immediate future.

He regretted that on March 31st, 1926, the Association had to face a total deficit of just over £2 500. This implied that for the time being, at any rate, they could not give effect to the expansion which should, and would, naturally take place, if the necessary funds had been at their disposal. With the help, however, of the Ways and Means Committee, the needs of the Association were being more prominently and more systematically brought to the notice of the many firms, public supply authorities and others, who did not as yet subscribe to this national work. Also the scheme of membership which was mentioned last year had been put into operation, and was proving moderately successful, there being now some 600 members enrolled.

The work of the various sections was being maintained, attention being specially concentrated on the more important inquiries. One of the sections of more than ordinary interest, at the moment, was the colliery section, the work of which is financed by the coal owners. Amongst other matters, the question of the reduction of the number of varying types of rails in the coal mines had been the subject of a most elaborate inquiry, resulting ultimately in a recommendation to reduce the present 38 sizes, with 12 or more sections, down to a total of 14. With the gradual adoption of these British standards throughout the coalfields large economies were bound to result.

The question of international collaboration in standardisation work had recently come under the consideration of the Association, and the situation was being most carefully explored.

With the revival of trade and greater Government support which this national work undoubtedly merits, the Association should once again be in a position to carry forward with renewed energy the growing needs of the country for the expansion of this industrial standardisation, so beneficial to the whole Empire.

Phase Advancers.

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be expected, it continued to generate when the main motor had come to rest. The particularly interesting feature, however, is that the phase advancer continues to generate at the

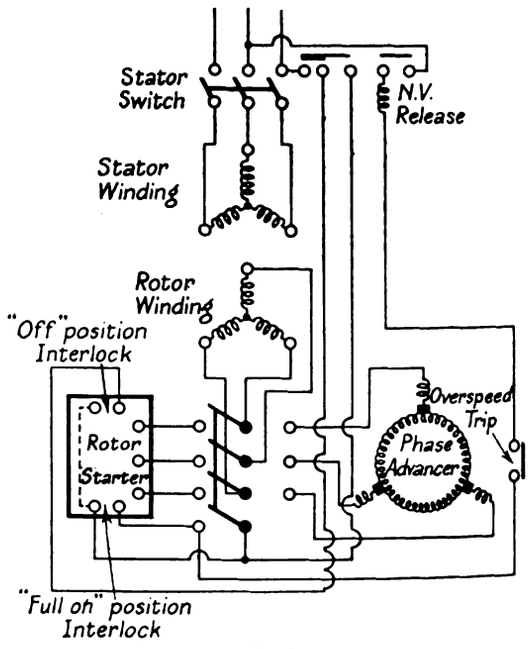

Fig. 6.

frequency at which it was operating when the supply to the main motor was cut off, although there is no longer any synchronous machine in the circuit to fix this frequency.

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COAL-CUTTER PROTECTION.

Details and Objects of the Metrovick System.—A Strong Design—Complete Interlocking Arrangements—Fireproof Protection

AN improved system of protection for motor driven gear used at the coal face has been developed by the Metropolitan-Vickers Electrical Co. to meet the demand for fuller protection on underground electrical apparatus. The system is especially applicable to coal-cutters and coal-conveyors which are driven by direct-started squirrel-cage motors. Its object is to protect trailing cables, prevent open sparking and provide against injury to operators and apparatus. It is claimed that not only is much more complete protection afforded than has hitherto been obtainable, but the system

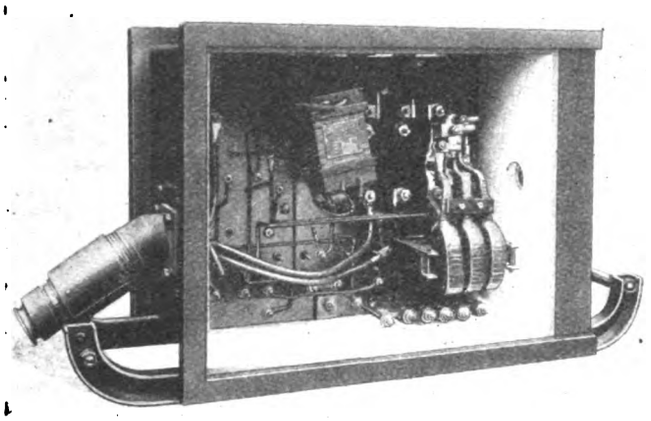

Fig. 1—Back view of gate-end starter.

embodies characteristics which will result in reduced working costs and also in increased output.

The essential apparatus includes a special gate-end starting box, containing a main contactor with protective and resetting devices, a control switch suitable for mounting in any type of coal-cutter, and a standard form of trailing cable with suitable standard terminal plugs. Complete control of the gate-end apparatus is effected by means of the controller on the coal-cutter. An important feature of the system is that the control circuits are at a pressure not exceeding 20 V and no main current is made or broken in the controller. Power is connected and interrupted only by the contactor in the gate-end box.

Fig. 1 is a back view of the gate-end starter. Fig. 2 shows in detail the apparatus on the front of the panel. The power circuit to the motor is made and broken by a standard 125 A, three-pole air-break contactor (A), with magnetic blow-out coils, of the type used in rolling mill control and other severe services. A bias weight (C) is fitted which prevents the contactor being closed by the gate-end box being overturned. The overload relay (B) has two windings connected in different phases, so as to operate on overload on any or all phases. It has a time-lag allowing four to five times full load current for 5 sec. for motor starting and twice full load current for about 20 sec. so that the service is not interrupted through temporarily difficult cutting. Protection of the trailing cable and motor is completed by the leakage trip relay (D), which operates in the event of leakage from any phase to earth. The purpose of the arcing relay (G) is to prevent completion of the resetting control circuit until current interruption at the main contactor is complete. A red signal lamp (L1) indicates when the supply is connected to the gate-end starter and a white lamp (L2) indicates when power is connected through to the motor.

The box in which the gate-end starter apparatus is contained is of strong boiler plate with terminal sockets for the incoming power line and the outgoing trailing cable. It is mounted on long skids which can be drilled for fixing standard tub wheels to facilitate transport in-bye. Both front and back covers of the box slide in deep machined grooves, giving a flameproof construction yet allowing easy access to the apparatus when desired. Arrangements have been made now whereby a specially designed isolating switch can be fitted between the incoming cable box and the body of the tank. The switch has been arranged to isolate all parts within the starting box, so as to avoid risk of shock from accidental contact with live metal, and is interlocked mechanically with the covers so that the front and back covers cannot be withdrawn except with the switch in the open position, and must be properly replaced before the switch can be closed. It is strongly recommended that the isolating switch be included as a standard part of all automatic gate-end starters.

The controller by which the apparatus is operated is designed to fit into the controller chamber of any coal-cutter, but in cases where this compartment is not of flameproof construction the controller is supplied in the flameproof case shown in the illustration. It consists of a single drum-type switch having only three positions, viz., forward, off and reverse. The motor cannot be started except by means of this controller, no operation being possible from the gate-end box except to trip the contactor in such emergency as, for instance, the interruption of communication by a roof fall.

The power and control lines are carried in a trailing cable having five cores, three for the power circuit, one earth core and one core for the pilot circuit. A four-core cable with Ferflex braid may be used, the braid serving for the fifth core, but the use of five-core cable is recommended.

The principles of operation of the system may be gathered by study of the diagram shown in Fig. 3, which should be read in conjunction with the layout particulars given in Fig. 2.

It is claimed the protection given by the system covers all risk of injury to the operator or the apparatus. Accidental contact with live conductors is impossible, since power cannot be supplied or maintained unless all covers are properly closed and locked and cables properly connected. Further, since power connection depends on an efficient connection between the case of the coal-cutter and the case of the gate-end starter, external casings of apparatus cannot rise above earth potential, provided that the gate-end starter case is effectively earthed, as it should be.

The system also obviates the possibility of accident due to unexpected starting, for after a stoppage due to overload, low voltage or failure of supply, the cutter will not restart when supply is restored, even though the switch handle may have been left in a running position.

The handle must first be returned to the off position and the controller operated in the correct sequence. This is a feature of considerable importance, since during a stoppage the operator may be engaged in examining or changing the cutters.

The apparatus is protected against open sparking, against mishandling on the part of the operator, and against injury

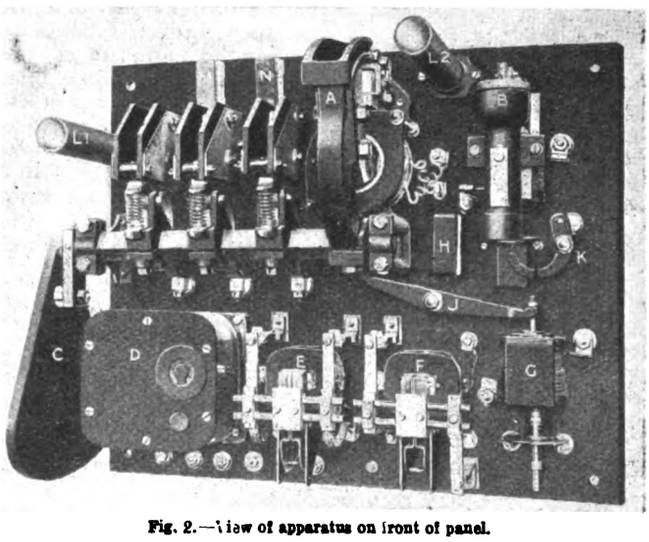

Fig. 2.—View of apparatus on front of panel.

resulting from overload, failure of supply or leakage to earth. The overload relay, while restrained by the time-lag device already mentioned from unnecessarily interrupting the service, effectively guards against overloads which are unduly heavy or sustained. The no-volt release and leakage trip operate instantaneously. The leakage trip can be adjusted to operate down to 5 per cent. of the full load current of the motor.

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After tripping, this relay remains latched out and prevents a restart until it is released by an authorised person responsible for ascertaining that the cause of the leakage has been put right.

In addition to providing protection the system effects important improvements in working efficiency. Increased output is obtained by the facility of resetting the overload and no-volt trips from the coal-cutter for there is no longer any need for the operator to walk back to his gate-end switch for this purpose. Saving is also effected by the elimination of unnecessary stoppages due to momentary overloads. Maintenance costs are reduced to a minimum since the power circuits are made and broken by a contactor capable of one or two million operations without attention, and with contacts capable of easy and inexpensive renewal.

An effective and economical arrangement of machine face cutting obtained by providing a single gate-end box with auxiliary switches for operating a coal-conveyor, as well as a coal-cutter, a controller and suitable socket for the trailing cable connections being provided on each machine. The coal-conveyor can then be connected and used after the coal-cutter, the protection thus covering both pieces of apparatus

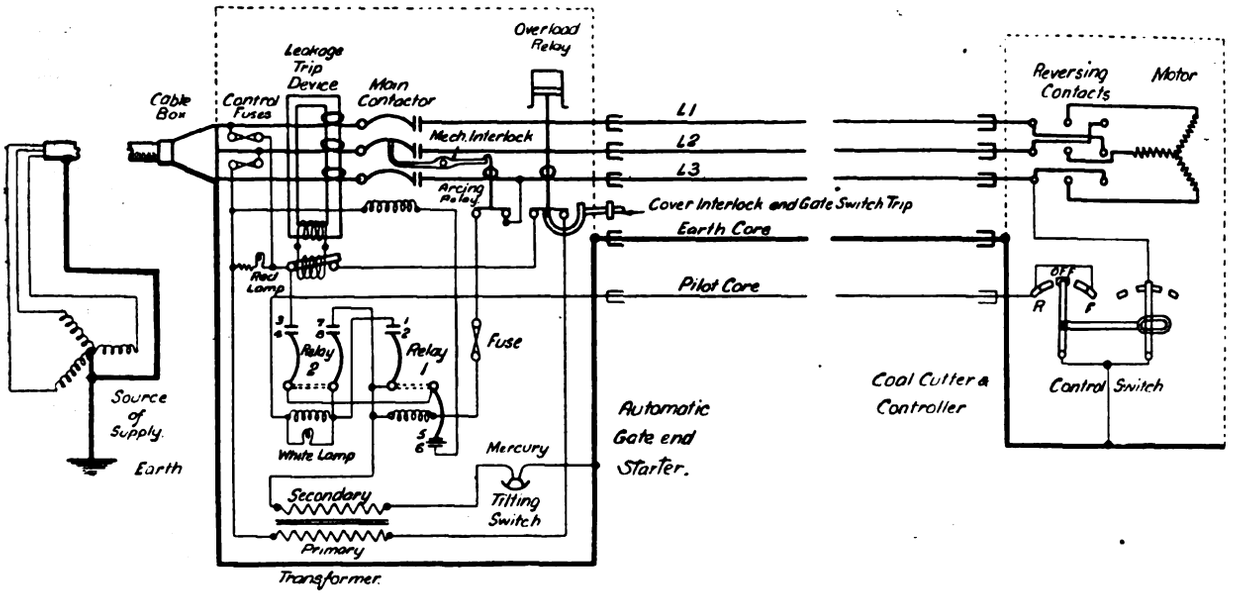

Fig. 3.—Diagram of Metropolitan-Vickers' coal-cutter protection system.

THE ELECTRICITY BILL AND THE FUTURE.

Some Opinions from the Provinces—Reliability of Supply Mainly a Question of Co-ordination—Water Power a Small Factor in Consumption.

SEVERAL of the addresses delivered by chairmen of local centres of the Institution of Electrical Engineers have dealt mainly with the Electricity Bill. Mr. W. H. T. Swire, in his address at Dundee, emphasised especially the question of the effect of linking up on reliability of service. The Electricity Bill is designed to secure co-ordination of effort, and on this the reliability and extension of electrical supply largely depends. The latter part of the address dealt mainly with applications, including the possibilities of electricity for heating. An institution catering for 800 persons a day and consuming 3 kWh per person per week for its electric cooking was mentioned. Electricity can also be favourably employed in baking ovens, and several supply authorities are considering the granting of special rates when baking is done during the night. In conclusion a reference was made to the valuable propaganda work being done by the E.D.A. and other bodies.

Mr. G. H. Nelson's address to the Sheffield sub-centre likewise dealt with the Electricity Bill, attention being drawn to the contrast between the consumption per head of population in Great Britain (only 110 kWh, or possibly 200 if private plant is included) and in certain American States. Thus the East North States (including Indiana, Illinois, etc.) consume 800 kWh per head—in spite of the fact that Great Britain is relatively more densely populated. This is not, as is commonly assumed, due to hydro-electric supply. In Illinois only 5 per cent. of energy generated is derived from hydro-electric stations. One result of widespread electrification will doubtless be the building of factories away from the great centres; in America this tendency to decentralisation has made marked progress. There are also great possibilities in railway electrification. In the North East States of America 2 200 million kWh are used annually for electric railway purposes as against 386 millions kWh in this country. If all our railways were electrified they would take 4 600 million kWh per annum. Reference to these data led to a discussion of the advantages of railway electrification and the merits of electric as compared with steam locomotives, and it was also remarked that there has been substantial progress in tramway electrical apparatus—the outstanding advance being the speeding up of the tramcar so as to increase the average speed of a journey and the substitution of motors of higher speed per minute.

Reference may also be made to an informative address delivered by Prof. F. Bacon to the South Wales Branch of the Institution of Mechanical Engineers. Before giving an account of his recent experiences in Switzerland, he presented a message from Mr. Patchell, who remarked that in all the countries visited he found men actively at work—turning out a product that any shop might be proud of. Meanwhile, we are squabbling in our leading industries and so putting a severe brake on all wheels—enough to make angels weep! Professor Bacon reported that electricity is laid on to 95 per cent. of all houses in Switzerland and the steam locomotive is becoming extinct. Yet hydro-electric developments are not slowing down. Export of power to Italy, France and Germany is already taking place on a considerable scale. Within another decade Switzerland may be supplying 10 000 million kWh per annum to central Europe. Yet, although Switzerland is a highly industrialised country, it is singularly free from man-made ugliness. Even buildings for purely industrial purposes rarely offend the eye. The country is now completely coupled up to a network of high tension lines fed by some 300 power stations, 50 of which have capacities of from 10 000 to 100 000 h.p. The total capacity amounts to nearly 2,000 000 h.p., with an annual output of nearly 1 000 kW per head of population—five or six times the corresponding figure for this country.

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INSTITUTION OF ELECTRICAL ENGINEERS.

Distribution Problems—Voltage Standardisation Vital—Cheapening Supply the Main Consideration—Antiquated Systems.

AT the last meeting of the Institution of Electrical Engineers, a paper on "The Design of City Distribution Systems, and the Problem of Standardisation" was read by Messrs. J. R. Beard and T. G. N. Haldane. An abstract of this paper appears on p. 558 of our last issue. An account of the discussion is given below.

Mr. R. A. Chattock said that the lines of development indicated in the paper were very similar to those adopted in Birmingham and other large cities. Whilst standardisation was a desirable ideal, if it entailed the scrapping of a large part of the existing systems it would not cheapen supply for many years. He did not see how it was possible to superimpose an a.c. system on a d.c. system without scrapping a large amount of the latter. In their comparison of d.c. and a.c. costs, the authors assumed that no regulation of the a.c. was necessary. As regards the assumption that the voltage drop in the low-voltage cable should not exceed 6 per cent., his experience was that a drop of 7 to 10 per cent. was the usual figure on the high voltage system, apart from the drop in the transformers, owing to the fact that the h.t. cables were not only used for the lighting, but for the industrial load. That necessity was recognised in the e.h.t. regulations, which allowed a 12½ per cent. variation. In Birmingham it had been found necessary to put in induction voltage regulators on the h.t. side to correct for this variation. That would bring the a.c. and d.c. costs much closer together. Reliability of supply in densely populated areas was of great importance, and the batteries used in Birmingham, of which there were a considerable number, had fully justified themselves in that connection. Finally, the fact that d.c. machinery had to be installed for tramway supply was a very good reason why the supply for lighting purposes should be on that system.

The Right Pressure.

Sir John Snell, in a written communication, said he was glad to see the authors were advocating for a.c. systems declared pressures of 400 between phases and 230 V between phase and neutral. The Commissioners had been giving consents for a long time past to these declared pressures wherever systems were being changed from d.c. to a.c.; and in some cases where d.c. was persisting, 230 V between outer and middle and 460 V across outers on a three-wire system were being adopted.

Mr. C. P. Sparks said that the B.E.S.A. Committee dealing with these matters had been trying to get down to a definite standard to recommend, and after a great deal of hesitation and endless consultation with the interests involved, had at last made up their minds to standardise the 400 V three-phase and 230 V d.c. systems. He emphasised the importance of standardisation of supply pressure to the consumer. It was vital from the point of view of the manufacturers. With the rapid growth of demand batteries did not constitute an effective reserve. He was surprised at the author's moderation with regard to load density. One of the London undertakings had passed the 70 000 kW figure, and it was quite feasible that, with push, they would double it again. They could not deal with a load density of 150 000 kW per sq. mile with d.c., and must superimpose on it an a.c. system.

Mr. S. J. Watson felt sure that in many suburban areas it would be necessary to adopt an intermediate pressure between 11 000 V and 400/330 V. He himself had another pressure between 3 300 V, which was the single phase system used for the suburban areas, and the pressure applied to the houses. A single phase system was extremely useful in thinly populated areas, and in that case he usually came down from 3 300 V to a three-wire single phase system, with about 230 V in the houses. His policy was to have a.c. supplies all round the fringe of the area, and generally to work inwards as the density of the load increased by changing over the outer portions of the d.c. supply to the a.c. supply. Last year nearly 1 000 consumers were changed from d.c. to a.c., and in order to prevent the growth of the inner d.c. system he had changed over some of the large industrial works from d.c. to three-phase supply. This was not much more costly than continually increasing the number or size of the rotary sub-stations. The authors' suggestion to have the neutral conductor, whether the system be three-wire or four-wire, of the same size as the others was sound, because as the cooking and heating load in the residential district increased it was useful to have plenty of copper in the neutral conductor. Some 300 or 400 cookers had been installed last year in the residential area to which he had referred. With regard to the comparative costs of the standard a.c. and the d.c. systems, the authors showed the cost of the latter to be nearly £30 per kW per annum, but the cost in industrial districts to-day was probably about one-third that.

Mr. J. W. Burr had had experience of both the "distributor" and "feeder" types of network for low-voltage supply, and had found the "feeder" type the more flexible; it enabled the pressure to keep within proper limits more easily.

Two Objects of Standardisation.

Mr. C. A. Ward said he gathered that the two objects aimed at in a standard system were reliability and low cost, but the reduction of cost appeared to have been secured rather too much at the expense of reliability. It was surprising to see that, in spite of the present trend of inter-connecting everything, the authors recommended for the type of area most frequently found, a radial feeder system on the h.t. side without h.t. switchgear. Consequently all possibility of inter-connection with neighbouring sub-stations in case of emergency was excluded. On the other hand, the subdivision of the l.t. network seemed to be excessive. With regard to mains, as it was usually impracticable to lay them for the full ultimate capacity of the area, it appeared to him that a system of lead-covered paper-insulated cables in multiple duct conduits lent itself better to expansion than armoured cables buried direct in the ground. In the case of l.t., d.c., the cost of conversion to three-phase was prohibitive, but in certain cases it might be advantageous to consider whether a two-phase four-wire system could not be adopted, in which case conversion from three-phase to two-phase could be made in the usual way by means of Scott-connected transformers.

Mr. R. Borlase Matthews suggested that the load density figure might be given per route mile of cable, and that the number of consumers per route mile might also be given, instead of the kilowatts per sq. mile, because, although the latter was satisfactory for densely populated areas, the former would be more useful for country towns and rural areas.

Slogans No Good.

Mr. A. Page said it was not a bit of good to have slogans, campaigns and the rousing of the prospective consumer by special organisations if the engineers were not in a position to deal with the load when it came. Unfortunately, that was the position in very many of our undertakings to-day. A really forward policy did not mean rash expenditure, but caution could be overdone. Many of our distribution systems were antiquated. The Electricity Commissioners' report showed that the average cost of distribution in this country was £38 per kW of maximum demand, and in many isolated cases it was as high as £60. The conglomeration of systems in London was a humbling picture to the electricity supply profession, and it would pay handsomely to alter that state of affairs; figures proved it absolutely. We could get improvement without scrapping, and standardisation of pressure was one way. So far as he could see, the plan proposed by the authors was sound, but simplification was desirable. The salient features of the plan were three-phase four-wire distribution from transformer centres—not from feeding points—the transformer centres in turn being served by h.t. distributors at 11 000 V. He was of opinion that it was not necessary to put in an intermediate pressure, but that we should concentrate on primary transmission—h.t. distribution—and go down from that to the supply at which the pressure was given to the consumer. With regard to sites for sub-stations, he said that with town planning on the one hand, and congestion in city streets on the other, electricity supply engineers were at their wits' end, and he believed it would soon be necessary to ask for powers for the compulsory acquisition of land for the purpose, as was the case in connection with land for generating stations. Ventilation was a problem to be considered, and he asked how the authors proposed, particularly in underground chambers, to get rid of heat in apparatus which in some cases was to carry a load of 1 800 kVA.

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CORRESPONDENCE.

GOVERNMENT ELECTRICITY.

[To the Editor.]

Sir,—It is one of many drawbacks of the nebulous constitution at which we have arrived that a Government, once committed to a measure, cannot retrace a false step. Why should not its supporters be able to say: "We trust you and we will continue to defend your position; but you have made a great mistake, and you must make concessions to criticisms which you cannot meet." This, most unfortunately, cannot be. If the Government were defeated on the Electricity Bill, convention requires that it should resign, and the country might at once be plunged into the corrupt gamble of a General Election.

The small band of Conservative members who understood what this Bill must bring about *and were willing to back their opinion* made valiant attempts to secure certain amendments and were, of course, unable to obtain any concession of real value. The only change of importance is that the Board, instead of preparing schemes and submitting them to the Electricity Commissioners for approval, is to obtain schemes from the latter and then consider them. Either way, this arrangement is amazing. Both bodies are presumably composed of experts, the Commissioners being the technical advisers of the Ministry of Transport, while the Electricity Board was originally intended to fabricate schemes. The Commissioners have just produced a Report in which they make it clear that the supply of electricity is advancing in the most satisfactory possible manner. Suppose that—being wise men—they propose to leave it alone. What will happen? Or suppose that such schemes as they evolve do not the least correspond with the ambitions of the Board. Acute friction or a deadlock might then arise. What is to be done, as no crucial step can apparently be taken by this Board without the approval of the Commissioners? Other amendments accepted by the Government set up a novel tribunal of appeal against the ukases of the Board—a barrister with "one or more qualified assessors." The barrister arbitrators would know nothing of the complex technical questions involved, and the verdict would depend on the selection of the assessors.

The Board is to supply electricity, but must not, except as provided, produce it. The wretched producers, on the other hand, are to sell all their output to the Board, and to buy it back loaded with such expenses as the Board may charge. The Board, if it is dissatisfied with the performances of a selected station, may purchase it compulsorily and work it, if the Commissioners approve; but Parliament has the final decision, which must, therefore, be political. The Board is to borrow at once up to £33½ million, and as much more as Parliament may permit; but some of the existing undertakings will also have to borrow largely without a Government guarantee, and whether investors will be attracted to businesses with which a Government Board can interfere to any extent remains to be seen.

These are only a few features of a Bill which will plunge an immense and rapidly progressing industry into doubt and confusion.

In the House of Commons, on the 11th inst. especially, attempts were made to fix attention on the organic defects of the Bill; but destructive criticism was met only by vague generalities. "The Board," said the Attorney-General, "could supply electricity more cheaply than the authorised undertaker could produce it." That was "the essence of the scheme." Anyone who can be induced to believe this would naturally support the Bill.—I am, etc.,

Sydenham.

London, S.W.
November 15th.

[We publish this letter as an expression of opinion with which we do not agree. We would point out, however, that Lord Sydenham is in error in one particular. While the "wretched producers" are obliged to buy back their requirements from the Board, the cost in perpetuity is not to be more than that at which they can now produce it for themselves. In other words, if the establishment of the Board leads to economies, owners of selected stations will benefit. If it does not, they will not suffer. Moreover, as stated by the Attorney-General, the Board has no power to borrow more than £33,500,000.]

"FALSE PROPHETS."

[To the Editor.]

Sir,—We have read your article in The Electrician of October 29th, and we are glad to see the attitude you have taken with regard to these "False Prophets." As one of the oldest manufacturers of electric irons in this country (we believe we are the oldest) we have had great experience in the use of these articles in the household, and we say that the electric iron is practically fool-proof, and it is only by the greatest carelessness that any danger can result from its use. We are sure this statement can be confirmed by many thousand of users of electric irons which are now considered almost indispensable in the house where electric lighting is employed.

We know of cases where it has been decided to introduce electricity in the household mainly for the purpose of obtaining the benefit of the electric iron and similar appliances.

To overcome any possible danger of leaving the irons on and allowing them to become overheated in places such as workrooms where carelessness in closing might leave the irons connected, we have introduced a system of "Cordless Irons." The electric irons are constructed in the usual way, but they have no permanent attachment to the circuit; they have terminals making contact (like a plug in a socket). The irons are placed on an iron shelf (fitted for the purpose) and after about ten minutes "charge" they may be removed, as they are ready for use. The heavy "Goose" irons to which a permanent wire attachment would be objectionable, are used on the cordless system and are found to be very satisfactory. There is no reason why the same system should not be adopted for private houses and so reduce further the possibility of danger by leaving the wire connected.

We may mention here that our irons are wound with wire which has the property for increasing very much in resistance as the temperature rises, so that the electric iron, when ready for use, is actually taking far less current from the main than when it is cold. This principle acts as an automatic control to a large extent in the use of electric irons.

We join with you in deprecating any sort of advertisement which would tend to alarm the public and make it appear as if danger existed, which in the case of electricity is enormously less than with any other form of heating.—We are, etc.,

The Dowsing Radiant Heat Company, Limited.
F. M. Steele.

November 11th.

BRITISH TRADE WITH AUSTRIA.

[To the Editor.]

Sir,—Despite the fact that Austria has at the present moment in certain English business circles, for certain clearly defined reasons, something of a *mauvaise presse*, there nevertheless does exist in this part of Europe considerable opportunity for British trade. There are numerous British firms who have for many years done, and are still doing, quite successful business.

It is not overstating the case to say that much of the recent unpleasant experience of English firms doing business out here has been the result of a certain laxness in making preliminary investigation. Numerous cases have come to light in which English houses were proved to have taken risk in dealing with mid-European firms, such as they never would have taken in dealing with home firms. The explanation of this lies probably in the necessity of reducing heavy accumulations of stock, even on unusually risky credit terms.

British firms having business relationship with Austria and South Eastern Europe are finding it more and more advisable to become members of the British Chamber of Commerce, Vienna. One of the principal functions of the Chamber is the communication to its members of just that specific local knowledge which is invaluable to all houses exporting from England or the Dominions.

The supplying of confidential and first-hand information regarding Austrians, etc., business houses is a matter of daily routine in the Chamber, and all British firms doing, or contemplating, business with Austria are invited to get into touch with me.

D. Atherton-Smith,
Secretary British Chamber of Commerce Inc., Vienna.

Vienna,
November 15th.

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NEWS IN BRIEF.

Showrooms and the Sale of Fittings—Irish Electrical Trade—Gold Watch for E.T.B.I. Subscribers—Submarine Cable-laying Progress.

BURGLARS at a London costumier's shop stole—an electric fire!

The German postal authorities are replacing horse vans by 500 electric vehicles.

Three assistants are required by the Shanghai Municipal Electricity Department.

At a meeting of Blackburn Textile Society Mr. J. Greenwood, of W. H. Allen and Sons, gave an interesting address on turbine drives for mills.

Australian Commonwealth Trade Returns show that in the three months ended September 30th imports of electrical material were valued at £500 000.

Hebden Bridge U.D.C. is about to open new electrical showrooms and has made an agreement with local electrical contractors regarding the sale of fittings.

For the second time in just over a week the Foster Engineering Co.'s Merton works were broken into and radio apparatus worth several hundreds of pounds was stolen.

A junior technical officer, with knowledge of design, manufacture and testing of W.T. apparatus and small a.c. and d.c. appliances, is required for an Admiralty Experimental Station.

An electric motor and other electrical equipment at the Attercliffe, Sheffield steel works of Thomas Firth and Sons, Ltd., were destroyed by a fire believed to have been caused by a spark from a furnace igniting some oil.

It has taken fifty years to provide a telephone exchange for every county in Great Britain and Ireland. With the provision of exchanges in County Mayo (Ballyhannis) and Sutherlandshire (Dornoch) the chain is now complete.

The Manchester Electro-Harmonic Society's second concert of the season is to be held in the Manchester Limited Restaurant, Royal Exchange, this (Friday) evening, Mr. L. O'Brien, in the chair. The next concert is fixed for December 17th.

Struck by a vacuum cleaner which slipped from the shelf in the shop, Margaret Percival, aged 24, employed by the Electrolux Co., Newport Street, Bolton, was rendered unconscious. She was taken to the infirmary suffering from concussion.

At last week's meeting of the Electrical Section of the Newcastle-upon-Tyne and Gateshead Chamber of Commerce it was decided to support the amendment of the Associated Chambers of Commerce to the Electricity Bill, and to circularise local M.P.'s to that effect.

There was a large attendance at the E.D.A. Ladies' Night in Newcastle on November 10th. Miss A. Holm, the lecturer, was presented with a bouquet of carnations on behalf of a member of the committee. Participants in the discussion included Messrs. Monkhouse, Pinkney and Horsfall.

Electrical goods imported into the Irish Free State during September were valued at £31 686, a decrease of £7 908 compared with the corresponding month last year. For the first nine months of the current year, however, the aggregate is £327 687, an advance of £78 655 on the comparable period of 1925.

Between January 1st and October 15th Newcastle-upon-Tyne Electric Supply Co., connected 12 000 new consumers to its system. The figure is more than double the number of lighting consumers connected in any previous year, and has been achieved in spite of the general disorganisation following the coal strike.

Readers are reminded that any who desire to contribute a minimum of 6d. to the Electrical Trades Benevolent Institution can obtain a free coupon enabling them to participate in a "draw" for a gold watch. Contributions may be sent to Mr. R. E. Robson, Electricity House, Haymarket, Newcastle-upon-Tyne, or to the Editor of THE ELECTRICIAN.

A meeting of the Engineering Section of the Incorporated Society of British Advertisers will be held at the Midland Hotel, Manchester, at 2 p.m., on November 26th, for the discussion of direct mail advertising as it affects engineering firms. Members and others proposing to attend should communicate either with Mr. H. M. Goody, c/o Brookhirst Switchgear, Ltd., Northgate Works, Chester, or Mr. A. W. Swan, c/o Evershed and Vignoles, Ltd., Acton Lane Works, Chiswick, London, W.4.

It is announced that Amalgamated Press, Ltd., have acquired the publications of the Radio Press, Ltd.

During his visit to Luton on Wednesday the Prince of Wales was to inspect the Corporation's electricity works.

To facilitate exploration by visitors, the famous underground caves known as Wookey Hole, near Wells, are to be lighted electrically.

The first of the luxury flats in the new Devonshire House, Piccadilly, London, has an electric cooker, and electric washers, mangle and refrigerator.

Last Saturday members of the Manchester Branch of the Electrical Association for Women visited Salford Corporation's Agecroft power station.

During a fifteen-minutes' bus ride in London the other day an ELECTRICIAN representative noticed 26 commercial electric vehicles on the road.

A new "Tricity" electric restaurant will be opened early next month in the new building at the junction of Savoy Street and the Strand, London, W.C.

"What the Corporation of Glasgow has done for the Electric Consumer" was the subject of an address by Mr. R. B. Maccall to the Educational Institute of Scotland.

As a memento of the borough's jubilee year the members of Blackpool Town Council have been presented with inscribed brass ashtrays made at the Corporation electricity works.

A further sum of £25 000 has been offered by the Department of Scientific and Industrial Research to Cambridge University for building and equipping an extension to the low-temperature research station.

Out of the contributions to the Edinburgh Corporation Tramway Employees' Hospital Fund for the year ended October 31st, 1926, allocations to various local hospitals have been made amounting to £485.

Employees of the Pearson and Knowles Coal and Iron Co. have presented to Warrington Infirmary a new X-ray apparatus, as a memorial to the late Mr. G. H. Fraser, managing director of the company. The cost of the apparatus was £400.

Sir Ernest Benn is addressing the Publicity Club of London at the Hotel Cecil on November 22nd, at 7 p.m. The subject of the evening will be "A Consideration of the Relationship between Trade and Technical Journals, Advertisers and Advertising Agents."

The organisation for the reception of wireless programmes by ordinary telephone initiated by The Hague Municipal Telephone Service, has been successfully inaugurated. When a listener is called on the telephone the wireless broadcasting connection is automatically disconnected.

The Royal Bank of Canada states that the electrical energy generated in Canada in July last exceeded the quantity generated in July, 1925, by 21 per cent. The use of power in Canada is 2·8 times that of the United States, and is expected to reach about 33 000 000 kWh per day before the end of this winter.

It is reported that the Telegraph Construction and Maintenance Co.'s new cable ship "Dominia" has completed the laying of the Pacific Cable Board's duplicate cable from Bamfield to Fanning Island, a distance of 3 448 miles. The work occupied 17 days. Siemens Bros. & Co.'s cable ship "Faraday" is now linking up the section of the cable between Fanning Island and Fiji.

The Calendar of University College (University of London) for the session 1926-7, has been issued by Taylor and Francis, Red Lion Court, Fleet Street, London. This volume consists of 698 pages, and it appears to contain all the information that students or prospective students could desire regarding the personnel of the teaching staff, fees and syllabuses, etc., for the various departments.

Lecturing on "Safety First" before the South Wales Branch of the Association of Mining Electrical Engineers, Major E. I. David, said that electrical apparatus proportioned for normal conditions might be inadequate for short circuit conditions, and gave information regarding the use of reactances as a means of protection. A large number of members and student members were enrolled at the meeting.

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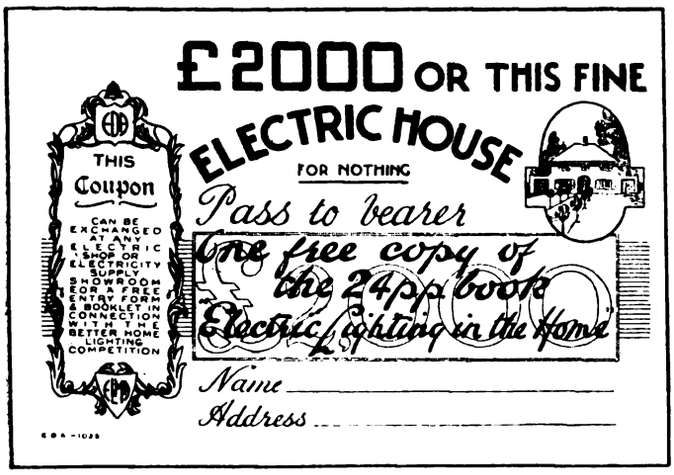
"WIRING THE HOMES OF BRITAIN."—XII.

"Contact" Suggestions for Electrical Campaigners—More Demonstration Houses Opening—News from the Districts.

READERS who profited by the advice to secure copies of the special "contacts" edition of the "Home Lighting News"—which, it may be repeated, is obtainable free of charge from the E.D.A.—are now in possession of a number of useful suggestions for increasing and maintaining contact with the public. In a campaign of this kind, spread over a lengthy period, public interest cannot be retained exclusively


£2000 OR THIS FINE
ELECTRIC HOUSE
FOR NOTHING
THIS
Coupon
CAN BE EXCHANGED AT ANY ELECTRIC SHOP OR ELECTRICITY SUPPLY SHOWROOM FOR A FREE ENTRY FORM & BOOKLET IN CONNECTION WITH THE BETTER HOME LIGHTING COMPETITION
Pass to bearer
One free copy of the 24pp book "Electric Lighting in the Home"
Name
Address

A small-scale reproduction of the new campaign-help referred to in the accompanying article.

by newspaper advertising, and it is therefore necessary for local electrical interests to keep the campaign in the public eye in the intervals between the official advertisements.

One cheap and efficient way is to exhibit a lantern slide of the prize house in the local cinema. A coloured slide of the house is supplied by the E.D.A. for 5s. 6d., and 8s. 6d. buys a similar slide incorporating the contractor's or supply undertaking's name and address.

Another cheap campaign-help prepared by the E.D.A is a coupon in the form of a cheque which can be distributed with letters, accounts, etc., or can be distributed by hand at local cinemas. This cheque, which is reproduced above, can be obtained from the E.D.A. at the rate of £1 for 5 000. Early this week 120 000 of these coupons had been sold, and it is expected that very large quantities will be disposed of. Orders have also been received for 90 of the cardboard model prize houses, referred to in recent issues, 949 copies of the new cheap poster, and for 27 cinema slides.

During the week ending November 13th new electrical circles were formed at Brighton, Basingstoke, Kidderminster and Portsmouth, and throughout the country there are now some eighty such circles in existence.

Birmingham's Fine Effort.

Demonstration houses, which are contributing so much to the effectiveness of the campaign wherever they are opened, are very much to the fore in the reports from the South Midland area this week. An ELECTRICIAN representative states that the local committee at Birmingham, the centre of the area, is making a determined bid to achieve a record in this matter, and looks like succeeding, for by the end of the present week there will probably be four fully equipped houses open in the city. Three have been described in previous issues. The new one is at Hall Green, and here again the choice of locality has been good, for the suburb is a progressive one, using a lot of electricity.

But this is not all. The Birmingham Committee is hopeful of having three or four more, or even five, demonstration houses opened in the city in the near future. The success already achieved has brought an offer from a Birmingham firm of builders to build a specimen house exclusively for the purpose of demonstrating electric lighting and equipment. The builder would, of course, benefit from the demonstrations, and the offer is an interesting example of the inter-dependent character of the two trades. This offer the committee were considering at the moment of writing. It will probably be accepted.

The number of visitors to the first three houses in Birmingham during last week was gratifying, being something like 1 500, and the contractors are receiving orders for wiring and equipment which are directly traceable to the influence of the demonstration houses.

It is felt in this area, by the way, that the limit of time during which a demonstration house should remain open is about a month or three weeks. A good deal of importance is attached to the first impressions which visitors receive, and the committee are anxious to avoid anything like staleness.

The example set by Birmingham is being keenly followed elsewhere in the area. At Walsall, work is already in hand upon two demonstration houses, which are to be opened in a few days' time. At Nottingham, also, two houses will shortly be opened, and Leicester and Worcester will have one each at an early date.

Enthusiastic meetings have been held during the last few days at Evesham and Kidderminster. At the latter place a local contractors' association has been formed in connection with the campaign, and, our correspondent states, will probably join the E.C.A. in the near future.

Meetings are being arranged at Stourbridge and Wednesbury for next week, with a view to establishing local circles.

The Lincoln demonstration house—"Glengarth," Nettleham Road—has been built by Mr. W. Middleton, a local builder, for Mr. F. Smith, and it is due to the courtesy of these two gentlemen that arrangements have been made for a two weeks' special tenancy for electrical demonstration. The house was opened by the Mayor of Lincoln at a civic ceremony last Saturday in the presence of a representative gathering of local men. The Mayor spoke of the advantages of electricity, and said the statement that electricity was dearer than gas was erroneous. The house will be open each day, from 3 to 8 p.m., until Saturday, November 27th.

Screen Publicity in Liverpool.

According to Mr. R. C. Hawkins (states an ELECTRICIAN correspondent) one of the most active centres in the North Western area is Liverpool, where the "Contacts" in the recent issue of the "Home Lighting News" are being used to good advantage. The Electricity Department have for some time been in the habit of advertising on the screen in the Empire Music Hall, and this is now being utilised for campaign purposes. Other halls in Liverpool are also showing slides, and in Birkenhead arrangements have been made for advertisements in 13 picture houses. Liverpool is making a special effort to have models of the competition house displayed in the great stores, such as Lewis's, Bon Marché, etc. It is not intended that booklets should be given out, but that prospective competitors should be directed to the electrical shops. The model house will be moved round amongst the large stores during the period of the campaign. The local Circle finds that the newly-issued cheques are popular, and it has been proposed further to advertise the campaign by the aid of sandwichmen.

The district is holding its own in the sale of books, though it is a little backward in getting local circles together. Returns of books distributed have not yet been fully completed, but an examination of the position shows that in Liverpool about 30 per cent. of the books sent to the trade have been handed over to the public. In Blackburn the figure is slightly higher, and in Manchester somewhat less. In Liverpool it has been found that one book in every three is given in exchange for a coupon, and in Manchester the proportion is only about one in six, and in Blackburn lower still.

In Liverpool, the demonstration house on St. George's Plateau attracted no fewer than 160 000 persons up to within three days of the final closing. The local Circle do not intend to arrange any further demonstration of this character until later. Possibly in February next another house will be opened, however, and it is reported that Birkenhead is also moving in this matter. There is little extensive Press advertising in the North Western area, and little enthusiasm about this method of pushing the campaign. The depression in the staple industries is doubtless the cause.

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OVERSEAS TRADE.

Continued Increase of Exports of British Electrical Goods.

WHILE imports of electrical machinery, apparatus and material into this country show decreases of £36 826 and £468 045 respectively, for the month of October, 1926, compared with October, 1925, and for the past ten months, compared with the corresponding period of last year, the exports of British electrical goods of the same classes show increases of £321 360 for the month and £107 062 for the ten months. The total value of exports of British electrical goods for the ten months is £14 746 076, compared with imports of £43 372 269 during the same period, an excess of over ten million pounds.

Amongst the classes of exports which show considerable increases for October this year, compared with October, 1925, are railway and tramway motors, increase £11 172, other motors and generators, increase £32 280, electric wires and cables, rubber insulated, other than telegraph or telephone wires and cables, increase £17 279, ditto, with insulation other than rubber, increase £107 444, telegraph and telephone wires and cables, other than submarine, increase £57 731, telegraph and telephone instruments and apparatus, increase £37 852, batteries and accumulators, including parts, increase £30 673.

Imports Again Show Reduction.

Imports.	Month of October		Eight Months.	
	1925	1926	1925	1926
	£	£	£	£
Electrical Machinery	65 608	94 368	903 780	918 983
Electric Wires and Cables, Insulated—				
Rubber insulated (not being Telegraph or Telephone Wires or Cables)	25 622	9 672	173 866	153 141
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	43 624	52 802	312 354	330 81
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	13 953	13 531	153 960	129 202
Submarine Telegraph and Telephone Cables	—	—	—	7 006
Telegraph and Telephone Instruments and Apparatus (except wireless valves)	81 130	49 294	693 064	371 252
Carbons, Electric	10 846	7 703	78 546	72 377
Electric Lamps and parts thereof—				
Electric Glow Lamps	33 681	32 103	356 148	247 831
Arc Lamps and Electric Searchlights	419	1 212	4 576	3 817
Parts thereof (except Carbon Rods)	3 155	862	7 894	12 569
Batteries and Accumulators (including parts)	96 189	94 791	486 287	483 537
Electrical Instruments (other than telegraphic and telephonic): Commercial (including ammeters, voltmeters, etc.), House Service Meters, and Scientific	23 975	13 307	229,132	173 569
Switchboards other than Telegraph and Telephone	353	—	1 183	1 004
Electrical Goods and Apparatus, all other Sorts	116 987	109 071	936 479	964 119
Total of Electrical Goods and Apparatus	515 542	478 716	4 337 269	3 869 224

Exports Still Increasing.

Exports	Month of October		Ten Months.	
	1925	1926	1925	1926
	£	£	£	£
Electrical Machinery—				
Railway and Tramway Motors	39 409	50 581	456 009	368 416
Other Motors and Generators	186 811	219 091	1 829 917	1 789 417
All other Sorts	264 422	264 585	2 536 219	2 553 009
Electric Wire and Cables, Insulated - Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	130 845	148 124	1 150 939	1 274374
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	120 500	227 944	1 012 419	1 439 065
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	50 571	108 302	588 588	687 738
Submarine Telegraph and Telephone Cables	13 093	6 602	1 542 722	798 919
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	228 907	266 759	2 389 124	2 546 946
Carbons, Electric	645	1 452	21 868	13 566
Electric Lamps and Parts—				
Electric Glow Lamps	50 547	38 596	408 663	393 223
Arc Lamps and Electric Searchlights	868	215	10 759	4 499
Parts thereof (except Carbon Rods)	206	347	3 387	3 746
Batteries and Accumulators (including parts)	74 107	104 780	819 479	815 474
Electrical Instruments (other than Telegraphic and Telephonic): Commercial (including Ammeters, Voltmeters, etc.), House Service Meters and Scientific	35 262	31 476	289 054	324 487
Switchboards, other than Telegraph and Telephone	8 494	8 443	72 902	69 752
Electrical Goods and Apparatus, all other sorts	158 795	207 545	1 506 845	1 663 445
Total of Electrical Goods and Apparatus	1 363 482	1 684 842	14 639 014	14 746 076

THE NATIONAL REGISTER.

Further Instalment of Latest Registered Contractors' List.

PUBLICATION is continued below of the list of registered electrical installation contractors at October 1st, 1926:—

Hythe.—T. C. Gilbert and Co., Ltd.

Ilford.—The Ajax Co.

Ilfracombe.—Ilfracombe Elec. Light and Power Co., Ltd.

Ilkley.—Albert Innes; Francis Law, Ltd.

Ipswich.—Ipswich Corporation Electric Supply Dept.; Mann Egerton and Co., Ltd.; Wood and Co. (Ipswich) Ltd.

Jarrow.—J. J. McCabe.

Jarvis Brook (Sussex).—Crowborough District Gas and Electricity Co.

Kendal.—G. Gilkes and Co., Ltd.

Kettering.—Barnett and Soans.

Kingston-on-Thames.—W. H. Gaze and Sons, Ltd.

Knaresborough. Topham Bros., Ltd.

Knutsford.—George Acton.

Lancaster.—William Hodgson Inman.

Leatherhead.—Buchanan and Curwen.

Leeds.—H. Carr; S. Dixon and Son, Ltd.; Arthur English; Green and Smith, Ltd.; Albert Innes; McCulloch and Newitt; S. Rayton and Co.; Thos. Rigby, Ltd.; Shaw, Dale and Co.; F. H. Sowden; Spink and Simpson; Wallis and Watson, Ltd.; White Bros.; Fred Whitehead (Farsley); J. C. Wilkinson; R. F. Winder; Woodhead Partners.

Leek (Staffs).—G. A. Hardy.

Leicester.—Brooks and Clayton; Central Light and Power Co.; Cook and Co.; William Cross and Son; Electrical Equipment Co.; R. A. Evans, Ltd.; Gent, Hurley and Orringe; H. T. Griffiths; Harding Brothers; J. E. Lester; V. W. Mack and Co.; Midland Dynamo and Motor Repairs Co., Ltd.; Perkins and Spencer; Robinson and Blackwell. Smith and Poyner; Cyril Tidd; W. L. Timson; T. H; Wathes and Co., Ltd.; F. Webb and Son.

Lewes.—H. J. Galliers.

Lincoln.—W. Gregory and Son; G. A. Howard; Penney and Porter (Engineers) Ltd.; B. C. Roe; C. R. Spouge.

Liverpool.—Boothroyd Repairs, Ltd.; E.P.I. Limited; F. B. Hellon and Co., Ltd.; John Hunter and Co.; Lambton and Hobster; Lindsay and Co.; McGoff and Vickers, Ltd.; Northern Electrical and Ventilating Co., Ltd.; R. F. Parry; Walter Patterson; F. D. Phillips; Portus and Rhodes; Pulford Brothers, Ltd.; Sandon Motor and Engineering Co., Ltd.; A. E. Stanwell.

Llandrindod Wells.—G. Davies and Co.

Llandudno.—H. Lance, Willoughby and Co.

London, N.—Artofex Engineering Works, Ltd., N.1.; Brunswick Engineering Co., Ltd., N.1.; J. H. Golding, N.16; Jacob White and Co., N.1; Herbert Lee, N.7; Linzell, Dickinson and Co., N.16; P. D. Morris, N.1; Archibald D. Post, N.17; Riddle and Goddard, Ltd., N.6; A. E. Sandilands, N.4; Robert J. Scarborough, N.12; W. E. Westwood, N.16.

London, N.W.—G. W. Franklin and Son, N.W.10; E. G. Kellond, N.W.6; Ridout and Ratcliff, Ltd., N.W.1; E. S. Russell and Co., N.W.1; Thos. H. Smerdon, N.W.5; G. A. Turner and Co., N.W.10; Watson, Marsh and Co. (Brondesbury) Ltd., N.W.6; Weston Contracts Co., N.W.1.

London, East.—Eastern Armature Winding Co., E.14; Electric Specialist Co., E.9; Hackney Borough Council, Elec. Dept., E.5; Jack H. Hayman, E.6; J. P. Ryan, Junr., E.11; Troup Curtis and Co., Ltd., E.16; County Borough of West Ham Electricity Department, E.15.

London, E.C.—Anderson, Angell and Co., E.C.1; D. Assersohn, E.C.4; Bell Brothers and Co. (London), Ltd., E.C.3; Collins Electrical Ltd., E.C.1; F. G. Edey and Co., Ltd., E.C.4; E. E. Edwards and Co., E.C.3; Electrical Installations Ltd., E.C.4; Electricity Services Ltd., E.C.4; General Electrical Construction and Maintenance Co., Ltd., E.C.4; Henfrey Electrical Installations, E.C.2; F. Hodgson and Co., Ltd., E.C.4; W. G. Hodgson, E.C.4; Holbrook's Electric Service Co., Ltd., E.C.2; John R. Lauder, E.C.2; Marryat and Place, E.C.1; Mather Brothers, E.C.4; Chas. S. Mayfield and Co., E.C.4; Pinching and Walton, E.C.4; Francis Polden and Co., Ltd., E.C.4; Roger Stephenson, E.C.1; L. G. Tate and Co., Ltd., E.C.4; G. E. Taylor and Co., E.C.4; Trollope and Colls, Ltd., E.C.2; E. B. Wright, E.C.4.

(*To be continued*).

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THE ELECTRICITY BILL.

Amendments on Report Stage—Third Reading Passed by 131 Majority—Points from the Debate—First Reading in the Lords.

THE Report stage of the Electricity Supply Bill in the House of Commons was concluded on November 11th.

Mr. R. Hudson moved an amendment providing that the first option to acquire a selected station should be given to the joint electricity authority in any district where such an authority had been constituted. The amendment was agreed to.

The Minister of Transport moved an amendment to provide that the Board shall not themselves operate a generating station until they had first endeavoured to enter into arrangements with the joint electricity authority where the generating station was situate in an electricity district where such as authority had been constituted. This was agreed to.

On Clause 6 Mr. R. Hudson moved an amendment providing that where an area of supply is situate in an electricity district for which a joint electricity authority has been constituted, the Board shall first endeavour to enter into arrangements with the authority for the provision of any new generating station required by a scheme, and it was agreed to.

Mr. P. J. H. Hannon moved an amendment making it obligatory, instead of permissible, on the Board, if required, to advance, free of interest, such sums as might be necessary to enable authorised undertakers or owners to amend or alter the frequency as required by the Board. This was agreed to.

Repaying Borrowed Monies.

The Attorney-General moved an amendment to provide that the interest and sinking fund on money borrowed for purposes of carrying out standardisation of frequency shall be repaid by the Electricity Commissioners to the Board, and that this expenditure should be spread over the whole of the revenue received from the sale of electricity and apportioned between the different suppliers. This was also agreed to.

An amendment to Clause 16 was moved by Mr. P. J. H. Hannon to permit supply authorities whose undertakings were under deed to purchase to amend the terms of purchase with the approval of the Electricity Commissioners, without coming to Parliament for a Bill or Order. The Attorney-General was willing to accept the amendment, but, in consequence of opposition, it was withdrawn for the time being.

On the motion of the Minister of Transport, a sub-section was added to Clause 19 providing that " Before any such regulations [made by the Electricity Commissioners] come into force they shall be laid before each House of Parliament for a period of not less than 30 days on which that House is sitting, and if either House of Parliament, before the expiration of that period, present an Address to his Majesty no further proceedings shall be taken thereon."

An amendment, moved by the Minister of Transport, providing that the Central Electricity Board should pay to the Minister of Transport any expenses and liabilities incurred before the commencement of the Act preliminary to the preparation of schemes was also agreed to.

An amendment, moved by the Attorney-General, applying the provisions of Clause 35 as to compensation for loss of employment to officers and servants of any advisory Board which might be turned into a Joint Authority was agreed to.

On Clause 36, the House agreed to an amendment defining a " large area of supply " as one including the whole of the districts of two or more local authorities.

On Clause 44, dealing with the interpretation of the terms of the Bill, Sir Philip Dawson moved that, in calculating the cost of taking a supply of electricity from the Board over a a number of years, it should be assumed that the price of fuel and wages rates remained constant. This was agreed to.

A proposal by Mr. Attlee that the amount contributed to relief of rates from the net surplus in any year should not exceed 1½ per cent. of the outstanding debt was agreed to.

On November 12th Lt.-Col. J. T. C. Moore-Brabazon moved that the Bill be read a third time. Since the second reading of the Bill (he said) two changes had taken place. The first gave power to the Board to close down certain stations compulsorily, and the second allowed local authorities to sell apparatus. The generating resources of the country were left in the present owners' hands, but they were co-ordinated to the best advantage.

Mr. C. R. Attlee moved an amendment that the House could not agree to the third reading of a Bill which failed adequately to protect the public interests and perpetuated the existence of private ownership in a service which ought to be owned and controlled by the community. The Government, he said, recognised the need for some change, but were bound by their principles not to interfere with the opportunities for private profit making. That was the failure of the bill.

Mr. Montague, seconding the amendment, said the fundamental principle of the Bill was unsound.

Sir J. Nall said that since the Weir Report was published there had been, taking 1921-2 as the basis of development, a total increase at the end of 1924-5 of 70 per cent. of electricity sold for lighting and domestic purposes and nearly 87 per cent. for power purposes. And this was the industry which, according to the Government, was so laggard that it must be spoon-fed in the manner proposed in the Bill.

Sir Philip Dawson supported the Bill. He believed it would be productive of greater efficiency in the control and management of the industry, and general benefit all round in the shape of a more abundant and cheaper supply of electrityl He was convinced that the Bill would result in a very materia. improvement.

Mr. P. A. Harris said he and his friends were bound to ask themselves whether, because they believed that municipal enterprise was the best solution of the problem of the supply of electricity, they were justified in voting against this Bill. He did not think they were. The provision of cheaper power was so urgent that it would be a very serious blow to our industries to incur further delay.

Sir P. Pilditch supported the Bill, believing that it would assist in the production of electricity at such a cost as would enable British industry to compete with the foreigner.

Sir R. Sanders said he was a believer in private enterprise, but the supply of electricity was one of those public services which private enterprise could not run entirely on its own account, but which must be supplemented by public assistance. The case for the Bill seemed to be that, admirable as might be the way in which the present undertakings were conducting their industry, they did not extend to the whole country, and it was believed that by linking up those undertakings a larger supply of electricity would be obtained at a cheaper rate.

Mr. George Balfour said he had to reiterate what he had asked from the beginning, " Where are the facts on which this Bill is based ? " Throughout all the proceedings they had had nothing but loose talk and statements of what was done in other countries and what could be done here, without a single fact to support them. This matter could not be explored until the facts were put before a Select Committee.

The Attorney-General Replies.

The Attorney-General, replying to the discussion, said he had been told by Mr. Balfour that those members of his party who were supporting the Bill were doing so because they had been bought by concessions, in order to bribe them to vote for a Bill of which they disapproved. There was not a syllable or a suggestion of truth in that accusation. The names of the members of the Board had been asked for, but they were not yet available, as the Minister of Transport had to consult the interests concerned before making the appointments. What the promoters of the Bill desired was that the Board should have regard for every interest, which in the long run would best serve the community as a whole. The Government were not advocating any great change in public policy. All that they were advocating was a cheapening of the costs of electricity to the consumers, and that was the object of the Bill.

The Bill had none of the features of nationalisation to which the Conservative Party objected. Under it the State would employ no wage-earners ; the individual station would still be run and occupied by the individual owner ; none of the incentive to private gain would be taken away ; and no bureaucracy would be created. It was true that the effect of the Bill would be to perpetuate the existence of private ownership. The Conservatives believed in private ownership. They intended to perpetuate its existence by removing its abuses.

The amendment was defeated by 201 votes to 70, and the Bill was read a third time.

The Bill was read a first time in the House of Lords on Tuesday. It is proposed to take the second reading next Tuesday.

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THE E.T.B.I. FESTIVAL.

All Previous Subscription Lists Surpassed—Urgent Need for Proper Organisation—Sir Hugo Hirst's Stimulating Suggestions.

THIS year's Festival Dinner of the Electrical Trades Benevolent Institution, held at the Trocadero, London, on November 10th, can be said without exaggeration to have inaugurated a new era in the activities of this excellent organisation. All previous subscription lists were eclipsed, the grand total being £6 151, of which £1 081 was given or promised during the evening.

Sir Hugo Hirst, to whose personal efforts as President for 1926 this gratifying response was so largely due, said that although the raising of funds was his immediate task, he had also tried to discover why the E.T.B.I. fund was not of a size suitable to the importance and comparative prosperity of the electrical industry, and he hoped that as the result of his investigations it would be possible to establish the trade charity on a firmer basis. Donations and subscriptions received this year had easily beaten all previous records, but it was necessary to consider the future. There was, he was convinced, no need for begging appeals to be made every year when there were ways of securing the desired revenue without. Instead of about £26 000 of accumulated capital the E.T.B.I. should have at least £100 000.

The Institution had no list of potential subscribers, but only one of past supporters. In the past, support had been given by a few people who gave large sums, but very few of those who were most likely to benefit from the fund had even been approached. The feeling of charity was as great in the electrical industry as elsewhere, but it had not been made use of. A start in this direction had been made in connection with this year's appeal, and it had resulted in donations from over 3 000 separate subscribers. With an extension of the appeal to the small subscribers on a properly organised basis, he was satisfied in his own mind that the Institution could get an annual revenue of £10 000 without any frantic blowing of trumpets at the last minute. He had been surprised to discover that many people in the industry were unaware of the existence of the E.T.B.I., and this was another direction in which organisation could secure improvement. It was, of course, unreasonable to ask Mr. Hawes, the hon. secretary to do more; he was already devoting an enormous amount of time to the work.

Regular Income Needed.

Many suggestions for obtaining small donations regularly throughout the year had been made available, and THE ELECTRICIAN had already offered to supply special collecting boxes for use in electrical works and offices. In announcing the total subscriptions given above, Sir Hugo said there were further donations still to come.

Mr. Ll. B. Atkinson agreed that, while no reflection was cast on the present committee, steps should be taken to put the Institution on a more businesslike basis. The electrical industry was one of the most prosperous in the country and the poverty-stricken state of its benevolent fund was a disgrace. Other speeches in similar vein were made by Mr. R. A. Chattock and Sir Newton Moore. Lt.-Col. A. F. H. S. Simpson paid fitting tribute to the characteristically energetic way in which Sir Hugo Hirst had added so materially to the funds of the Institution, and also to his personal qualities. He had earned, many distinctions and more would come to him, but nobody at the head of a great organisation could earn a greater tribute than the love of his staff; and this Sir Hugo possessed to a remarkable degree.

We begin the publication below of the list of contributions in connection with the Festival Dinner in the hope that others who have not yet subscribed will do so :—

Armstrong Stevens and Son, £1 1s.; E. G. Acheson, Ltd., £3; Ashford and Co., £10 10s.; H. J. Atkins, £1 1s.; R. Armstrong and Co., Ltd., £1 1s.; Anchor Chemicals Co., £2 2s.; Acme Fibre Co., Ltd., £1 1s.; H. E. Ablewhite, £1; Acme Electrical Manufacturing Co., £1 1s.; Automatic Coil Winder and Electrical Equipment Co., Ltd., £2 2s.; Wm. Anderton and Co., Ltd., £1 1s.; Autocar Auxiliaries, Ltd., £1 1s.; J. Adler, 10s.; Art Metal Construction Co., £1 1s.; Anglo-Swiss Screw Co., Ltd., £2 2s.; Arkinstall Bros., Ltd., £1 1s.; Akkurat Wood Turning Co., £1 1s.; Asbestos and Mineral Corporation, Ltd., £1 1s.; Aston Chain and Hook Co., Ltd., £2 2s.; Attwater and Sons, £5 5s.; Geo. Angus, £1 1s.; American Hard Rubber Co. (Britain), Ltd., £2 2s.; Ashford, Dunn and Co., 10s. 6d.; Aron Electricity Meters, Ltd., £25; H. W. Allen, £2 2s.; Aberdeen G.E.C. Staff, £3 3s.; D. Assersohn, £26 5s.; Atlas Preservative Co., Ltd., 10s. 6d.; Llewellyn B. Atkinson, £3 3s.; Ashby, Morris, Ltd., £1 1s.; A. Avis (Rugby), Ltd., £1 1s.; A. Arculus and Co., £1 1s.; Anglo-American Varnish Co., £1 1s.; Allen, Strong and Co., Ltd., £2 2s.; A. E. Adams, £1 1s.; Ash and Lacy, Ltd., £1 1s.; Llewellyn B. Atkinson (additional contribution), £1 11s. 6d.

F. Boyes, £2 2s.; Borough Billposting Co., £26 5s.; D. H. Bonnella and Son, Ltd., £3 3s.; Bell's United Asbestos Co., Ltd., £2 2s.; J. T. Bedford, 10s. 6d.; J. Brown and Co., £2 2s.; J. Burns, Ltd., £1 1s.; Berry, Wiggins and Co., Ltd., £2 2s.; Brown Lennox and Co., £5; S. A. Baker, £1; Brooks Tool Manufacturing Co., £1 1s.; Bonnella Bros., Ltd., £2; J. S. Brown and Sons, £2 2s.; Bryan, Symons and Co., £2 2s.; B. Black and Son, £1 1s.; A. Balfour and Co., Ltd., £2 2s.; British Brown Boveri, Ltd., £21; W. G. Brown, £1 1s.; W. A. Blake, £1 1s.; W. J. Bache, 10s. 6d.; Bourne and Son, Ltd., £1 1s.; Brookhirst Switchgear, Ltd., £1 1s.; British Fibrocement Works, Ltd., £1 1s.; Blighty, Ltd., £2 2s.; Blackett, Hulton and Co., £5 5s.; T. J. Boorne, 10s. 6d.; Geo. Baker and Sons, Ltd., £2 2s.; Burt, Boulton and Haywood, Ltd., £2 2s.; British Diamond Die Co., Ltd., £2 2s.; G. N. Barnes, £1 1s.; W. Bower, 3s.; Booth and Brookes, Ltd., 10s. 6d.; Bristows Cooke and Carpmail, £26 5s.; H. Berkeley, £2 2s.; Brittains, Ltd., £15; Brompton and Kensington Electricity Supply Co., Ltd., £10 10s.; M. H. Buckea, £1 1s.; Boving and Co., Ltd., £2 2s.; D. A. Bremner, £5; E. Byng, Esq., £200; Mrs. I. Byng, £10 10s.; F. M. Birkett and Sons, Ltd., 10s. 6d.; Bristol G.E.C. Staff, £4 4s.; Bruce, Peebles and Co., Ltd., £20; Brookes, Ward and Co., £2 2s.; T. Boston and Son, Ltd., £2 2s.; T. Birkett, £1 1s.; W. H. Briscoe and Co., Ltd., £2 2s.; Brookes (Birmingham), Ltd., £1 1s.; H. Bricknell, £1 1s.; Barker and Allen, Ltd., £1 1s.; C. J. W. Barwell, £10 10s.; Birmingham Enamel Co., Ltd., £2 2s.; Butler, Spragg and Co., Ltd., £1 1s.; H. Berrage and Co., 10s. 6d.; H. L. Bentley, £1 1s.; J. Booth and Co., Ltd., £2 2s.; Thomas Bonser and Co., £1; J. and W. Baldwin (Aston), Ltd., £1 1s.; Bell's United Asbestos, £2 2s.; S. E. Bullock and Co., Ltd., £1 1s.; Baller and Mantle, £2 2s.; A. T. Beck and Co., Ltd., £1 1s.; Burton, Delingpole and Co., Ltd., £1 1s.; H. W. Bainbridge and Co., Ltd., £5 5s.; Blakes Wharves, Ltd., £1 1s.; Berry's Electric, Ltd., £5 5s.; British Broadcasting Co., Ltd., £25; Biddle and Co., £1 1s.; C. F. Brooke, £3 3s.; E. Baylie and Co., £1 1s.; Belfast Ropework Co., £1 1s.; R. I. Bagnall, £1 1s.; Smith Bassett, £1 1s.; Babcock and Wilcox, Ltd., £10 10s.; Birmingham Electricity Supply Dept., £3 3s.; Bearings Service Co., 10s. 6d.; W. H. Baker and Co., Ltd. (1910), £3 3s.; Baxter and Caunter, Ltd., £2 2s.; Thos. Bolton and Sons, Ltd., £5; T. Boston and Co., £1 1s.; Belfast G.E.C. Staff, £4 15s.; R. H. Brookhouse, £5 5s.; British Thomson-Houston Co., Ltd., £21; T. Brand, 10s.; S. Bullock (S. Bullock and Co., London, Ltd.), £10 10s.; Bedford Engineering Co., £2 2s.; P. J. Brewer, £2 2s.; V. C. Bond and Sons, £10 10s.; H. Bates and Son, £2 2s.; Buchanan and Curwen, £1 1s.; H. R. Burley, £1 1s.; C. Bazell, £2 2s.; Bogota Telephone Co., Ltd., £52 10s.; Baxendale Bros., Ltd., £1; F. C. Blackwell and Co., £1 1s.; L. W. Brown, 5s.; Beardshaw, Esq., £1 1s.; Brampton Bros., Ltd., £1 1s.; Brooks, Ward and Co., £5 5s.; R. A. Bradshaw, £1 1s.; J. W. Ball, 10s. 6d.; British Engine Boiler and Electrical Insurance Co., Ltd., £2 2s.; L. W. Barsdorf, £2 2s.; British Goodrich Rubber Co., £5 5s.; W. F. S. Bishop, £2 2s.; Boots Cash Chemists (Lancashire), £1 1s.; W. S. Bundy, 10s. 6d.; Booth and Co. (Middleton), Ltd., £2 2s.; J. and T. Brocklehurst and Sons, Ltd., £5 5s.; B. C. Barton and Son, £2 2s.; S. J. Brown, £2 2s.; Geo. Burn, Ltd., £1 1s.; Bush, Beach and Gent, Ltd., £1 1s.; Barton, Williams, 10s. 6d.; A. T. Bartlett, £1 1s.; G. Bailey and Co., Ltd., £3 3s.; Sir W. H. Bailey and Co., Ltd., £1; E. H. Blow, £1 1s.; C. G. Boscoe, 10s.; British Alabaster Bowl Co., Ltd., £10; W. G. Beaumont and Son, £1 1s.; Boro' of Newcastle-under-Lyne (staff contributions), 10s. 6d.

A. J. Cheyne, £1 1s.; F. M. Chapman, £3 3s.; Cona, Ltd., £2 2s.; A. Chamberlain, £5; T. S. Chutter, £1 1s.; Collier Bros., £1 1s.; G. Chelioti, £2 2s.; Cookson Produce Purchase and Chemical Co., Ltd., £1 1s.; J. Cole, £1 1s.; Cryselco, Ltd., £5 5s.; Crystalate Manufacturing Co., £5; Crane Chemical Co., 5s.; Cobland's Steam Saw Mills, Ltd., £2 2s.; F. Chiesman and Co., Ltd., £2 2s.; Cooper, Dennison and Walkden, Ltd., £2 2s.; Cory Brothers and Co., £2 2s.; Cole and Co., £1 1s.; Herbert W. Clarke and Sons (Erith), Ltd., £2 2s.; Crofts (Engineers), Ltd., £1 1s.; Crypto Electrical Co., £5 5s.; T. H. Cuffwright, 10s.; A. M. Coates, 10s.; J. W. Carpenter (Earls Court), £1 1s.; S. H. Callow, £5; County of London Electric Supply Co., £20; F. Crawford, £3 3s.; C. W. Cave and Co., Ltd., £2 2s.; J. Clements, £1 1s.; Joseph Crosbee, 10s. 6d.; City Castings and Metal Co., £2 2s.; Cresswells Asbestos Co., Ltd., £1 1s.; R. Cruickshank, Ltd., £1 1s.; W. Canning and Co., Ltd., £2 2s.; Carrs (Birmingham), Ltd., £5 5s.; City Rolling Mills, Ltd., £2 2s.; Dr. N. R. Campbell, £5; Cambridge Instrument Co., £1 1s.; G. S. Cattell, £1 1s.; Coronium Metal Co., Ltd., £5 5s.; Clark and Howard, Ltd., £1 1s.; J. Caslake, £1 1s.; Cox, Long and Co., £2 2s.; City and Suburban Typewriter Co., £5.

(*To be continued.*)

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

MR. Jas. R. Reef, wholesale electrical factor, of Wallingford, has been elected to the Wallingford Town Council.

The late Mr. Alfred E. Terry, a director of Herbert Terry and Sons, left £111 834—with net personalty, £99 837.

The late Sir Ernest Harvey, a director of the British Columbia Electric Railway Co., Ltd., left property of the value of £139 254.

Ald. J. Arnott and Ald. D. B. Foster have been elected as chairmen of the Leeds Tramways and Electricity Committees, respectively.

Mr. H. A. S. Mugford, electrical engineer, of 109, Albert Road, South Norwood, has been elected a member of Croydon Town Council.

Burnley Guardians have increased the salary of Mr. Snowden, electrical engineer at Primrose Bank Institution, from £260 to £286 per annum.

Mr. W. Holt, traffic manager of the Metropolitan Railway, has been elected president of the Operating Superintendent's Conference for 1927.

Councillor R. J. Wilder, of Wilder and Sons, electrical engineers, Wallingford, Berks, has been appointed a "bridgeman" of Wallingford.

The late Mr. Robert McMaster, traffic superintendent of Belfast Corporation Tramways, left personal estate in Great Britain and Northern Ireland of £4 890.

Mr. J. R. Birkhead has resigned the position of manager of the Radio Devices Co., Nottingham, having secured an appointment as manager of an engineering business at Birmingham.

Presentations were made at the Helsby works of the British Insulated Cables Ltd., last week, to Mr. T. Hadfield, of the technical staff, who has sailed for America to take up a position at Minneapolis.

The late Mr. Z. E. Knapp, formerly chief engineer to the Underground Railways of London, and general manager of the London United Tramways, left English estate of the value of £8 310, with net personalty, £7 947.

Coun. A. Hutchinson has been recommended for appointment as convener of the Kirkcaldy Tramway and Electric Lighting Committee, from which position Coun. Fergusson has retired after occupying it over 30 years.

The King has approved the award by the President and Council of the Royal Society of the Hughes Medal to Admiral Sir Henry Jackson, F.R.S., for his pioneer work in the scientific investigation of radio-telegraphy, and its application to navigation.

Tunbridge Wells Town Council has increased the salary of Mr. J. E. Pownall, chief assistant at the electricity works, from £524 17s. 4d. per annum to £605 2s.; and that of Mr. R. A. C. Baldwin, shift engineer, from £253 18s. 8d. per annum to £307 7s. 4d.

Sir C. G. C. Hamilton (chairman), Mr. J. B. Close and Mr. J. E. Monius are resigning from the board of Burndept Wireless, Ltd., and it is understood that the position of chairman will be filled by Mr. J. Macgregor, the managing director of Johnson and Phillips, Ltd.

Col. J. G. Oakley, late chairman of the Basingstoke Electricity Committee, who has just retired from the Council, was last week presented by the electrical staff with an electric shaving pot and hot water jug. The presentation was made by the electrical engineer, Mr. F. Swarbrick.

Capt. E. M. S. Mackirdy, J.P., the new Mayor of Malmesbury, is a director and chairman of the Malmesbury Electric Supply Co., Ltd. He joined the Town Council six years ago, and acted as Mayor in 1922, when he was prominently identified with the introduction of electricity into the borough.

On November 13th, at their residence in Watford, Mr. and Mrs. W. E. Warrilow and family celebrated the coming of age of their eldest son, Mr. Cyril H. Warrilow, who was educated at Watford Grammar School, and who has for nearly three years past been on the staff of the L.M.S. Rly. Co.'s civil engineering department centred in Watford.

Alderman L. Tweedy-Smith has resigned the chairmanship of Southend Electricity Committee as a protest against criticism of the Council's consulting electrical engineer. Alderman Tweedy-Smith, whose health has been indifferent for some months, is leaving England shortly after Christmas or a tour abroad for the benefit of his health. The new chairman of the Electricity Committee is Councillor James le Masurier.

Mr. Charles R. Boggs, factory manager of the Simplex Wire and Cable Co. sailed from Boston (U.S.A.), on November 7th, for a two months' tour of Europe. On November 23rd, he will present a paper before the Institution of the Rubber Industry in London, entitled "Selenium in Rubber Compounds," giving the latest information regarding the selenium method of curing rubber compounds, of which he is the inventor.

Sunderland Town Council has decided that Mr. W. A. Royle shall be designated assistant manager of the Corporation electricity undertaking, and his salary is fixed at £700 per annum, an advance of £65 upon his previous salary, the salary being based on the cost of living and to be subject to rise or fall in accordance with the scale of the National Joint Board for the Electricity Supply Industry. The title of the present chief assistant of the undertaking is to be altered to that of chief assistant engineer.

Points of View.

Interesting Pronouncements on a Variety of Topical Electrical Subjects.

THE day of large profits on small turnovers has passed.—*Mr. P. F. Bennett.*

* * *

Look after the complaints and the compliments will take care of themselves.—*Mr. Joseph Lucas.*

* * *

Our application and use of electricity is still only worthy of the Middle Ages.—*Sir Alfred Mond, M.P.*

* * *

It is sometimes an advantage for directors to know a little of the business they control.—*Sir W. Noble.*

* * *

The rapid and wide development of electricity can only fully succeed with a co-operative spirit within the industry.—*Mr. G. H. Nelson.*

* * *

The present Government was the first to produce a practical scheme for the improvement of the electricity supply in this country.—*Mr. Neville Chamberlain.*

* * *

If I thought I was going to listen for the remainder of my life to broadcast speeches from Parliament I should be inclined to do away with my wireless set.—*Sir Arthur Stanley.*

Forty Years Ago.

Interesting News Extracts from "The Electrician" of November 19th, 1886.

A GLANCE through the files of THE ELECTRICIAN of forty years ago recalls that :—

The Electrical Engineering Football Club held its first smoking concert.

* * *

Electric lighting was installed on the Dardanelles fortifications.

* * *

A manual engine for driving small dynamos was introduced by Mr. Sellars of Birkenhead.

* * *

The cable steamer "Citta di Milani" was launched at Sunderland for the Pirelli Co.

* * *

Preparations were being made to celebrate the jubilee of the electric telegraph in England.

* * *

The London, Brighton and South Coast Railway decided considerably to extend the use of electricity for train lighting.

Obituary.

The following deaths have been announced :—

MR. JOSEPH MOONEY, aged 75, of Dublin, chairman of the Dublin United Tramways Co.

MR. THOMAS GUNN, aged 80 years, at Clacton on Sunday, head of Thomas Gunn, Ltd., electrical retailers, of 30, Fore Street, London.

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BUSINESS ITEMS.

Changes of Address, Representatives, and other Developments.

MR. F. S. C. King has opened a wireless depot at 87, St. Aldate's Street, Oxford.

Barnes and Avis, Ltd., of 5-9, Duke Street, Reading, have opened a radio department.

Mr. Wallace H. Winchcombe, radio engineer, has opened business premises at 160, County Road, Swindon, Wilts.

The new proprietors of Somerset Motors, Corporation Street, Taunton, announce that they are closing the wireless department.

As his premises are required by the owner, Mr. Montague Cooper, radio engineer, 60, East Street, Taunton, is retiring from business at Christmas.

A firm of engineers in Rangoon wishes to represent British manufacturers of electric lifts, etc. Particulars from the Department of Overseas Trade. (Reference No. 408.)

An agent in Berlin desires to represent British spinners of cotton yarns used in the cable industry. Applications to the Department of Overseas Trade. (Reference No. 420.)

An agent in Melbourne wants to represent British manufacturers of telephones, electrical appliances and fittings. Apply to Department of Overseas Trade. (Reference No. 400.)

The registered offices and laboratory of the British Cast Iron Research Association have been removed to 24, St. Paul's Square, Birmingham. The telephone number is Central 1885.

Kemps Mills, Ltd., have transferred their wireless apparatus manufacturing business to Kirkcaldy, where the works formerly occupied by the Whytebank Engineering and Boiler Co. have been secured.

A firm of manufacturers of insulating varnishes, etc., desires to represent, for the Province of Ontario, a British maker of electrical white cotton tape. Details from the Department of Overseas Trade. (Reference 526.)

Walter Dixon and Co., 38, Bath Street, Glasgow, announce that the practice of consulting engineers carried on by them with the late Mr. Walter Dixon and Mr. Frank Anslow as principals is being continued under the firm name of Walter Dixon and Co., the partners being Mr. Frank Anslow and Mr. Arthur Dixon, son of the late Mr. Walter Dixon.

An agreement fixing reduced rates of import duty upon good imported from Germany into Finland is being enforced provisionally until December 31st, 1926. The following are amongst the new rates, which apply equally to similar goods of United Kingdom origin imported into Finland: Electrical machines, such as dynamos, electro-motors, converters, transformers, choking coils, etc., weighing more than 250 but not more than 500 kilogs. each, 5.60 Finnish marks per kilog.; electrotechnical special apparatus and parts thereof, not specially mentioned in the tariff (except electro-magnetos for motors and the like, wireless receiving apparatus and parts therefor, electric arc system and induction system stoves, welding apparatus, magnetic rotary and fixed apparatus for removing iron particles from grain and similar material), 6.50 Finnish marks per kilog.; machinery and apparatus not specially mentioned in tariff, weighing up to 500 kilogs., except machines for domestic use, 2 Finnish marks per kilog.

Registered Contractors.

Only Ten Names Added to the National Register in November.

AT last Friday's meeting of the Executive Committee of the National Register of Electrical Installation Contractors, there were only thirteen applications from electrical contractors for registration, and of these, three were declined, making the net increase ten.

The newly-registered contractors are: Bland, Leslie George, 12, West Street, Ware, Herts; Colley, Marriott and Co., Ltd., Cheapside, Liverpool; Crowther, Harry Thomas, 79, Dale Street, South Shields; Handley and Higgins, 36, Princess Street, Knutsford; Jones, J., and Co. (Nottingham), Ltd., 18, Canal Street, Nottingham; Keay, George Francis, 361, Grimshaw Lane, Middleton Junction, Lancs; Little, Frank Robert, 6, Bertram Terrace, Ashington, Northumberland; Mitchell, John Albert, 70, Coventry Street, Kidderminster; Sutcliffe, Henry, 32, Brook Lane, Chester; Wardleworth, L. and V., 95, Bury Old Road, Heaton Park, Manchester.

IN LIGHTER VEIN.

Notes on the Origin and Development of "The Sparc."

OUR special commissioner who has introduced so many interesting electrical birds, beasts and fishes to readers of THE ELECTRICIAN, has now presented his report on the Sparc bird.

* * *

The pedigree of the Sparc (he writes) is so long that several telescopes in series are required before the first of its ancestors can be seen dimly in the distance. It is first mentioned at the birth of the electrical industry when Noah made the ark light on Mount Ararat. No doubt the bird mentioned on this historic occasion was really the Sparc, which probably brought back a piece of cable for the earth connection, so that the ark could light.

An artist's impression of the "Sparc."

* * *

Since then the Sparc has kept up the tradition, and to-day many of them are daily discovering earths, although the occasion is no longer one for universal rejoicing; far from this, it has resulted in the bird meeting with extreme disfavour in many instances. The wild variety are shot at sight, but often only after much damage has been done. Recently a huge Sparc, the largest in captivity, whilst jumping from one conductor to another, was shot (with a camera) under very unfair conditions in the dark.

* * *

The praises of the Sparc have been sung by more than one poet. Here is an example:—

With lightning's flash and thunder's crash
Through air spaces, the Sparc
Jumps the gaps not shown on maps;
Illuminates the dark.

From brush to brush delights to rush
To where the surge is urging.
He's in clover with flashover;
All conductors merging.

But quietly trained with force restrained
He'll splutter, spark and fuse;
Or carry messages for miles,
Or melt all metals if you choose.

* * *

From time immemorial the Sparc has been both the best friend and the greatest enemy of the electrical engineer. The face of a well-trained Sparc glows with pleasure to such an extent that its radiance is only exceeded by that of the sun, and the warmth of its welcome is such that it literally melts away all opposition to its advances.

* * *

The Sparc is an enthusiastic arbitrator and cementer of unions, and can be trained to play with two rails, and so bring them so closely into contact with each other that their affection is such that they join forces and become inseparable companions, clinging together molecule to molecule, atom to atom and electron to electron.

* * *

Very straightforward in all his actions, the Spark comes always straight to the point. He is a sociable bird, and often joins the conductors, but has been known to cut the insulators and discharge the condensers. His enthusiasm is remarkable, and all duties are discharged with a fiery energy that is rarely damped, for a quenched Sparc is full of re-morse.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given.

PARISH CHURCH, MELTHAM.—Electric light wiring and fitting. Particulars from Mr. W. R. Carter, secretary, Church Council, Birchfield, Meltham, Yorks.

AYRSHIRE EDUCATION COMMITTEE, November 19th.—Electric light installation at the higher grade school, Dalmellington. Particulars from Mr. W. Reid, Master of Works Education Offices, Ayr.

BELFAST EDUCATION COMMITTEE, November 19th.—Electric lighting installations at (1) Ulsterville Public Elementary School, and (2) Porter's Memorial Public Elementary School. Specifications from the Education Architect, Education Officer, College Square, Belfast.

DUNDEE CORPORATION, November 19th.—Supply of arc lamp carbons. Specifications, etc., from Mr. D. H. Bishop, general manager and engineer, Electricity Supply Department, Dudhope Crescent Road, Dundee.

DUNDEE CORPORATION, November 19th.—Supply of four-core, three-core and two-core l.t. cable. Specification, etc., from Mr. D. H. Bishop, general manager and engineer, Electricity Department, Dudhope Crescent Road, Dundee.

GREAT WESTERN RAILWAY, November 19th.—Supply of stores, including (Form 18) telegraph instruments; (Form 19) electrical apparatus (insulators), etc.; (Form 20) electrical wires and cables; (Form 21) telegraph ironwork and tools; and (Form 22) telegraph drysalteries. Specifications and forms of tender from the Stores Superintendent, Swindon.

LEYTON CORPORATION, November 19th.—Electric light installation at Knott's Green Special School. Specifications from Mr. J. H. Jacques, 61, West Ham Lane, Stratford.

MANCHESTER CORPORATION, November 19th.—Industrial electric motors (specification 170); and starting switches for d.c. motors and star-delta switch starters (specification 171). Specifications from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; £1 1s. deposit for each.

WEST DERBY GUARDIANS, November 19th.—Electrical supplies. Forms of tender from the Clerk, Brougham Terrace, Liverpool.

CARDIFF CORPORATION, November 22nd.—(1) Water tube boiler, mechanical stokers and forced draught plant; (2) steel chimney and grit collecting plant; (3) induced draught plant. Particulars and specification from the City Electrical Engineer, The Hayes, Cardiff. Only members of the King's National Roll are invited to tender.

FARNWORTH URBAN DISTRICT COUNCIL, November 22nd.—(*a*) Low tension cables, (*b*) distribution pillars, (*c*) underground disconnecting boxes. Specifications from the Engineer and Manager, Electricity Department, Albert Road, Farnworth, Lancs.

FARNWORTH URBAN DISTRICT COUNCIL, November 22nd.—(*a*) Metallic sheathed wiring system, (*b*) v.i.r. wires and cables, (*c*) general wiring accessories. Specifications from the Engineer and Manager, Electricity Department, Albert Road, Farnworth, Lancs.

PRESCOT GUARDIANS, November 22nd.—Electric lighting of Female Mental Hospital, Whiston Institution, Prescot.

CAERPHILLY URBAN DISTRICT COUNCIL, November 23rd.—Electric wiring of 48 bungalows at Ilan Road, Abertridwr. Specifications from Mr. W. C. B. Hillman, Council offices, Caerphilly.

MANCHESTER CORPORATION, November 23rd.—Copper bonds for tramway rails. Specification from Mr. H. Mattinson, General Manager and Chief Engineer, Corporation Tramways, 55, Piccadilly, Manchester.

WORTHING CORPORATION, November 23rd.—Installation of complete fire alarm system in the borough. Forms of tender, etc., from the Borough Surveyor.

RICHMOND (SURREY) CORPORATION, November 24th.—Overhauling and maintenance of fire alarm, fire telephone and firemen's call bell systems. Specifications from the Borough Engineer and Surveyor, Town Hall, Richmond.

BRIGHTON CORPORATION, November 25th.—Supply and erection at Southwick power station of 15 625 kW turbo-alternator, with condensing plant and auxiliaries. Specifications from the engineer, Mr. John Christie; deposit £3 3s.

CROYDON CORPORATION, November 26th.—(*a*) 10 complete bodies for electric tramcars; (*b*) 10 complete sets of maximum traction bogie trucks; (*c*) magnetic track and wheel brake equipments for 10 tramcars; and (*d*) 10 complete sets of electrical equipments for tramcars, with assembly of 10 car bodies, trucks, electrical equipments and brakes into complete tramcars in readiness for service. Specifications, etc., from the Tramways Manager, Tramway Offices, Thornton Heath; deposit £2 for either (*a*), (*b*), (*c*) or (*d*).

HAMMERSMITH (LONDON) BOROUGH COUNCIL, November 26th.—Two water tube boilers, each capable of supplying, 45 000 lbs. of steam per hour, mechanical stokers, feed pumps, piping, conveyors, bunkers, etc. Specifications, etc., from Mr. F. Hill, Electricity Works, 85, Fulham Palace Road, W.6.

NORTH CORK COUNTY BOARD OF HEALTH, November 29th.—Electric lighting of Kanturk District Hospital. Plans, etc., from the secretary (Mr. M. Regan), Mallow; deposit £2 2s.

ERITH URBAN DISTRICT COUNCIL, November 30th.—Low tension cables. Specification, etc., from the Electrical Engineer, Walnut Tree Road, Erith.

HASTINGS CORPORATION, November 30th.—Pumping plants in two pumping stations, including turbine or centrifugal deep well pumps driven by electric motors, with all electrical equipment and connections inside buildings. Specifications, etc., from Mr. G. Midgley Taylor (John Taylor and Sons), Caxton House, Westminster, S.W.1; deposit £5.

DUBLIN PORT AND DOCKS BOARD, December 1st.—Supply and erection of a 4-ton level luffing electric portal crane. Specification from the Engineer of the Board (Mr. J. Mallagh), East Wall, Dublin.

SOUTH INDIAN RAILWAY CO., LTD., December 3rd.—Steam turbine driven generating plant. Specifications (10s.) from the company's offices, 91, Petty France, Westminster, S.W.1.

GREAT SOUTHERN RAILWAYS CO., December 6th.—Six or 12 months' supply of electric cables (under form 129), electric lamps (form 137), etc. Forms (6d. each from the Stores Superintendent, Great Southern Railways, Inchicore, Dublin.

PRESTATYN URBAN DISTRICT COUNCIL, December 6th.—Underground cables, overhead lines, transformers, e.h.t. and l.t. switchgear and sub-station equipment. Specifications, etc., from Mr. J. Lloyd Hughes, Clerk of the Council; deposit £2 2s.

METROPOLITAN WATER BOARD, December 6th.—Two steam driven electric generators (one 100 kW and one 50 kW), switchboard, piping, etc., for Kempton Park Pumping Station. Specification, etc., will be supplied on deposit of £1 1s. with the Accountant, 173, Rosebery Avenue, London, E.C.1.

DUBLIN PORT AND DOCKS BOARD, December 7th.—Twelve months' electrical supplies. Tender form (No. 10) from the Secretary, Westmoreland Street, Dublin.

SUTTON COLDFIELD CORPORATION, December 14th.—Supply and erection of 1 000 kW steam turbine and gear driven d.c. generator, with condensing plant, auxiliaries and piping. Specification from Mr. T. Bloore, Electricity Works, Sutton Coldfield; deposit £2 2s.

NOTTINGHAM CORPORATION, December 31st.—Two 30-inch electrically driven centrifugal pumps (section F.F.); one motor-driven twin booster; each for an output of 10 kW (section K.K.); and one storage battery of 256 cells, capacity 275 Ah at one-hour discharge rate (section M.3), for North Wilford power station. Specifications, etc., from Preece, Cardew and Rider, 8, Queen Anne's Gate, Westminster, S.W.1; deposit £2 for each section.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trades (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMWAYS, November 19th.—Electric train equipment for 105 motor cars and 100 trailer cars. (Reference A.X. 3 810.)

LATVIAN POST AND TELEGRAPH ADMINISTRATION, November 20th.—High frequency telephone equipment. (Reference B.X. 2 993).

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INDIA STORE DEPARTMENT, November 23rd.—Eight overhead travelling electric cranes (10 ton and 25 ton). Specifications (5s. each) from the Director-General, Branch No. 10, Belvedere Road, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 23rd.—Lighting arresters and transformers. (Reference B.X. 2 792.)

PORT ELIZABETH MUNICIPALITY, November 25th.—Supply and erection of duplicate electrically driven automatic float-controlled centrifugal sewage pumps, etc. (contract 24, Mill Park). (Reference A.X. 3 680.*)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 26th.—Primary battery material.

SYDNEY CITY COUNCIL, November 29th.—High and low tension cables (contract 1 057). (Reference B.X. 2 959.)

SYDNEY CITY COUNCIL, November 29th.—Three-phase oil-immersed induction voltage regulator. (Reference B.X. 2 936.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 30th.—Supply of 110 kW transformers. (Reference B.X. 2 874.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, November 30th.—Two tons of galvanised building wire. (Reference A.X. 3 721.)

BELGIAN MINISTRY OF NATIONAL DEFENCE, December 1st.—Supply of 458 portable accumulator batteries of 150 Ah capacity for the Signalling Section of the Army. Particulars (Cahier des Charges Special, No. 709), from 15, Rue des Augustins, Brussels; charge 4½ francs.

EGYPTIAN MINISTRY OF THE INTERIOR, December 1st.—X-ray apparatus (Reference B.X. 2 999.)

SOUTHLAND ELECTRIC POWER BOARD, INVERCARGILL, N.Z., December 1st.—Supply of a 3 000 H.P. horizontal Francis turbine and 2 350 kW generator. (Reference B.X. 2 822.)

SYDNEY CITY COUNCIL, December 1st.—Tungsten filament electric lamps. (Reference B.X. 2 995.)

VICTORIAN RAILWAY COMMISSIONERS, December 1st.—Rotary converter or rectifier set, with switching equipment for its automatic operation.

EGYPTIAN MINISTRY OF THE INTERIOR, December 2nd.—Supply and erection of four pumps, filters, electric motors, etc., at the Sembellawein Waterworks. (Reference A.X. 3 764.)

EGYPTIAN MINISTRY OF THE INTERIOR, December 5th.—Electric motors and accessories. (Reference B.X. 2 996.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, December 6th.—Key switches. (Reference B.X. 2 962.)

STATE ELECTRICITY WORKS, MONTEVIDEO, December 6th.—Diesel-electric generating sets.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 7th.—Three-phase induction regulator for Waikato electric power scheme (section 206.) (Reference B.X. 2 935.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 10th.—Electric motors. (Reference B.X. 2 861.)

JOHANNESBURG MUNICIPALITY, December 11th.—High tension cable (contract 714). (Reference B.X. 3 017.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 14th.—Sub-station cables and cable boxes for Arapuni (section 188). (Reference B.X. 3 010.)

KEETMANSHOOP (SOUTH AFRICA) MUNICIPALITY, December 15th.—Supply and delivery of material for an electric lighting scheme for the town. (Reference B.X. 3 007.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 15th.—Switchgear, cable, motor-generator sets, junction boxes, etc., for Hutt Valley Locomotive Workshops. (Reference B.X. 2 949.)

VICTORIAN ELECTRICITY COMMISSION, December 15th.—Water tube boiler, with superheater, economiser, etc.. for Yallourn power scheme. Specification (No. 28/82), from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.2; deposit £3 3s.

EGYPTIAN MINISTRY OF EDUCATION, December 16th.—Five a.c. motors and switchboard for Assiut model workshops. (Reference B.X. 3 016.)

INDIA STORE DEPARTMENT, December 21st.—Supply and erection of overhead transmission line, 110 000 V, about 280 miles in length. Specification (5s.) from the Director-General, Branch 14, Belvedere Road, London, S.E.1.

INDIA STORE DEPARTMENT, December 21st.—About 280 miles of overhead transmission line (110 000 V). Specifications (5s. each) from the Director-General, Branch No. 10, Belvedere Road, London, S.E.1.

VICTORIAN RAILWAY COMMISSIONERS, December 22nd.—Supply of a wheel lathe, with electrical and other equipment. (Reference A.X. 3 735.)

VICTORIAN GOVERNMENT RAILWAYS, December 29th.—Electric rivet heaters. (Reference B.X. 3 014.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 1st.—Supply and erection at site of Seru pumping and power station, of four Diesel engine alternator groups, three pumps and accessories. Specification (10s. 6d.) from Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1.

INDIA STORE DEPARTMENT, January 4th.—Supply and erection of overhead equipment (1 500 V) and steel structures for about 140 miles of railway route, in connection with the great Indian Peninsula Railway electrification. Specification (£2) from the Director-General, Branch No. 10, Belvedere Road, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 4th.—Supply of switchgear and transformers for Waikaremoana electric power scheme. (Reference B.X. 2 872.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 4th.—Bells and buzzers (schedule C147). (Reference B.X. 2 984.)

CHINA, January 15th.—Turbo-generators, condensers, boilers, switchgear, transformers, etc. Tenders are invited by a Chinese company holding a concession for water and electricity supply. (Reference B.X. 2 998.)

NEW ZEALAND GOVERNMENT RAILWAYS, January 17th.—Switchgear, cables, motor-generators, lamps, etc. (Specification E.14.) (Reference B.X. 3 020.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 18th.—Transmission line steel towers for Waikaremoana electric power scheme (section 31.) (Reference A.X. 3 732.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 18th.—Switchboard cable (schedule C. 151). (Reference B.X. 3 013.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, January 19th.—Electric bells and tumbler switches. (Reference B.X. 3 011.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, January 20th.—Electric railway car equipments, including motors, control equipment, air compressors, etc. Specification (No. 1 065) from the Chief Mechanical Engineer, Wilson Street, Redfern, N.S.W.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 25th.—Telephone transmitters and parts. (Reference B.X. 3 012.)

NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMWAYS, January 26th.—Manufacture and supply of electric train equipment for 105 motor cars and 100 trailer cars. (Reference A.X. 3 810.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 1st.—Storage battery and booster for Waikaremoana Electric Power Board (section 28). (Reference B.X. 2 937.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 15th.—Transformers, for Waikato (section 207). (Reference B.X. 2 985.)

Tenders Accepted.

DARWEN CORPORATION.—Landis and Gyr, supply of electricity meters.

FORT WILLIAM CORPORATION.—D. Bryce, electric light installation in 32 houses in Alma Road, Fort William,

BURNLEY CORPORATION.—Stewarts and Lloyds, Ltd., standards for tramway extensions in Brunshaw Road.

FAVERSHAM EDUCATION COMMITTEE.—H. S. Tett and Co., Ltd., electric light installation at Council Schools, £37 16s.

CLACKMANNAN COUNTY COUNCIL.—R. Ormiston, electrical installation in new premises, Drysdale Street, Alloa Road £62.

LIVERPOOL CORPORATION.—Adams Hydraulics, Ltd., two sets of sewage ejectors and electrically driven air compressors, £892.

WESTMINSTER CITY COUNCIL.—Coleby and Co., electric lighting work at the City Cleansing Surveyor's flat, £150 4s. 6d.

GLASGOW CORPORATION.—Kennedy, Stark and Co., electric lighting installation, etc., at Mearnskirk Sanatorium; J. Brash and Son, main supply cables.

BATTERSEA (LONDON) BOROUGH COUNCIL.—General Electric Co., Ltd., works power switchboard and switchgear, £1 353 and £1 552 respectively. (Recommended.)

SOWERBY BRIDGE URBAN DISTRICT COUNCIL.—Oakley, Green and Wilson, electrician's work in connection with the erection of two houses on the Albert Road site.

SUNDERLAND CORPORATION.—Pritchett and Gold and E.P.S. Co., Ltd., electric battery and accessories for the Borough Mental Hospital, £204 3s. (recommended).

(*Continued on page* 599.)

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ELECTRICITY SUPPLY.

Big Leeds Loan for Mains and Services—More Objections to Proposed Chiswick Station—West Midlands J.E.A.—Progress at Plymouth.

BICESTER U.D.C. has agreed to grant to Cooper and Co. a six months' option for the supply of electricity.

Leeds Corporation is seeking sanction to loans of £400 000 for electricity supply mains and £96 000 for services.

Hastings T.C. has decided to carry out mains extensions to supply new houses and for street lighting at a cost of £2 448.

Having completed the transformer station at Padiham, the Lancashire Electric Power Co. is proceeding with the laying of cables.

Ballymoney Chamber of Commerce has decided to support the Bann and Lough Neagh drainage and hydro-electric schemes.

Stone R.D.C. has assented to the proposals of Stone U.D.C. to supply electricity in the parishes of Barlaston, Trentham and Stone Rural.

Romsey T.C. has consented to the application of the Power Development Co., Ltd., for a Special Order to supply electricity within the borough.

Flint Supply Inaugurated.

The electricity supply at Flint was formally inaugurated last Saturday, the Mayoress switching on the current, which is obtained from Electricity Distribution of North Wales, Ltd.

Weardale R.D.C. is recommended by its Electricity Committee to proceed with an electricity supply scheme for the district. The Council has decided to consider the matter in committee.

Evesham General Purposes Committee recommends the T.C. to adopt electric lighting in High Street by means of current supplied by the Shropshire, Worcestershire and Staffordshire Electric Power Co.

There was a brief failure of the electricity supply at Torquay and Newton Abbot last week in consequence of large quantities of leaves having been carried by the river water into the condensers at the electricity works.

Bangor Corporation is applying to the Electricity Commissioners for sanction to a Fringe Order to supply electricity to certain premises in the Penchwintan-Penrhosgarnedd area, outside the statutory area of supply.

Armagh Asylum Board has decided to extend the electric lighting system to the four asylum cottages. There are to be six lights per house, and the charge will be 1s. per week for the first two years and 6d. per week afterwards.

At the meeting of Carnarvon Town Council last week, the chairman of the Electricity Committee said that since the erection of the generating station, the working expenses had greatly increased, and, with current at 7d. per kWh, there was a loss.

The new electricity plant with 11 000 V feeder and sub-stations at Rhyl is almost completed and will be in operation very shortly. The work has been carried out by W. T. Henley's Telegraph Works Co. and the English Electric Co.

Proposed Walsall Extensions.

Subject to the Joint Electricity Authority indemnifying the Corporation against the outlay, Walsall T.C. proposes to place orders for a turbo-generator at a cost of about £48 840, and boiler plant costing £91 881, and to expend £9 200 upon the laying of a main within the borough.

Mr. H. Titmarsh has placed before a meeting of residents of Linton (Cambridgeshire) three electric lighting schemes, at an estimated cost of £4 500. The meeting decided in favour of an electric lighting scheme, and another meeting is to be held shortly to go fully into the matter.

At a recent meeting of the New Forest Verderers at Lyndhurst, the Clerk stated that he had sent formal notice of objection to the scheme promoted by the Power Development Co. for the supply of electricity to the New Forest. Lord Montagu said that it was proposed to transmit the electricity at 11 000 V by overhead wires.

Southend T.C. has received from the Greater London Trust, Ltd., a communication asking whether the Corporation will be prepared to consider the sale of the electricity undertaking to the Trust. A reply has been sent to the effect that the Electricity Committee has no intention at the present time of recommending the Council to dispose of the undertaking.

A report on the electricity undertaking at Wokingham (Berks) states that owing to the general strike, with consequent bad trade, the adoption by the citizens of electric lighting has been far slower than was expected. There were, on October 1st, 101 premises using it, and the town hall clock, hitherto lit by gas, will in future be electrically illuminated.

Surrey County Council last week discussed the proposed erection by the London and Home Counties Joint Electricity Authority of a power station at Chiswick, and it was decided to ask the Ministry of Health to postpone giving sanction to the scheme until the County Council has submitted its views. The Mayor of Richmond said that the area proposed to be supplied from the station could be equally well served if the station were erected on one of the vast marshes in Essex.

The West Midlands Joint Electricity Authority has approved a report of the General and Finance Committee covering a scheme of purchase and adaptation of an existing building in Wolverhampton at an estimated expenditure of £10 210. The Authority has resolved to continue the proceedings for obtaining an order for the compulsory acquisition of the land required at Ironbridge for the new base load generating station, and the scheme for extensions of the Birchills generating station at an estimated cost of £212 438 has also been approved.

Cannock Showrooms.

Cannock U.D.C. has opened extensive premises in Wolverhampton Road as electricity showrooms, workshops, stores, etc. Mr. S. T. Allen, chief engineer and manager to the West Midlands Joint Electricity Authority, recently performed the opening ceremony, and Mr. A. Whitehouse (chairman of the Electricity Committee) announced that the consumers on the Council's mains numbered 189 in 1923–4, and had increased to 674 in 1925–6, while their consumption increased in the same period from 1 828 000 to 4 195 000 kWh per annum.

Ashton-in-Makerfield (Lancs) is now receiving a bulk supply of electricity from Wigan T.C. The supply is at 6 600 V, three-phase, transformed down to 400 V for power and 230 V for lighting and other purposes. The Ashton sub-station is equipped with e.h.t. switchgear, two 300 kVA transformers and low-pressure distribution board. Three distribution pillars have been erected in the town. The transformers and switchgear have been supplied by the English Electric Co. Wigan Corporation laid the low-pressure cables and service, the sub-contractors for the cables being W. T. Henley's Telegraph Works Co.

Remarking on the progress of the Plymouth electricity undertaking Mr. E. G. Okell, borough electrical engineer, says that in 25 years the number of consumers has grown from 100 to 10 689. In the post-war period the capital expenditure of the undertaking has more than doubled, and notwithstanding considerable reductions in the price of current the revenue has increased in the same proportion as the expenditure. Some 40 miles of new cable per annum have been used during the past two or three years, and further extensions are taking place. A complete reorganisation of the works at Prince Rock is in progress. Three generating sets of a total capacity of 400 kW have been superseded by a 6 000 kW turbo-generator.

A beginning has been made upon the preliminary work in connection with the erection of Coventry Corporation's new generating station at Longford. The ceremony of cutting the first sod was performed last Friday by the Mayor (Alderman F. Lee). The existing station at Sandy Lane is capable of generating over 30 000 kW by means of seven B.T.-H. turbo-alternators. It is intended that the new station shall be capable of extension to an ultimate capacity of about 100 000 kW, and the contract, involving a cost of over £500 000, placed with the British Thomson-Houston Co., Ltd., covers the provision of all buildings and the complete equipment for generating 37 500 kW by means of two of the latest design of B.T.-H. two-cylinder high efficiency turbines, running at 3 000 revs. per min., and designed for 325 lb. gauge pressure, 700 deg. F. These turbines will be coupled to alternators, each having an output of 18 750 kW, 6 600 V, three-phase, 50 cycles. A transformer bank will be connected to each alternator, so as to raise the pressure from 6 600 V to 33 000 V for transmission to sub-stations, the e.h.t. switchgear being of the compound-filled type remote controlled from a control gallery in the switchgear annexe.

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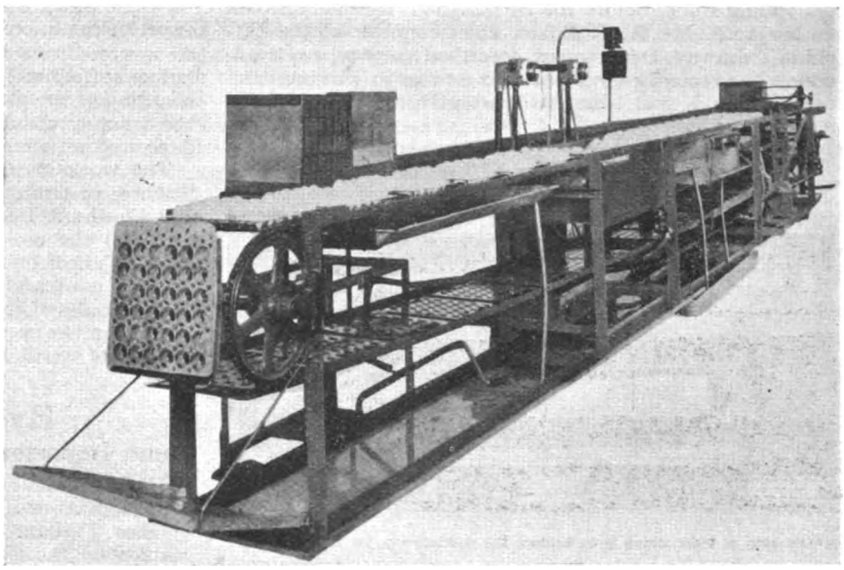
ELECTRICAL NEWS IN PICTURES

Mr. G. W. Moore, manager of the Automatic Telephone Manufacturing Co., Ltd., and a director of the International Automatic Telephone Co., Ltd., who has returned from a business tour of the United States, where he finds the telephone is an indispensable adjunct to life.



A novel application of electric heating recently notified in THE ELECTRICIAN was for the sterilisation of eggs in an electrically heated oil bath. Here is an illustration of the apparatus which causes oil at 235 deg. F. to fill up the pores of the shell and thus exclude all air.

A feature of the W.O.B. Campaign in Birmingham is the floodlighting of the King's Norton demonstration house. Last week about 1 500 people visited local electric houses.

The Mayor of Coventry is here seen cutting the first sod on the site of the Corporation's new power station at Hawkesbury Lane. Details of the plant are on page 598.

Tenders Accepted.

(*Concluded from page* 597.)

STEPNEY (LONDON) BOROUGH COUNCIL.—Wm. White and Co., 25 160 yards of v.i.r. cable, £312 19s. 3d. (recommended). Also tendered; Metro-Vick Supplies, Ltd., £312 19s. 3d.; and Catchpole and Co., £317 4s. 9d.

WESTMINSTER CITY COUNCIL.—Coleby and Co., electric light re-wiring at Great Smith Street Baths, £273 17s. 7d. (recommended). Also tendered: Buchanan and Curwen, £341 10s., and Belshaw and Co., £483.

GUILDFORD CORPORATION.—A. Grove, wiring 56 houses for electric light, £439 9s., with extension to 114 additional houses, subject to the present contract being carried out to the satisfaction of the borough electrical engineer.

BERMONDSEY (LONDON) BOROUGH COUNCIL.—Igranic Electric Co., motor starter, for Artillery Lane establishment, £22 15s.; Sturtevant Engineering Co., Ltd., blower fan (belt driven) and motor-driven fan, with starter, £146. (Both recommended.)

STOKE NEWINGTON (LONDON) BOROUGH COUNCIL.—W. T. Henley's Telegraph Works Co., Ltd., electric cables; Reason Manufacturing Co., ordinary meters up to 20 A; Measurement, Ltd., ordinary meters above 20 A up to 100 A; Ferranti, Ltd., prepayment meters (all recommended).

STEPNEY (LONDON) BOROUGH COUNCIL.—Catchpole and Co., conduit, fittings and distribution boards, £653 19s. 10d. (recommended). Other tenderers: Wm. White and Co., £621 14s. 7d.; Metro-Vick Supplies, Ltd., £702 18s. 7d.; Simplex Conduits, Ltd., £736 4s. 7d.; and British Thomson-Houston Co., Ltd., £847 13s. 5d.

METROPOLITAN ASYLUMS BOARD.—T. Clarke and Co., Ltd., installation of battery-charging plants at ambulance stations, £388 15s. (recommended). Also tendered: V. G. Middleton and Co., Ltd., £396; Riddle and Goddard, Ltd., £495 5s.; Toy and Winslow, £496 5s.; Read and Partners, Ltd., £506 10s.; G. E. Taylor and Co., Ltd., £516.

BERMONDSEY (LONDON) BOROUGH COUNCIL.—English Electric Co., Ltd., supply and fixing of 60 kW shunt compound-wound motor generator and accessories at new baths and washhouses, Grange Road, £454 13s. 6d. Other tenderers: Metropolitan-Vickers Electrical Co., Ltd., £482 4s. 6d.; General Electric Co., Ltd., £470; and Lancashire Dynamo and Motor Co., Ltd., £458 6s.

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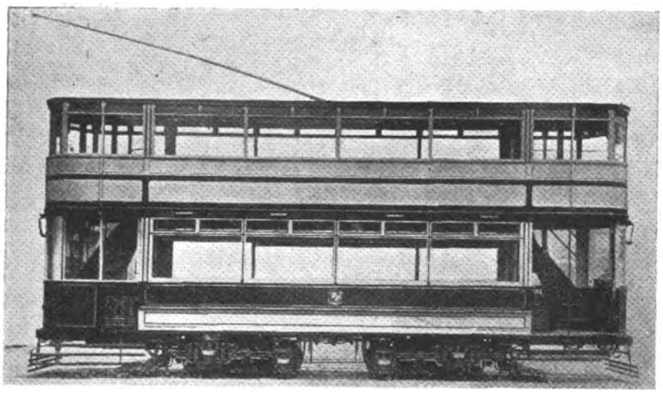
ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

IN a lecture on the construction and maintenance of tramways rolling stock, before the Birmingham Electric Club on November 12th, Mr. A. C. Baker, chief engineer of the Birmingham Tramways Department, described a new type of tramcar which has recently been put into service in Birmingham. This car, he said, had been designed with a view to giving



The new type of tram which is to become the standard car for Birmingham.

quick acceleration, high free running speed, and first-class riding comfort. A 60 H.P. motor was used, and in addition to the usual hand brake and magnetic brake a new and highly efficient air brake was used. This permitted an acceleration, with a fully laden car (the maximum load being 19½ tons), of 3 ft. per sec., and a free running speed of thirty miles per hour on the level. Both the upper and the lower saloons were upholstered with spring seats, and the lighting was considerably improved., The trucks were of an improved bogie type. There were at present 20 of these cars in service in Birmingham, said Mr. Baker, and they would in all probability become the standard car for the city.

Mr. James Dalrymple, general manager of the Glasgow Tramways, addressing the Institute of Cost and Works Accountants at Glasgow last week, said that at the beginning of the financial year on June 1st it was estimated that there would be a drop of £150 000 in the revenue of the Glasgow Tramways for the current year. The introduction of the 2d. maximum fare on July 1st, however, stopped the decrease. The revenue of tramway undertakings throughout the country, generally, was decreasing, due principally to slackness of trade and the consequent scarcity of money among a large section of the working classes.

WIRELESS NEWS.

P.M.-G. Outlines the Future Broadcasting Policy.

ON Monday in the House of Commons the future of broadcasting was discussed on consideration of a supplementary estimate of £295 000 for the transfer on January 1st next of the service of the B.B.C. to the new authority, the British Broadcasting Corporation, which will maintain it under Government control.

On March 31st last, the Postmaster-General said, there were 1 964 000 wireless receiving licences, and by October 31st the total was 2 097 000 ; with a revival in trade there should be 2 200 000 on March 31st next. According to the March 31st estimate the total revenue next year would be £1 100 000, from which the cost of collection, 12½ per cent., was to be deducted, leaving £926 500.

Of this sum the Corporation would receive next year £805 000, and an increase of another 200 000 in the licences would raise the revenue to £866 000, the Treasury, according to the arrangement now proposed, drawing an increasing proportion of the revenue as the number of licences increased ; but the whole financial basis of the scheme was to be reviewed in two year's time.

The new Broadcasting Corporation was a "semi-public body operating as trustees in the national interest." The governors of the new corporation were persons of wide and varied interests with a broad knowledge of affairs ; their tenure of office would be for five years, and the charter of the corporation extended for ten years.

ELECTRIC FARMING.

Report of Development Commissioners on Work at Research Stations.

THE Development Commissioners, in their report for the year ended March 31st last, deal with the Rothamsted experiments in crop production and soil management and the discovery, from those experiments, of a simple means of reducing the resistance of the soil to the plough, viz., negative charging of the ploughshare by means of a dynamo carried on the tractor, which causes water from the soil colloids to be deposited on the ploughshare.

The work in plant physiology of the Imperial College of Science, in conjunction with the Rothamsted, East Malling and Cheshunt Institutes, is also reviewed. This work indicates (1) the use of electricity at low voltages produces as good an effect on the growth of plants as the higher voltages hitherto used, and (2) that the increased yields of grain secured as the results of electrical discharges are due not to an increase in the number or size of ears of corn, but to a reduction of the number of sterile flowers.

Hydro-Electric Schemes.

Some Important Projected Developments in Canada

THE Canadian Official Press Bureau in London states that proposals will be submitted to the next session of the Quebec Parliament for harnessing energy at the Carillon Rapids on the Quebec River, estimated at from 300 000 to 350 000 h.p. An agreement has been reached between the Quebec and Ontario Provinces as to apportionment between the two provinces of the power generated, and the construction of the dam (estimated to cost £7 000 000) will be undertaken by a private company. The Spruce Falls Power and Paper Co. is building a hydro-electric power plant at Smoky Falls (Ont.). The Ontario Government is spending nearly £200 000 in adding to its hydro-electric services.

Electricity for Textile Industries.

Interesting Recommendations by Leeds and Bradford Town Planning Committees.

A PROPHECY as to the future of electricity in the textile district of Yorkshire is contained in a report of the Leeds and Bradford Joint Town Planning Committee.

The report states that : "Electricity promises to be the great power provider of the future, and as the greatest industry of the region is one admirably adapted for the use of this type of power, the problem of locating works zones for the textile industries will be simplified. The gradual spread of the lines of the Yorkshire Electric Power Co. over the area unserved by municipal supplies, shows that the region is not likely to lag behind in the race for electrification.

"In the re-constructed coal field of France smoke has been eliminated by the adoption of electric power, and any new pits sunk in the region ought to be electrically run. The Temple Newsam pit is one of the best examples in this country of an electrically worked coal mine, and has proved that electric working can be a financial success under the least economic conditions of a single self-contained pit."

Important Electrical Exhibition.

Preliminary Arrangements for Big Melbourne Show Next Year.

IT may interest British manufacturers of electrical equipment to know that the Electrical Federation of Victoria (Australia) proposes holding an all-electrical exhibition in Melbourne from September 10th to October 1st, 1927.

The exhibition will embrace all phases of the electrical industry, including engineering, domestic appliances, accessories and radio. The Melbourne Exhibition Building, with a floor space of approximately 100 000 sq. ft., has been booked for the occasion.

Some idea of the importance of the field presented to the British electrical manufacturer may be judged from the fact that the importations from Great Britain alone for the year ending June 30th, 1925, amounted to approximately £4 400 000.

Manufacturers desiring further information should communicate with the Electrical Federation, Law Court Chambers, Queen Street, Melbourne.

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COMPANY NEWS.

Electrical Share Market Steady—Changes Mainly Towards Higher Price Level—Hydro-Electric Co.'s Debenture Issue.

THE electrical share market has steadied during the past week, and, although no great activity has been witnessed, such changes as have occurred have been towards a higher level of prices, with the prominent exception of Johnson and Phillips shares, which are 2s. 6d. lower. The ordinary stock of the London Electric Railway Co., which comprises the Bakerloo, Hampstead and Piccadilly tubes, has risen 5 points to 57½. District ordinary stock at 58½ shows an improvement of 4½ points, and Metropolitan Railway ordinary at 62 is 2½ up. City and County of London Electric Supply shares have regained the 1s. 3d. lost last week. Among manufacturing descriptions, Siemens, though quoted ex dividend, show 1s. 3d. improvement.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
	Electricity Supply.				
10	Brompton & Kensington Ord. ..	30/-	30/-	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	90	90	100	67
15	Charing Cross Elec. Ord. (£1) ..	47/6	47/6	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	49/4½	48/1½	52/6	20/3
6	,, ,, 6% C.P. ..	23/-	23/-	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	62/6	61/3	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	17	17	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	35/6	35/6	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	40/7½	40/7½	41/6	8/-
4½	,, ,, 4½% C.P. ..	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	22/6	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord. (£5) ..	18½	18½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	41/3	41/3	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
¶6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
6	,, ,, 6% C.P. ..	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	144½	144½	123	24
6	,, ,, 6% Pf. Stk. ..	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69	69	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	77½	77½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	57½	52½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	76½	76½	89	65
4	Lon. Un. Trams. 1st Deb. ..	40½	40½	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	65½	65½	101½	49
5	,, ,, 5% Deb. ..	66½	66½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	62	59½	84½	19
3½	,, 3½ Pf. Stk.	63½	63½	88½	40½
3½	,, 3½% Deb.	69½	69½	92½	51
3½	Met. Dis. Ord. Rly. Stk. ..	58½	54	58	12½
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb. ..	68	68	73½	48½
¶5	Yorks. (W.R.) Trams. Ord. ..	12/6	12/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	67/6	67/6	62/-	26/6
6	,, ,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	22/6	22/6	23/4	19/7
7	,, ,, ,, 7% Deb.	104½	104½	107½	92
10	Brush Electrical Ord.	26/10½	26/3	29/-	10/-
‡15	Callender's Cable Ord.	65/-	65/-	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref.	26/3	25/-	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)	12/9	12/9	28/9½	1/1
7½	,, ,, 1st Pref. ..	22/6	22/6	26/-	5/-
10	Elec. Construction Ord. ..	31/10½	31/10½	30/4	6/7
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	14/-	14/-	29/3	7/3
6	,, ,, 6% C.P. ..	17/6	17/6	21/3	10/6
—	Ericsson Telephones 7% Pref.	21/10½	21/10½	21/-	12/7
6	Ferranti 6% Pref.	19/3	19/3	18/6	16/9
7	,, 7% 2nd Pref. ..	18/-	18/-	19/-	13/9
7½	General Elec. Ord.	20/6	20/-	59/-	13/6
20	W. T. Henley's Ord.	80/-	80/-	86/6	23/3
17½	Johnson & Phillips Ord. ..	56/3	58/9	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	23/9	23/9	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	46/3	46/3	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	29/4½*	28/1½	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	29½	29½	56/2/6	19
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	74½	74½	87½	60
10	Eastern Ord. Stk.	180½	180½	213½	113/2/6
3½	,, 3½% Pref. Stk. ..	66½	66½	84/17/6	49
4	,, 4% Deb.	78½	78½	103½	60
10	Eastern Extension Ord. (£10) ..	18½	18	21½	10/12/6
4	,, ,, 4% Deb. ..	78½	78½	97½	60
22	Gt. Northern Telegraph (£10) ..	27	27	42/12/6	19
‖10	Indo-European (£25)	47½	48	59½	25
—	Marconi's Wireless T. Ord. ..	16/3	16/3	9/16/3	20/9
7½	,, Int. Mar.	22/6	22/6	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	17½	17½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	78½	78½	10	60/2/6

* Ex-dividend.

‡ Plus share bonus. ¶ Plus 3 p.c. in respect of 1921. ‖ Including bonus.

AMAZON TELEGRAPH CO., LTD.—Div. of 4 p. c., less tax, recommended.

SIEMENS BROS. AND CO., LTD.—Intm. div. 2½ p. c., less tax, has been declared.

BOGOTA TELEPHONE CO.—Div. of 12½ p.c., actual, less tax, payable November 1st.

JOHNSON AND PHILLIPS, LTD.—Int. div. 5 p.c., less tax, payable November 25th.

ADELAIDE ELECTRIC SUPPLY CO., LTD.—Fin. div. 6 p. c., making 12 p. c. for year.

CAWNPORE ELECTRIC SUPPLY CORPORATION, LTD.—Intm. div. 3 p. c., on ord. shs., payable November 23rd.

ELECTRIC CONSTRUCTION CO., LTD.—Int. div. at rate of 6 p. c. per annum on ord. shs., less tax, payable November 30th.

PERAK RIVER HYDRO-ELECTRIC POWER CO., LTD.—Applications were invited on Wednesday for an issue of £1 250 000 5 p.c. guaranteed deb. stk. 1951, at £99 10s. p. c.

CITY OF BUENOS AYRES TRAMWAYS CO. (1904), LTD.—Div. 1s. 3d. p. sh. (at rate of 5 p.c. per annum), less tax, for three months ended September 30th, payable November 16th.

ASSOCIATED LEAD MANUFACTURERS.—It is proposed to increase the capital to £2 500 000 by the creation of 192 000 additional 6 p.c. cum. pref. shs. of £1 each and 288 000 additional ord. shs. of £1 each.

VERA CRUZ ELECTRIC LIGHT, POWER AND TRACTION, LTD.—Estimated net earnings for September, after deducting London office exes., $4 900, decr. $14 700. Aggregate from January 1st, $154 100, decr. $14 900. [$1 Mex. = 24·5d.]

RADIO CORPORATION OF AMERICA.—Gross income for quarter ended September 30th, $14 734 100. After provision for operating and administrative expenses, depreciation, income tax, etc., surplus pfts. are $2 116 090, making $3 986 621 for nine months ended September 30th.

WESTERN UNION TELEGRAPH CO.—Gross revs. for nine months ended September 30th, 1926, $102 045 928, against $94 181 287; total exes., $88 929 541, against $80 783 640; int. on bonded debt, $1 753 982, against $1 752 053; net income, $11 362 405, against $11 645 594.

TELEPHONE MANUFACTURING CO., LTD.—The holders of the income debenture stock have been notified that the company, having the requisite funds at its disposal to repay the stock, any holders who wish to have their money before December 31st may do so, receiving interest up to the date of repayment.

CHELSEA ELECTRICITY SUPPLY CO., LTD.—An extraordinary meeting was called for yesterday (Thursday) evening to consider resolutions to increase the capital to £450 000 by the creation of 50 000 additional £1 shares, and to capitalise £148 308 of the undivided profits and distribute it to holders of ordinary shares in the form of fully-paid £1 ordinary shares in the proportion of three new shares for every five shares held.

INDIA RUBBER, GUTTA PERCHA AND TELEGRAPH WORKS CO., LTD.—Net pft. for year ended August 31st, £86 721, plus, £20 457 brt: in. Div. on pref. shs. paid in January and July absorbed £12 500, to res. £35 000. Div. on ord. shs., 5 p.c., tax free, fwd. £22 178. Notwithstanding the adverse effect of the general strike and the coal strike, the company's business has been well maintained and the reserve fund has been increased to £315 000.

AGAR, CROSS AND CO., LTD.—At the annual meeting in London, Mr. F. F. Agar (chairman) said it was proposed to carry to reserve £115 000 from the year's profits and to increase the carry forward by £34 208. An interim dividend of 5 per cent. actual, tax free, on the ordinary shares was paid in June last, and the directors recommended a final dividend of 6 per cent. and a bonus of 5 per cent., tax free, making a total distribution of 16 per cent., tax free, for the year.

WHITEHALL ELECTRIC INVESTMENTS, LTD.—Following were approx. net operating returns for September of undertakings in which coy. is interested: Cia Chilena de Electricidad, £56 000; Cia de Electricidad de Valparaiso, £12 000; Cia Hidro-Electrica (Rental), £6 000; Cia Electrica de Tampico, £9 000; Puebla Tramway, Light and Power Co., £12 000; Vera Cruz Electric Light and Traction, £500; Cia de Luz Electrica y Fuerza Motriz de Orizaba, £1 700; Cia Electrica de Cordoba, £250.

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SUBMARINE CABLES TRUST.—Rev. for period from April 16th to October 31st, 1926, £10 309, exes. £397, leaving £9 912, plus £84 brt. in. After provision for payment of interest coupons, £8 997 has been transferred to redemption fund. With exception of holding in American Telegraph and Cable Co., whole of trust securities have been realised. Trustees are in negotiation with Western Union Telegraph Co., lessees of American Telegraph and Cable Co., but if these negotiations fall through, this holding will be realised in some other way, in order that the final accounts can at once be prepared for the division of the net proceeds among the holders of the coupons of reversion.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—Preliminary announcements have been issued in connection with the reserve capitalisation arrangements for the County of London Electric Supply group of companies—the County of London Co., the South London Electric Supply Corporation, and the South Metropolitan Electric Light and Power Co. The directors state that they will not be able to announce the amount of the bonus at the extraordinary meeting called for November 23rd, when resolutions are to be submitted in preparation for the bonus distribution. The amount, however, will be announced before the end of the year. A similar course is being followed in the case of the other two companies. The bonus of the County of London Co. will be distributed to the ordinary shareholders in the form of fully-paid up ordinary shares.

"HAVE YOU JOINED THE...."

HAVE you joined the WOB Club, and if so are you an active *member? The only qualifications required are enthusiasm and a supply of "E.D.A. 1002." Here are the principal rules:*

1.—Every member shall on every possible occasion distribute "E.D.A. 1002" to benefit his health and strengthen his pocket.

2.—Every member, when having nothing to do, shall go out into the street and chant the popular ditty "Have you got your Competition Booklet yet?"

3.—Every member shall once at least during every meal make the secret sign of the WOB. Club by placing "E.D.A. 1002" in his neighbour's pocket.

NOTE.—*The password of the WOB Club is: "Talk and work in Circles."*

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—Following a meeting of the shareholders' committee last week, a statement, signed by Mr. C. L. Nordon, chairman of the committee, has been issued. This committee was appointed on October 11th at a meeting of shareholders representative of about 766 shareholders, with an aggregate holding of about £470 000, with the object of asserting and protecting the shareholders' rights following the board's announcement that they had appointed Sir Gilbert Garnsey and the company's auditors to make an investigation. At present the committee has failed to secure any effective voice in the conduct of the inquiry into the causes which have led to the serious losses with which the company is faced, and as to its future directorate and management. The committee has appointed Kemp, Chatteris, Nichols, Sendell and Co. as its secretaries, and proposes to take any further steps that may appear desirable in the interests of the shareholders.

PROGRESS OF THE LOEWENSTEIN OPERATIONS.—The International Holdings and Investments Co. (of which Mr. A. Loewenstein is chairman) has decided to offer to shareholders 4 242 000 new 1s. ord. shs., at a premium of 14s. p. sh. Shareholders representing 62 p.c. of the issued capital are stated to have agreed to apply for the number of shares to which they are entitled, and the balance of 1 585 840 shares has been unconditionally guaranteed, without commission. In a circular to the shareholders, the directors state that the company in August last entered into a contract for the purchase from the Barcelona Traction Light and Power Co. of 12 750 ordinary shares and of a certain debt, and of all of the share capital of the Cataluna Railway Co. undertaking, in consideration therefor, to deliver to the Barcelona Co. £647 500 of its 5½ per cent. first mortgage bonds. This contract has enabled the Barcelona Traction, Light and Power Co., which for some time past has been desirous of restricting its business to the generation and supply of electric light and power, to dispose of its electric railway properties. The directors have purchased at slightly below £12 a share 7 500 preferred and 12 500 ordinary shares in the Société Internationale d'Energie Hydro-Electrique (Sidro). The board has also agreed upon certain conditions to acquire interests in various European, American and African undertakings, including hydro-electric enterprises in Austria and Italy, and the total of the company's investment in such undertakings will amount to about £63 392.

New Companies.

MACHINERY CONSTRUCTIONS, LTD.—Cap., £3 000. Manufacturers of and dealers in electrical apparatus, etc. Reg. office: Broadway Buildings, Westminster, S.W.1.

MAWLITE ELECTRIC LAMP CO., LTD.—Cap., £200. Agents for train lighting, sign, miner's and other electric lamps. Reg. office: 28, Belgrave Road, London, S.W.1.

PASSINGHAMS (BRADFORD), LTD.—Cap., £3 000. Manufacturers of and dealers in wireless machines and accessories, etc. Solicitors: A. V. Hammond and Co., Bradford.

R. B. PHILLIPS AND CO., LTD.—Cap., £8 000. To acquire business of mechanical and electrical engineers, etc., recently carried on by Mills, English and Co., Ltd., at Castle Buildings, Llanelly.

JONES BROTHERS (STREATHAM), LTD.—Cap., £10 000. Shop fitters' engineers, contractors for electric light and power installations, etc. Reg. office: Eastwood Works, Besley Street, Streatham, London, S.W.16.

WARREN BROTHERS (MIDDLESBROUGH), LTD.—Cap., £12 000. To carry on business of electricians formerly carried on by J. W. F. Warren and S. N. Warren, as "Warren Brothers," at 15-17, Grange Road West, Middlesbrough.

PEARSON AND REINHOLD, LTD.—Cap., £10 000. Manufacturers of apparatus, appliances, plant and material employed by advertising contractors, electricians, etc. Reg. office: Finsbury Court, Finsbury Pavement, London, E.C.2.

ERITH ELECTRICAL CO. (BARBER AND WHITE), LTD.—Cap. £400. To acquire business of electrical engineers and makers of and dealers in wireless apparatus, carried on by W. J. Barber and W. White, at 88, High Street, Erith, Kent.

ELECTRICAL AND RADIO DISTRIBUTORS, LTD.—Cap., £500. To acquire business of an electrical, wireless and accumulator service, carried on by Basil Tunmer at 71, Monks Park, Wembley. Reg. office: 20, Bedford Row, London, W.C.1.

OLDS AND CO., LTD.—Cap., £5 000. To carry on business of buyers, sellers, letters on hire, hire-purchase or easy payment system, of electrical appliances, installation fittings, machinery, etc. Solicitor: H. Hind, 15, Long Row, Nottingham.

ÆDON PORTABLE WIRELESS, LTD.—Cap., £600. Manufacturers of and dealers in scientific and electrical apparatus and machinery, galvanic and electric batteries, wireless sets, aerials, wires, valves, loud speakers, microphones, etc. Reg. office: 140, Euston Covered Market, Euston Road, London, N.W.1.

Metal and Chemical Prices.

TUESDAY, November 16th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£64 0 0	10s. 0d.	—
Electro Wirebars	,,	£66 2 6	—	2s. 6d.
H.C. Wire, basis	per lb.	9 1/16d.	—	—
Sheet	,,	9¼d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 0 9/16d.	—	—
Brass 60/40—				
Rod, basis	per lb.	7¼d.	—	—
Sheet, basis	,,	10¼d.	—	—
Wire, basis	,,	10¼d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£6 5 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 0 0	—	—
Lead Pig—				
English	,,	£31 0 0	10s. 0d.	—
Foreign or Colonial	,,	£29 10 0	10s. 0d.	—
Tin—				
Ingot	,,	£311 10 0	£8 5 0	—
Wire, basis	per lb.	3s. 11d.	1d.	—
Aluminium Ingots	per ton	£112 0 0	—	—
Spelter	,,	£34 0 0	£1 2 6	—
Mercury	per bottle	£17 0 0	—	—

Sulphur (Flowers)—Ton £11 15 0 *Sodium Chlorate*—Per lb. 2½d.
,, (Roll-Brimstone)—,, £10 10 0 *Sulphuric Acid* (Pyrites, 168°)
Copper Sulphate— ,, £25 to £25 10s. per ton, £6 15 0
Boric Acid (Crystals) ,, £37 *Sodium Bichromate*—Per lb. 3½d.
Rubber—Para fine, 1s. 7½d.; plantation 1st latex, 1s. 8d.

The metal prices are supplied by British Insulated Cables Ltd.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ANGELL WIRELESS SUPPLY STORES, 38, Boleyn Road, Dalston. £20 2s. 10d. August 31st.

BLACKFRIARS RADIO CO., 60 and 61, Blackfriars Road, S.E. £12 19s. 1d. October 9th.

HUGHES, Alf. H., Ekington Road, Coal Aston, electrical dealer. £32 2s. 8d. October 14th.

MOSELEY ELECTRIC CO., 8½, Parade, Birmingham, electrical engineers. £11 17s. 3d. October 11th.

PICKWELL AND CO., 288A, Hyde Road, West Gorton, wireless dealers. £10 17s. 10d. October 7th.

WHITFIELD ELECTRICAL CO., LTD., 357, Caledonian Road, King's Cross, electrical engineers. £19 5s. 4d. October 7th.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

ANDERSON AND PENNEY, LTD., South Shields, electrical contractors.—Registered October 7th, £500 debenture and £500 debenture, to O. Anderson, 65, Stanhope Road, South Shields, electrical contractor, and J. S. Penney, 88, Sunderland Road, South Shields; general charge.

CHAMBERS AND CHAMPION, LTD., London, S.W., manufacturers of electrical apparatus.—Registered November 1st, £150 debenture, to C. E. Mott, 14, King William Street, E.C., solicitor; general charge.

GILFILLAN BROTHERS, LTD., London, W.C., manufacturers of wireless apparatus.—Registered October 16th, £750 debentures, to W. Greenwood, 40, Hertford Avenue, East Sheen, director of the company; general charge.

HALESOWEN LIGHTING AND TRACTION CO., LTD., London, W.C.—Registered October 20th, £7 500 debenture to Shropshire, Worcestershire and Staffordshire Electric Power Co., 88, Kingsway, W.C.; general charge. *£26 000. June 2nd, 1926.

HINDHEAD AND DISTRICT ELECTRIC LIGHT CO., LTD.—Registered November 1st, £50 debentures, part of amount already registered; general charge. *£6 700. July 22nd, 1926.

MAWDSLEY'S, LTD., London, N., electrical engineers.—Registered October 28th, debenture, to bank, charged on property at Dursley; also general charge. *£6 300. January 4th, 1926.

RADIAX, LTD., London, N., electrical engineers.—Registered October 11th, £750 debentures (filed under section 93 (3) of the Companies (Consolidation), Act, 1908), present issue £600; general charge. *Nil. June 22nd, 1925.

THAMES ELECTRIC CO., LTD., Kingston-on-Thames.—Registered October 29th, £5 000 debentures; general charge. *Nil. July 30th, 1925.

THOMAS (H. AND S. W.) CO., LTD., Tenby, electrical engineers.—Registered October 27th, mortgage, to Bank, charged on South Parade Garage, Tenby, with plant, etc.

Satisfactions.

CITY WIRELESS CO., LTD., Liverpool.—Satisfaction registered October 10th, £700, registered April 8th, 1925.

MUSSELBURGH AND DISTRICT ELECTRIC LIGHT AND TRACTION CO., LTD., London, E.C.—Satisfaction registered October 25th, £1,400, part of amounts registered November 30th, 1905, and May 12th, 1909.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

MELLIER, LTD., 31, George Street, Hanover Square, London, W.1, electricians, etc. A largely attended meeting of creditors was held on November 10th, at the offices of Ball, Baker, Ash and Co., C.A., Finsbury Court, Finsbury Pavement, E.C. The chair was occupied by the liquidator, Mr. C. C. Baker, who said that there was very little information he could give the creditors as he was not in possession of the company's books or assets. A receiver had been appointed on behalf of the debenture holder, who, he understood, claimed some £30 000. The receiver had informed him that the assets would probably not produce sufficient to fully satisfy the debentures. The debenture holder might receive 12s. or 13s. in the £1, but no more, and that meant that the creditors would receive nothing. As far as he could ascertain the claims of the trade creditors were £7 270, and there were other unsecured creditors for £24 962. The latter figure included an item of approximately £19 760 for unpaid purchase money not handed over to the vendor when the company was registered between three and four years ago. The debenture holder was Sir E. Mackay Edgar, who sold the business to the company, which was formed with a capital of £25 000. The purchase price was £50 321, of which £24 998 was payable by the issue of fully paid shares and the balance of £25 323 was to be discharged by a payment in cash. The cash payment, however, was never made, and Sir Edward Edgar received debentures, issued in July, 1923. Some time after the company was formed a freehold property was sold to it by Sir Edward Edgar for £25 000, which was never paid. The company erected certain structures on the land at a cost of about £11 000. A portion of the estate was sold early in the present year for £6 962, and the remainder was mortgaged for £5 500. After some discussion, during which dissatisfaction was expressed at the position, a resolution was unanimously passed to the effect that the voluntary liquidation of the company should not be continued, but that John Boulding and Son, one of the principal creditors, should apply for a compulsory winding-up order.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Companies Winding-up Voluntarily.

BARLOW AND REDRUTH, LTD. D. E. Campbell, 79, Lichfield Street, Wolverhampton, appointed liquidator, October 30th.

MILLER AND SONS, LTD. By Special Resolution October 22nd, confirmed November 8th. C. J. Dixey, chartered accountant, 9A, Sackville Street, W.1, appointed liquidator.

TRIBE (A. E.) AND CO., Ltd. W. Boniface, 10, Serjeant's Inn, Fleet Street, London, chartered accountant, appointed liquidator, November 8th. Meeting of creditors at liquidator's office, 11.30 a.m. Thursday, November 25th.

Bankruptcy Information.

ANDERSON, Frank, 109, Warwick Street, Greenheys, Manchester, electrical engineer. Receiving order, November 8th. Creditor's petition.

BROCK, Reginald Lewis, trading as R. L. BROCK AND CO., 5, Bedford Row, Tavistock Road, Plymouth, electrical engineer. First meeting, November 24th, 3 p.m., 11, St. Aubyn Street, Devonport. Public examination, December 31st, 11 a.m., Western Law Courts, Guildhall, Plymouth.

FENTON, Reginald, 514, Sheffield Road, Chesterfield, electrical engineer. Receiving order, November 11th. Debtor's petition.

HEANEY, W., 12, Market Place, Henley-on-Thames, Oxon, electrician. First meeting, November 24th, 12.30 p.m., 29, Russell Square, London, W.C.1. Public examination, December 2nd, 2 p.m., Assize Courts, Reading.

McMAHON, Albert James, 51, St. Thomas Street, Weymouth, and Melcombe Regis, electrical contractor. Receiving order, November 12th. Debtor's petition.

WELLS, Arthur Jack, lately in partnership with William Bashford, 52, Princess Street, Luton, under the style of WELLS AND CO., electrical engineers. First meeting, November 24th, 11 a.m., Official Receiver's Office, The Parade, Northampton. Public examination, December 16th, 11.30 a.m., Court House, Luton.

Notices of Dividends.

BARDSLEY, John Anderson Alfred, 91, Old Hall Lane, Withington, Manchester, electrical contractor. First and final dividend, 1s. 3½d. in the £, payable, November 22nd, Official Receiver's Office, Byrom Street, Manchester.

GREENALL, William Hampton, trading as HAMPTON ELECTRIC CO., Newerne Street, Lydney, in the county of Gloucester, electrician. First and final dividend, 8½d. per £, payable November 23rd, Official Receiver's Office, 34, Park Place, Cardiff.

Notice of Intended Dividend.

WEBB, Alfred Frank, 102, Duke Street, St. Helens, Lancashire, electrician. Last day for receiving proofs, November 27th, Trustee, E. D. Symond, 11, Dale Street, Liverpool.

Application for Discharge.

THOMAS, Frederick Harold, trading in co-partnership with Walter Ernest Evans, at Salubrious Chambers, Salubrious Passage, Swansea, under the style of THOMAS AND EVANS, electrical engineers. Hearing, December 15th, 2 p.m., Town Hall, Swansea.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

244 880 E. T. P. KERRIDGE and F. W. TRENDELL. Construction of multiple-way coil-holder for wireless telegraphy or telephony. (5/11/24.)
244 885 CROMPTON AND CO., LTD., and W. F. JONES. Automatic circuit-breakers. (7/11/24.) (Addition to 199 526.)
244 889 BRITISH INSULATED AND HELSBY CABLES, LTD., and J. L. PACKER. Lead or like metal-sheathed electric cables. (20/11/24.)
225 564 BRITISH THOMSON-HOUSTON CO., LTD. Process for regulating the speed of alternating-current machinery. (28/11/23.)
244 901 C. A. BAKER and J. BELL AND CROYDEN, LTD. Electromedical appliances. (4/12/24.)
244 902 W. H. BUSHELL and J. MERRETT. Wireless distributor boards. (4/12/24.)
226 240 AKT.-GES BROWN, BOVERI ET CIE. Selective protective apparatus for electrical circuits. (15/12/23.)
227 810 COMMANDITAIRE VENNOOTSCHAP FROGER'S ELECTRICITEITS MAATSCHAPPIJ. Electromagnetically-actuated electric switch mechanism. (19/1/24.)
227 101 J. D. COENRAADS. Means for establishing or breaking the connection of two electric conductors. (5/1/24.)
244 389 F. MERK. Telephone table-sets. (13/12/24.)
244 917 GENERAL ELECTRIC CO., LTD., and J. F. TURNER. Advertising and electrical testing device. (29/12/24.)
234 441 NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPEN-FABRIEKEN. Device for hermetically sealing electric leading-in wires in a glass wall. (23/5/24.)
230 026 AMERICAN APPLIANCE CO. Gaseous electric space current device. (1/3/24.)
244 944 HENLEY'S TELEGRAPH WORKS CO., LTD., W. T., and W. W. WATKINS. Electric cables. (3/2/25.)
244 962 BRANDES, LTD. (RYPINISKI M. C.) Terminal connector. (10/3/25.)
244 965 BRITISH THOMSON-HOUSTON CO., LTD. (GENERAL ELECTRIC CO.) Suspension insulators. (12/3/25.)
244 968 F. MERK. Telephone table-set. (9/2/25.)
245 176 G. C. BEDDINGTON. Calling-up devices for wireless communication. (31/7/24.)
245 183 A. CARPMAEL and A. J. RANSFORD (legal representatives of R. B. RANSFORD, deceased) (C. K. CHANDLER). Telegraphic and telephonic receiving circuits. (3/9/24.) (Cognate application 2 326/25.)
227 793 A. A. CLOKEY. Telegraphic recording instruments. (19/1/24.)
245 204 IGRANIC ELECTRIC CO., LTD., and J. H. A. SPAINK. Protection devices for electrical rectifiers. (3/10/24.)
245 205 D. E. BARNETT. Electric terminals, connectors or the like. (3/10/24.)
245 207 J. W. CLARK. Operating means for electric signalling devices. (4/10/24.)
245 213 A. C. SHORE, A. P. WITCHELL and W. P. BROOKS. Electrical switches. (6/10/24.)
245 221 W. E. TREMAIN. Leading-in insulators in combination with lightning protectors for telegraphic purposes. (11/10/24.)
245 225 W. BARKER and C. E. CLARKSON. Electrical contact clips. (15/10/24.)

Application for Patents.

October 18th.

25 936 AKTIESELSKABET DRAMMENS ARMATUR-FABRIK. High-tension switches (23/11/23, Norway.)
25 938 E. W. BONSON. Electrical connectors.
25 971 BURNDEPT WIRELESS, LTD., and C. F. PHILLIPS. Electric transformers.
25 934 J. G. DALOZ. Commutators for electric machines. (20/10/25, Belgium.)
25 943 INTERNATIONAL GENERAL ELECTRIC CO., INC. Dynamo-electric machines. (16/10/25, Germany.)
25 915 F. E. MINTON and A. B. REEVES. Electric switches.
26 014 G. SCHWORETZKY. Electric flat-irons.
25 918 P. G. SIMMONDS. Electric switch.
25 965 SOC. DE PARIS ET DU RHONE. Electric starting-machines for motor vehicles. (24/11/25, France.)
25 966 SOC. DE PARIS ET DU RHONE. Electric starting-machines for motor vehicles. (8/7/26, France.)
26 005 H. SONNENFELD. Electric cables. (25/6/27, Czecho-Slovakia.)
25 935 L. H. WADSWORTH. Electric contact plugs, etc.
25 986 H. WEICHSEL. Alternating dynamo-electric machines.
25 940 T. E. WILLIAMS. Electric switches.

October 19th.

26 103 A. F. A. ACCUMULATORS, LTD., and E. G. LIND. Galvanic batteries.
26 118 O. T. BLATHY. Rotating field magnets for turbo-generators. (10/4/26, Hungary.)
26 076 BRITISH THOMSON-HOUSTON CO., LTD. Electro-magnetic devices. (19/10/25, U.S.)
26 080 E. S. FRANKLIN. Cables for transmitting high-frequency electrical energy.
26 101 E. GELES. Radio aerials. (19/10/25, Roumania.)
26 059 N. J. MCAINSH and SIR W. NOBLE. Methods for maintenance of constant potential, etc., in electrical circuits.
26 107 W. MANCHESTER and S. D. WHITE. Cord-grip electric plugs.
26 807 S. C. MILLER. Supply of current to thermionic valves.
26 060 W. S. PERCIVAL and C. E. PRINCE. Wireless receiving circuits.
26 082 TELEFUNKEN GES. FUR DRAHTLOSE TELEGRAPHIE. Wireless telegraphy, etc. (20/10/25, Germany.)
26 077 VEREINIGTE GLUHLAMPEN UND ELECTRICITATS AKT.-GES. Thermionic electron tubes. (8/7/26, Austria.)
26 056 A. H. WILLIAMS. Electrical welding.

October 20th.

26 195 BRITISH THOMSON-HOUSTON CO., LTD. Time element electro-responsive devices. (20/10/25, U.S.)
26 217 C. L. I. MANUFACTURING CO., LTD., and A. J. LAIRD. Automatic electric switches.
26 232 CIE. DES FORGES ET ACIERIES DE LA MARINE ET E. D'HOMECOURT GRANAT, Electric transmitters for polyphase distant control system. (31/10/25, France.)
26 228 EDISON SWAN ELECTRIC CO., LTD., and L. H. SOUNDY. Electric inductance coils, etc.
26 229 EDISON SWAN ELECTRIC CO., LTD., and L. H. SOUNDY. Variable electrical condenser.
26 145 T. D. EDWARDES. Electric switches.
26 197 and 26 202. A. ESAU. Radiation of electrical energy. (10/11/25, Germany.)
26 155 GENERAL RADIO CO. and G. W. WALTON. Electric condensers.
26 231 W. H. LE BRETON. Grid leaks, etc., for wireless telephony, etc.
26 146 W. LEE. Electric switches.
26 238 SIR O. J. LODGE, M. M. MELINSKY, and E. E. ROBINSON. Method of preventing re-radiation from wireless aerials.
26 230 J. M. LYON and W. I. G. PAGE. Inductance coils.
26 140 C. G. SMITH. Secondary batteries.
26 160 G. THRELFALL. Aerial masts.
26 217 E. A. WATSON. Automatic electric switches.

October 21st.

26 241 E. L. BROOKS. Device for winding wire on electrical instruments, etc.
26 347 L. DE FOREST, LTD. Electromagnetic units for sound-reproducing devices. (24/10/25, U.S.)
26 334 M. HOCHSTADTER. Insulation of electric conductors. (21/11/25, Germany.)
26 335 STANDARD UNDERGROUND CABLE CO. High-voltage bushings. (1/7/26, U.S.).

October 22nd.

26 450 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and H. H. HARRISON. Multiplex telegraph systems.
26 479 J. M. BOOKER. Wireless apparatus.
26 367 BRITISH INSULATED CABLES LTD., and L. B. WILSON. Electric prepayment meters.
26 426 BRITISH THOMSON-HOUSTON CO., LTD. Electric control systems. (22/10/25, U.S.)
26 433 P. R. COURSEY, and DUBILIER CONDENSER CO. (1925), LTD. Multiple electrical condensers.
26 396 DUBILIER CONDENSER CO. (1925), LTD. Electrical condensers. (2/4/26, U.S.)
26 398 and 26 399 DUBILIER CONDENSER CO. (1925), LTD. Electrical condensers (29/4/26, U.S.)
26 397 DUBILIER CONDENSER CO. (1925), LTD. Wire-wound resisters. (14/4/26, U.S.)
26 400 DUBILIER CONDENSER CO. (1925), LTD. Electron-tube filaments. (17/5/26, U.S.)
26 387 FABRIK ELEKTRISCHER ZUNDER GES. and J. SCHURMANN. Electric fuses.
26 445 W. T. GOWER. Electric lamps for cycles.
26 402 R. C. GRASEBY. Clock-controlled switch mechanism, etc.
26 469 L. R. E. GRATZMULLER. Arrangement for exciting alternating-current motors. (24/10/25, France.)
26 456 P. HAGSPIHL. Electrodes for electric accumulators. (13/6/26, Germany.)
26 366 F. H. HAYNES. Calculator for determining relationship between inductance and capacity.
26 477 W. J. HOFFMANN. Electromotor.
26 437 B. VON LOUTZKOY. Sparking-plugs. (30/8/26, Germany.)
26 453 L. MAGRINI. Oil switches. (15/2/26, Germany.)
26 357 J. G. MALTBY. Variable reactance units for wireless receivers.
26 350 M. S. MILLER. Thermionic-valve holders.
26 363 H. A. YOWARD. Rheostats.

October 23rd.

26 552 S. G. S. DICKER (NAAMLOOZE VENNOOTSCHAP PHILIPS' GLOEILAMPENFABRIEKEN). Discharge tubes for rectifying alternating currents.
26 537 T. HALL. Electric condensers.
26 491 W. HALLIDAY. Remote-control electric relay switches.
26 509 F. E. HOWELL. Electric switch.
26 535 L. MAGRINI. Oil switches.
25 547 METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Electrical protective systems. (16/1/26, U.S.).

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Friday, November 19th (To-day).

POLYTECHNIC.—Regent Street, London. Lecture on "Artificial Production of the Human Voice," by Sir R. Paget, Bart. (In aid of King Edward's Hospital Fund for London.) 5 *p.m.*

INSTITUTION OF MECHANICAL ENGINEERS.—Institution, Storey's Gate, St. James's Park, London. Paper by Mr. T. A. F. Stone on "Electric Locomotives: A Method of Classifying, Analysing and Comparing their Characteristics." 6 *p.m.*

ELECTRICAL TRADES COMMERCIAL TRAVELLERS' ASSOCIATION.—St. Bride's Institute, London. Annual general meeting. 7 *p.m.*

ELECTRICAL DEVELOPMENT ASSOCIATION.—Royal Society of Arts, John Street, Adelphi, London. Conference on "Shop Window Display." Speaker, Mr. E. Willson. 7.30 *p.m.*

EFFICIENCY CLUB.—Vernon House, Park Place, St. James's Street, London. Discussion on "The Relative Fields and Merits of Gas and Electricity." 7.30 *p.m.*

JUNIOR INSTITUTION OF ENGINEERS.—39, Victoria Street, Westminster. Lecturette on "Short Wave Wireless Communication." By Mr. B. J. Axten. 7.30 *p.m.*

UNIVERSITY OF LONDON.—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Lecture VIII by Dr. J. A. Fleming, F.R.S. on "Electric Measurement." 5.30 *p.m.*

Saturday, November 20th.

ASSOCIATION OF MINING ELECTRICAL ENGINEERS. (SOUTH WALES BRANCH. WESTERN SUB-BRANCH).—60, Wind Street, Swansea. Paper by Mr. K. B. Ashton on "Mine Pumping."

Monday, November 22nd.

ELECTRICAL CONTRACTORS' ASSOCIATION. (EALING SUB-BRANCH).—Ordinary meeting.

INSTITUTION OF ELECTRICAL ENGINEERS.—Institution, Savoy Place, Victoria Embankment, London. Informal meeting. Discussion on "Comparative Electrical Progress in European Countries." (Opened by Mr. J. F. Shipley.) 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS. (MERSEY AND NORTH WALES—LIVERPOOL POOL—CENTRE).—Laboratories of Applied Electricity, The University, Liverpool. Paper by Mr. J. R. Beard and Mr. T. G. N. Haldane on "The Design of City Distribution Systems and the Problem of Standardisation." 7 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS. (NORTH-EASTERN CENTRE.)—Sopwith's Lounge, Newcastle-on-Tyne. Informal meeting. 7 *p.m.*

ELECTRIC LAMP MANUFACTURERS' ASSOCIATION OF GREAT BRITAIN.—Lighting Service Bureau, 15, Savoy Street, London. Fourth lecture of the 12th Illumination Design Course, by Mr. A. R. Powell on "Electric Lamp Manufacture and Economics of Light Production." 7.30 *p.m.*

Wednesday, November 24th.

ELECTRICAL CONTRACTORS' ASSOCIATION. (CROYDON BRANCH).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION. (CARDIFF BRANCH).—Ordinary meeting.

ELECTRICAL CONTRACTORS' ASSOCIATION. (BELFAST BRANCH).—5, Bedford Street. Ordinary meeting. 3.30 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS. (NORTH-EASTERN CENTRE).—Literary and Philosophical Society, Westgate Road, Newcastle-on-Tyne. Faraday Lecture by Prof. W. M. Thornton on "What is Electricity?" 7 *p.m.*

Friday, November 26th.

PHYSICAL SOCIETY OF LONDON.—Imperial College of Science and Technology, South Kensington. Papers by Mr. H. C. Hepburn on "Electro-endosmosis and Electrolytic Water Transportation" and Mr. L. Hartshorn on "The Input Impedance of Thermionic Valves at Low Frequencies." 5 *p.m.*

POLYTECHNIC.—Fyvie Hall, Regent Street, London. Lecture by Dr. E. Griffiths on "The Romance of Refrigeration." (In aid of King Edward's Hospital Fund for London.) 5 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS. (LONDON STUDENTS' SECTION).—Institution, Savoy Place, Victoria Embankment, London. Paper by Mr. H. J. D. Palfrey on "The Measurement of Light." 6.15 *p.m.*

INSTITUTION OF ELECTRICAL ENGINEERS. (SOUTH MIDLAND CENTRE.)—Grand Hotel, Birmingham. Annual Dinner. 7 *p.m.*

MANCHESTER ASSOCIATION OF ENGINEERS.—Manchester City Art Gallery. President's Conversazione. 7.15 *p.m.*

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The Electrician.

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COAL AND IRON.

THIS issue of THE ELECTRICIAN is devoted to the part played by electricity in the iron and steel industries. It synchronises, unhappily, with the occurrence of a period of unparalleled stagnation and depression, the incidence of which has been greater on those trades than on any others. With the coal supply from home sources cut off, or at least reduced to a negligible amount, these British key industries have had to subsist from hand to mouth, their requirements painfully eked out by foreign coal supplies or oil; for although supplies of gas have been maintained, its price as a fuel is prohibitive in industries of the magnitude of those under discussion and its use has been limited to the lesser needs of foundries and workshops.

All this is, however, common knowledge and will soon, it is to be hoped, be ancient history. Now we must look to the future and, with the handicap of the irretrievable losses of the immediate past, prepare to shoulder some heavy burdens. There are indications that a boom will follow the disastrous experience of the past six months. That, perhaps, would be the next most disastrous thing, seeing that it would almost inevitably be followed by a slump. We want neither; we want steady and stabilised conditions. Of excursions and alarms we have had more than enough.

The energies of the future have therefore to be bent towards repairing the damage and to taking such precautions as are within our power, so that in the event of further untoward circumstances we shall at least be able to apply the lessons we may have learned from the occurrences of the past six months. First we are forced to admit that the whole question of fuel economy has assumed a greater importance in industry than ever. Fuel, the iron and steel industries must have. In the production of pig iron, the basis of the whole superstructure, it is required not only for the generation of heat, but for the chemical requirements of the blast furnace process itself. Up to the present no method has been devised of dispensing with the use of solid fuel for this purpose. There is every indication that such solid fuel will cost more in the future than it has done in the past. It may well be believed that, seeing that not all the coal miners can hope to be reabsorbed into the industry and that the output per man is not likely very materially to increase, there will be less coal available. In that case some branches of industry will have to do with less and less coal or the pig iron industry will have to shrink, and with it the iron and steel industries as a whole. In any case it may be foreseen that the subsidiary operations of steel making and rolling, of reheating and of heat treatment will be forced to use as little raw coal as they can. They will turn, as they have been doing in the past six months, more and more to electricity as a source of heat. This, too, depends upon coal for its generation, but the circle will be less vicious than it appears, if that coal is rightly used, or if ways can be found of using less raw coal and more of the coke, gas and oils that can be derived from it. Engineers and metallurgists alike look to the fuel expert to indicate the ways and means of doing this.

The greater dependence upon electricity for heating, and more especially for heat treating is exemplified by the article by Mr. E. P. BARFIELD on "The Electrical Heat Treatment of Steel," which we publish on another page. The claims of electricity in this and other directions are well known, and it is unnecessary to elaborate them here. The ultimate economy of electricity in most of the operations of this kind is admitted. If only in the saving of wasters and the spoilation of material due to the older and empirical rule of thumb methods of heat treating steel, its admittedly greater first cost proves, in every instance, the truest economy.

If iron and steel become dearer, which seems inevitable, they must be made to go further. There are many ways of doing this. One is to use less and to have, increasingly, recourse, more and more, to alloys which, for various reasons, may be expected to go further, or to last longer, or both, and so to justify their higher first cost. Another way is to conserve better our existing supplies of iron and steel. The great enemy of the ferrous metals is rust, to the attacks of which they are especially prone. Every method whereby the more easily corroded forms of iron can be preserved will serve the purpose and conserve the supply. An example of the first method is afforded by the contribution by Mr. W. T. GRIFFITHS. How, by employing a given alloy, a metal may be made to perform far more efficiently the service required of it is admirably illustrated in this article on "Nickel-Iron Alloys." The object here is to secure increased electrical efficiency, and the method is to use an increased proportion of other metals, in conjunction with the iron. An example, no less practical, of the second method is given in the interesting paper by

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Mr. W. H. HARRIS on "Electroplating on Iron and Steel." The advent of chromium plating, for instance, will mean greatly increased life for the articles subjected to that process.

Finally, reference should be made to the article by Mr. L. P. SIDNEY on "Pure Iron and Its Applications in Electrical Engineering." The addition of certain alloying elements, as is well known in the case of the now familiar stainless steels, markedly reduces corrosion losses. It has only recently been realised that the same end can be attained by methods exactly the reverse of this, although perhaps the result is not so striking or so effective. Pure metals differ very greatly in respect of their physical and chemical properties, from impure metals. The deliberate addition of other metals and metalloids is often attended by valuable results. The presence of accidental impurities, and failure to eliminate the extraneous constituents usually present in crude metals, is hardly ever beneficial, and least of all so, in regard to corrosion resistance, in the case of ordinary iron and steel. Mr. SIDNEY brings out some very interesting aspects of the application of pure iron for electrical purposes.

Conditions in the iron and steel industries during the past twelve months have not been conducive to sensational discoveries. Those industries have not been able, in the preoccupations of the strike, to try new methods. The more homely developments we describe are as much as can, in the circumstances, be expected. Attention to such minor details is not, however, to be despised. Industry is, now more than ever, dependent upon the small things for its development and progress. The more their importance is recognised, the better it will be for industry at large.

Current Topics.

The Bill in the Lords.

THE Electricity (Supply) Bill, 1926, was given a second reading in the Lords on Wednesday without a division a motion to refer the measure to a Select Committee being defeated by 104 votes to 23. Their Lordships found it easier to stick to the point than their confrères in the Commons, and that well-known Socialist and almost legendary figure, Lord WEIR, of the Weir Report, made an admirable speech in defence both of the Bill and of himself. Those who claim that the statistics both of the Report and of Dr. ECCLES do not reveal our true position will be relieved to hear that the Weir Committee felt that the real question was not how well (or how badly) we were doing, but how much better we ought to do. This is a point which has been lost sight of. He added that it was not to our credit that in a new town of 8 000 workmen's houses, built during the last eight years within 11 miles of the House not one of the houses was wired for electricity. This is not a situation that could exist in any other progressive country, and will we hope, receive the close attention of Mr. BEAUCHAMP, Mr. BUSH, and other W.O.B.'s. For the rest, the Bill was a measure, one intention of which was to correct past mistakes, and, as Lord RAYLEIGH pointed out, it was only by Government interference that the situation could be ameliorated. Lord PEEL very rightly agreed that the Bill was not socialism and hoped that the compulsory powers would never be required, while Lord HALDANE, though generally giving it his blessing, complained that it did not touch the problems of distribution. Lord BANBURY spoke against it, mainly it appears, because he saw in it an attempt to force the railways into bankruptcy via electrification, though as they are excluded from the operation of the Bill the reason for his pessimism is not altogether clear. The ship therefore, in Col. MOORE-BRABAZON'S phrase, is almost ready to make its first voyage.

A Flood of Oratory.

THOSE, to the number of 700 or so, who attended the annual dinner of the British Electrical and Allied Manufacturers' Association last week, were treated to speeches whose inherent interest and manner of delivery were of a quality unusual at electrical gatherings. The Electricity (Supply) Bill, if it has done nothing else, has provided our industry with a great deal of much-needed publicity, and it is not therefore surprising that both the ATTORNEY-GENERAL and Sir ALFRED MOND were able to say something suitable to the occasion without at the same time making blunders, such as are by no means unusual. The star turn was, however, provided by Col. R. K. MORCOM, the chairman of the Association, who, in an epigrammatic and witty oration, said a good deal that badly required saying, and said it extraordinarily well. We especially commend his argument that a national electricity supply should be "of" and "for" but not "by" the nation; and we may be forgiven for repeating that in our view this end will be attained by the new measure, because it clears certain obstacles that impede progress out of the way. His amusing references to the baleful influences of experts and statistics, both separately and in conjunction, led up to a phrase which in these days of slogans might well be adopted as a watchword by those whose battle it will be to fight the battle of electrical development. The flow of electricity, he said, depends not only on the voltage, but on the resistance and capacity of the circuit. The electricity supply industry could be relied upon to look after the voltage if in their turns the Government would decrease the resistance and the consumer increased the capacity. The chance that all three of these necessary duties will be performed is good. For as Col. MORCOM rightly pointed out, the housewife is becoming increasingly aware that the cleanliness and convenience which are the direct result of using electricity in the home are worth doing a good deal to acquire, while the industrialist is realising that more power must be put behind the worker, if we are to improve and retain our commercial position. It may even be hoped that before long our railways will discover that electrification is a way out of their present difficulties, and will lend their assistance to the task of improving the national load factor.

Sir Douglas Hogg and the Bill.

IN his speech on the same occasion, the ATTORNEY-GENERAL made useful play with the dictum that appears in the B.E.A.M.A. book to the effect that British industry has not lost its power to expand, but that the necessity for co-operative action was more than ever clear. He went on to point out that this action would be made possible by the Bill, and though his arguments were received with some dissent, perhaps it is not too much to expect that in a cooler atmosphere even those who for one reason and another have been objecting to its provisions, will see that the time has come to make the best of it. Several weighty arguments may be advanced in favour of this policy. In the first place, some legislation is necessary even if it were only to be directed to such minor, though important, matters as wayleaves and selling powers. Secondly, it is advisable that such legislation should not only recognise the rights of private enterprise, but leave that enterprise free to develop. This the Bill will do to an extent which its Conservative opponents do not yet realise. Thirdly and most important, co-ordination and standardisation must be beneficial and though statisticians and others tell us that the effect may not be at once noticeable, it is certain that before very long progress on an increasing scale will be visible even to the most myopic. It is only natural that the electricity supply industry should dread legislation, but in this instance we think that their fears are groundless.

Electricity and the Future.

THE probable effects of the increasing availability of electricity on our industrial and sociological conditions were

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interestingly dealt with by Mr. W. E. FRENCH, in the address which he delivered to the North Midland Centre of the Institution of Electrical Engineers last week. The universal supply of electricity at low charges was, he said, likely to produce an effect, the reverse of that originally associated with electrical development, namely, the decentralisation and ruralisation of industries. One result might be the reappearance of small master-owners who would make certain integral parts of machines, which would be erected in a central establishment. The moral effect of this decentralisation would be very great, as it would remove much of the discontent of the present artisan. It was significant, too, that higher wages were the result of an increased use of electricity. In the United States about 3·3 electrical horse power were used per workman, the figures in Great Britain and Japan being respectively 50 per cent. and 25 per cent. of this. On the other hand, the average wages paid in the United States were about twice those paid here and about four times those paid in Japan. These figures gave some support to the view that there was a direct relation between the electricity consumption and the wages earned. Decentralisation would also have a beneficial effect on agriculture, while electrical traction would operate in the same direction. It is our opinion that the so-called industrial revolution is about to make a full circle and while the coming of the steam age drove people from the country in to the towns, the coming of the electric age will be followed by a gradually accelerating movement in the reverse direction.

Electricity in Sydney.

THE annual report of the acting general manager of the Sydney municipal electricity supply undertaking for the year 1925 discloses an interesting and satisfactory state of affairs. The area directly supplied covers approximately 155 square miles, with a population of 806 930, while in addition an area of 456 square miles, with a population of 78 850, is supplied in bulk. We note that the tariff problem is also present in Australia, and that with the idea of reducing the average price of the electricity supplied and at the same time penalising the unprofitable user it has been decided to charge 5d. per kWh for 2½ kWh per quarter per 100 sq. ft. of floor area, and 1¼d. per kWh for the remainder. This change over is compulsory in the case of commercial users and in the case of new residential consumers and those extending their installations. On the other hand a good many consumers have exercised their option in favour of the change. Power is supplied on a sliding scale from 1·5d. to ½d. per kWh, according to consumption. The total electricity sold by the department was 202 424 951 kWh, at an average price of 1·915d. About 41 million kWh of this amount is purchased from the New South Wales Government Railways Department. The largest consumer was the Metropolitan Meat Industry Board, who took 4 848 384 kWh. About 63 per cent. of the electricity sold is for power purposes and 26 per cent. for private lighting, etc. The total number of consumers at the end of the year was 130 388, or 15·79 per cent. more than in the previous year. The aggregate continuous rating of the generating plant is 75 500 kW in one station, the generating pressure being 5 300 V, and the transmission voltages 5 300, 11 000 and 33 000 V. The maximum load on the station during the year was 53 000 kW and on the system 71 380 kW. The station load factor was 45·54 per cent., and the system load factor 40·52 per cent.

More Electricity Bills.

THE notices of the legislation which it is proposed to introduce during next year's Parliamentary session, shows that in spite of what has happened during the present year, electricity is by no means to be neglected. Powers are sought for the establishment of an entirely new power company, which, under the name of the Wessex Power Co., wishes to generate and supply in parts of the counties of Oxford, Bucks, Berks, Hants, Wilts and Gloucester, and to link up with the system of the North Metropolitan Electric Power Co. The North Metropolitan Power Co. itself seeks power to raise additional capital for the general purposes of its undertaking. The London and Home Counties Joint Electricity Authority seeks power to acquire land in Chiswick for the erection of a power station, a scheme about which there has already been a great deal of discussion, and for power to abstract and utilise water from the Thames and return it thereto. The County of London Electric Supply Co. asks for authority to extend its area of supply to include the county of Essex and for various other powers. There will, it is therefore obvious, be no lack of activity in spite of the dead hand which the Central Board is supposed to be going to lay on power company enterprises.

Rural Electrification.

THE lecture on "Twenty Years Practice in Rural Electrification," which was delivered by Dr. A. EKSTRÖM, before the Institution of Electrical Engineers last week, comes at an opportune moment. The lecture was illustrated by a number of lantern slides, and several films showing the applications of electricity to farming, and left the audience in no doubt as to great progress which has been made in this direction in Sweden. The lines on which this development has been carried out permits those who desire to do so to compare the results of State and private enterprise. For the northern and central portions of the country are served by a State scheme, while in the south the work is carried on by a power company. Dr. EKSTRÖM gave a detailed account of the plans of the acquirement of waterfalls by the State, their development and the construction of transmission lines connecting them, plans which he was glad to say had been frustrated, because such development as had taken place under their control had proved to be uneconomic and militated considerably against the popularisation of electricity. On the other hand, progress in the power company's area, representing about one-third of Great Britain, had been rapid. While rural electrification was not always justified from the economic point of view, it could be made to pay, a statement which was amply justified by the figures that he gave. Dr. EKSTRÖM insisted on the necessity of employing suitable material for wiring works on farms. Some of the Swedish installations were open to a good deal of criticism in this respect. The lecture was full of useful information, and is worth close study by all British electrical engineers.

The Coal Dispute.

FIVE years ago last June Mr. LLOYD GEORGE "settled" a coal strike. To-day we rejoice that another similar trouble has come to an end. Five years ago the leader of every political party declared in the House of Commons that the settlement was satisfactory and permanent. To-day no such panegyric is delivered and yet the present settlement is probably a sounder affair than the political triumph of five years ago. Mr. BALDWIN may have to wait for his laurels, but they will be better worth having. For as a result of the happenings of the last seven months one very big thing has been done, the effects of which may be widespread to the lasting good of trade and industry. The Mining Association (the Owners' body) was first deserted, and now the Miners' Federation has for practical purposes come to an end. Coal mining will therefore in future be dealt with on a district basis and in due time on a much more rational pit by pit basis. The result will be that we shall get coal, that miners will get wages, and that industry will thrive. Neither Moscow nor Downing Street will be able to frame formulae which have no bearing upon the practical work of the coal trade. The burden of a great extraneous incubus has thus been removed from one of our key industries. It has been a difficult job, it has involved great hardships and incalculable cost, but it may after all prove to have been worth while.

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PURE METALS IN ELECTRICAL ENGINEERING.

Distinction between Chemical and Commercial Purity—Methods of Production—Properties of "Armco" Iron—Some Essentials.

By L. P. SIDNEY

NO modern development in metallurgy possesses greater interest for electrical engineers than the production and applications of what are now, by common acceptance, known as "commercially pure metals." They are to be distinguished from specially, and almost chemically pure metals by the fact that they are obtainable in reasonable commercial quantities and therefore available within reasonably economic limits, for the purposes of industry.

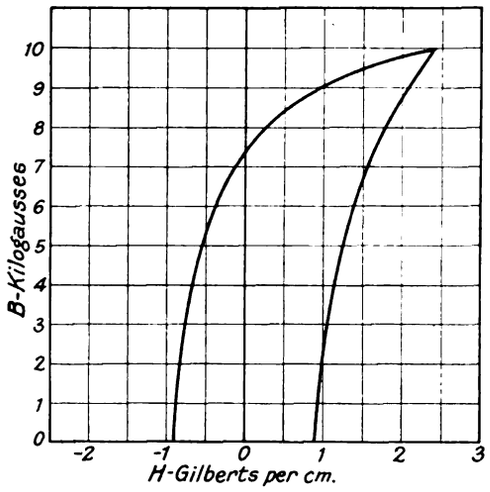

Fig. 1.—Typical hysteresis loop of annealed "Armco" ingot iron.

Absolutely pure metals are unknown.* In proportion, however, as metals approach the ideal, and apparently unapproachable standard of 100 per cent. purity, the properties of commercially pure metals differ from those of the cruder varieties which have, for centuries past, been employed. The presence of extraneous bodies, even in the most infinitesimal amounts, appears therefore profoundly to affect the most fundamental properties such as lattice structure; the distribution of the elementary particles within the lattice; the crystalline structure, order of size and growth; density and surface tension. The derived properties of strength, elasticity, hardness, impact resistance, and behaviour to corroding influences, and the entire range of magnetic, electrical and thermo-electrical properties undergo corresponding modifications. A pure metal may be assumed to possess physical constants differing very considerably from the constants of impure metals; commercially pure metals have properties which approach more closely and more uniformly those specific properties than metals the composition of which varies almost infinitely with the amount, the permutations and the combinations of the associated impurities they contain.

Upon a knowledge of the nature of these differences, and of the controllable degree to which material properties are influenced by the presence of impurities, either inherent or added deliberately for special purposes, much of the future of engineering and, in particular, of electrical engineering, depends.

Much work is being done in the production of almost chemically pure metals, by investigators both at home and abroad. The methods employed are almost invariably electrical. Electrolytic separation from solutions of salts, followed by remelting and finally refining in high frequency induction furnaces under a vacuum, are the methods chiefly in vogue. In other cases electrolysis is employed directly in purified molten metals. Thus, the National Physical Laboratory and the Bureau of Standards in Washington have carried, to a high state of perfection, electrolytic and other methods in the case even of such comparatively uncommon metals as manganese and beryllium, as well as aluminium, copper, zinc and magnesium, which can already be procured commercially in a high state of purity. Indeed, most of the industrial metals are obtainable in substantial quantities and in degrees of purity which would never have been dreamed of some fifteen or twenty years ago. Apart, however, from these "commercially pure metals," the following table affords interesting instances of the extent to which laboratory methods have succeeded in producing metals closely approximating to the ideal "chemically pure."

TABLE I.

Percentage of "main" metal in the purest base metals hitherto produced.

	Percentage Purity.
Aluminium[1]	99·990
Cadmium[2]	99·839
Copper[3]	99·953
Iron[4]	99·996
Lead[5]	99·997
Magnesium[6]	99·890
Manganese[7]	99·980
Nickel[8]	99·999
Tin[9]	99·988
Zinc[10] *	99·96

Not all the metals shown above are commercially available to the degree of purity indicated. Moreover, some of the published analyses are open to a certain amount of justifiable suspicion. It has been shown by Grard and others that aluminium, for instance, even of the highest purity, is apt to be contaminated by unsuspected amounts of alumina. Recent investigations by Jordan, Peterson and Phelps, presented at the October meeting of the American Electro-chemical Society this year, show that the process of refining metals such as nickel, platinum and iron is attended with constant danger of contamination by the refractory materials of the containers. Even with zircon prepared with great care, iron, on remelting, pertinaceously "picked up" appreciable quantities of phosphorus. Hydrogen is almost invariably present in electrolytically deposited metals, and oxygen and nitrogen occur as well. Moreover, in the case of most of the analyses given in Table i, the estimation of the bulk metal is admittedly calculated "by difference." Results of this kind can only be relied upon provided every possible impurity has been sought for and estimated with the highest skill and manipulative dexterity imaginable. The present writer has in mind certain discrepances which, years ago, vitiated the results of some ferro-

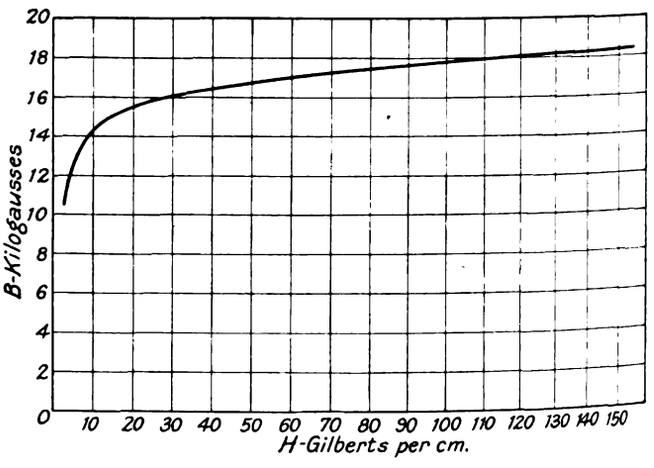

Fig. 2.—Normal induction curve of an annealed "Armco" ingot iron bar.

manganese analyses brought to his notice. The manganese "by difference" was eventually found to be contaminated with a totally unsuspected element, barium.

* A possible exception is zinc. The sample referred to in Table I is probably unique. It is claimed to be "spectroscopically" pure, in contradistinction to "chemically pure metal containing 99·987 per cent. of zinc.

Authorities.—[1] Anderson, "Aluminium," p. 130; [2] Budgen, "Cadmium," p. 78; [3] Mellor, "Treatise on Chemistry," vol iii, p. 31; [4] Langheim and Pfanhauser (quoted by Burgess, Iron and Steel Inst. Journal, 1913, No. ii, p. 337; [5] Smythe "Lead," p. 202; [6] S. L. Archbutt, Journal Inst. of Metals, No. 1, 1925; [7] Rosenhain, "N.P.L. Report"; [8] Quoted by Rosenhain, Autumn Lecture, before Institute of Metals, Liége, 1926; [9] Mundey, "Tin," p. 11; [10] Lones, "Nickel," p. 9. * A zinc of 99·987 per cent. purity is said to have been produced by the New Jersey Zinc. Co., Pennsylvania.

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The foregoing analyses must therefore be regarded with caution. At the same time, the industrial metals therein referred to can incontestably be obtained in degrees of purity closely approximating with those recorded. In regard, however, to iron, the Langheim-Pfanhauser figures are not, perhaps, to be taken too seriously. Similar figures given years ago by Hicks and O'Shea of samples of alleged similar purity have not gone unchallenged. The iron in both cases was electrolytic. The figures given in Table II may, however, be accepted as indicating, with substantial accuracy, the degrees of purity of various grades of commercially pure iron, notwithstanding that here, too, the iron has in certain instances been calculated " by difference." Every reasonable precaution may, however, be assumed to have been taken in estimating the impurities, although it may be well to note that in the case of the Swedish iron, the oxygen content was returned as " not ascertained."

TABLE II.

Iron in various grades of " Commercially Pure " Metal.

	Iron, per cent.
Swedish Bar	99·858
Lowmoor iron	99·766
Ingot iron	99·865
Mild steel	99·560
Electrolytic iron	99·723

Electrolytic iron is available in comparatively small quantities only, and is correspondingly expensive. The oxygen in the above sample was no less than 0·277 per cent. and the chlorine does not appear to have been estimated. Palmaer has shown that electrolytic iron corrodes very readily, owing, he suggests, to the presence of this element, of which he found 0·02 per cent. in a sample which retained, moreover, 0·02 per cent. of hydrogen even when heated to 500 deg. C.* Sir Robert Hadfield found that even at 1 400 deg. C. the sample in question evolved appreciable volumes of mixed gases amongst which was carbon monoxide.

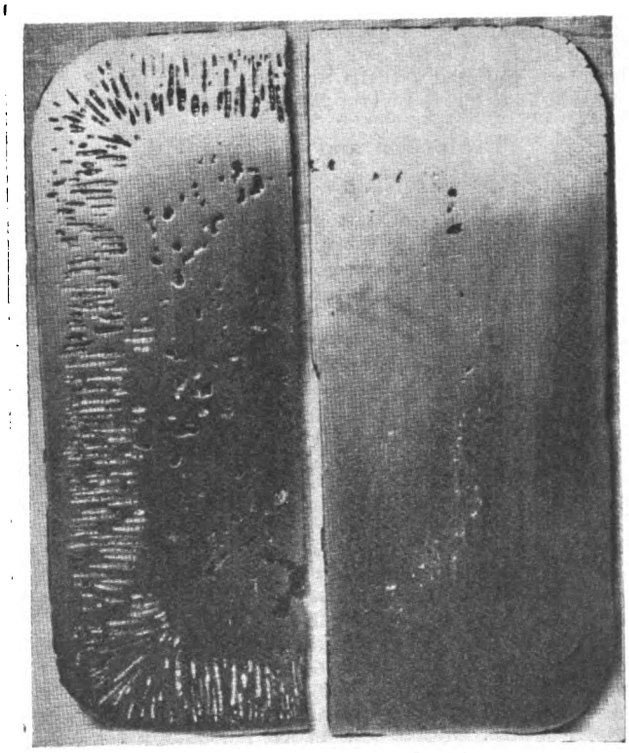
Ingot Iron the Purest.

From the figures given it emerges that the ingot iron is the purest of the samples of commercially pure iron investigated. This is the material known as " Armco " ingot iron, which is produced by processes of mass production, in openhearth furnaces capable of holding charges of 60 tons and upwards. It is, moreover, the material which was selected, a couple of months ago, for the £500 000 pipe line for Sao Paulo, the contract involving the use of some 30 000 tons of iron. It was placed with a British works in South Wales, the actual pipes themselves being entrusted to the care of a Scottish works. As, therefore, this material constitutes in practice the only " commercially pure iron " available in the quantities required in electrical engineering practice, it is to a description of its typical electrical and magnetic properties and applications that the remainder of this article will be mainly devoted.

The electrical conductivity of a metal varies with the temperature and the composition, and can only be ascertained by direct measurement and in comparison with a carefully selected standard. In the case of a pure metal the variation is, however, constant, and according to a definite law. Moreover, the purest metals are invariably the best conductors, and although a strictly limited number of metals, such as lead, tin, cadmium and zinc, have been shown by Matthiessen to be capable of alloying together without " material " deterioration in their intrinsic conductive capacities their alloys with other metals are always more resistant to the passage of the electrical current than the several metals composing them, taken individually. Oxygen is a constituent invariably present in, for instance, even the purest electrolytic copper or iron. In the case of the former it can be removed by remelting and " flapping," but only at the risk of becoming further contaminated by other impurities. The remelting of electrolytic iron is, on the other hand, hardly current economic metallurgical practice. It can be effected in small amounts in induction furnaces but is, like copper, liable to recontamination.

The accepted explanation of the higher conductivity of pure metals is that the absence of impurities preserves the complete regularity of the crystal structure. Their presence, as Dr. Rosenhain pointed out in his autumn lecture to the Institute of Metals last September, interferes with the passage of the electrons to which the transmission of the electric current is nowadays ascribed. In the electrical industry progress is closely bound up with the supply of cheap, high conductivity metal, for use in circumstances when copper, which, like silver, is specifically a high conductor, would, owing to its cost, be prohibitive. Recourse has, therefore, been had to the purer forms of iron commercially available: very mild steel, and high-grade wrought iron. Considerations of high tensile strength go by the board; the requirements sought are cheapness and high conductivity. They are both, however, inadequately served by such means.

To take a concrete example: the manufacturer of conductor rails is called upon to guarantee that the specific



Steel. Ingot iron.

Fig. 3.—Showing the uniform density of "Armco" ingot iron compared with steel, as indicated by the blow-holes honeycombing the steel.

electrical resistance shall not be greater than 6½ times that of copper. Such a steel would, as H. J. Skelton points out, be " entirely special, and only a very limited number of manufacturers are willing to accept orders."

In " Armco " ingot iron, on the other hand, we have a material which satisfies conditions in respect of both cost and high conductivity. This commercially pure metal has the low " mass resistivity " of 0·84 O per metre-gramme; equivalent to 4 800 mile-ohm. Its volume resistivity is 10·7 microhms per cubic centimetre, while it has the very excellent tensile strength of 38 000 to 44 000 lb. per sq. in. (17 to 20 tons per sq. in.). These figures correspond with a volume conductivity of 17 per cent., and a mass conductivity of 18 per cent. of that of standard annealed copper, which is well within the 6½ times specification in regard to electrical resistance laid down above. On this computation ordinary mild steel has a volume conductivity varying from 11 to 12 per cent. that of copper, and only, therefore, some 50 per cent. of the conductivity of ingot iron. Tests carried out at the National Physical Laboratory on a sample bar of " Armco " ingot iron gave 5·43 and 6·17 as the respective mass and volume relative resistance as compared with British standard soft copper. It is supplied in the form of black, or galvanised wire, according to requirements, and in these forms satisfies the most stringent specifications, and is therefore extensively employed under conditions which favour corrosion. A pure metal corrodes far less, and what is still more important, far more evenly, than a metal containing various and widely differing foreign constituents. Comparative tests have shown that ingot iron will, when subjected to corroding agencies, the bane of all metals, but more particularly of ordinary iron and steel, last from three to four

(*Concluded on page* 618).

* Quoted by Guillet, " Journal of the Iron and Steel Institute," 1914, ii, p. 70.

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ELECTROPLATING ON IRON AND STEEL.

Some Practical Requirements and Applications — Essential Precautions — Details of Plating Solutions.

By WILLIAM E. HARRIS, Assoc. M. Inst.M.M. (Silver Medallist Electro-Metallurgy: City and Guilds, London).

ELECTROPLATING of iron and steel calls for special methods, particularly in the preparation of the work before the actual plating. Generally speaking the surfaces of articles made of copper or brass, or such metals, have been brought to a fairly high finish before being sent on for electroplating, and apart from the removal of the grease and dirt left on the work from these preliminary surfacing processes, there is only a slight film of oxide or stain left to remove to get the chemically clean surface necessary for successful electroplating. Further it is only comparatively thin deposits which are required on the articles, mainly for decorative purposes, and to give them a pleasing finish.

Protection and Building Up.

Iron and steel articles, however, are usually coated for "protective" purposes to prevent corrosion and to keep the base metal from rusting, and whilst the methods used for the non-ferrous articles would be quite sufficient if only thin decorative coatings were required, special cleaning and preparation of the work are required when protective coatings are needed.

Since the war another specialised branch of electrodeposition has come into practice, that of "building up" worn parts of machinery, particularly of motor car and aero-engine parts, and also building up thick deposits of nickel and copper as protective coatings on many articles far too numerous to detail in this article.

For "protective" purposes nickel and copper coatings are most usually applied, zinc (electro galvanising), cadmium and chromium are also employed, the latter being a quite recent improvement with a great future before it. In the "building up" process nickel is generally the metal used, as it is hard and easy to deposit; in special cases iron and copper coatings are often given.

As in all electroplating the method of removing oils, greases, sand, etc., which may contaminate the work from the preliminary machining or polishing, is usually accomplished by boiling in a strong alkali solution (called the "potash boil"), but the oils and greases now in use are mostly of a mineral nature and are non-saponifiable, and so the purely chemical cleaner, like caustic soda or potash, is of little use and it becomes necessary to use different cleaners like the "tri-basic phosphate" or the "silico-aluminate" cleaner, the action of which is both chemical and mechanical. The latter cleaner consists of potassium aluminate and potassium silicate, both of which hydrolyse in solution to caustic potash and flocculent silica and alumina, and these flocculent particles, when the solution is boiling, give the face of the articles in solution a severe scrubbing and tend to remove the grease and dirt by mechanical means assisted, of course, by the caustic potash formed in the liquor. Electro cleaners have been used, but do not give the adhesion required in producing a perfect protective coating.

After removing the grease, etc., the iron and steel has further to be chemically cleaned before electroplating. This consists of removing any scale or stain on the metal, and can be carried out by simply soaking the article in a pickle of either sulphuric or hydrochloric acid. Modern methods, however, have cut this out with a process which ensures a perfectly clean surface and in such a condition that, properly treated, gives perfect adhesion of deposit, be it nickel, copper, or zinc.

Obtaining "Passivity."

If a piece of iron or steel, freed from grease and pickled in the ordinary way, be plunged into a bath of strong pure nitric acid and allowed to remain for a minute or so until all action ceases the iron is said to have become "passive." In this state, if suitably plated in a cyanide copper bath or a nickel bath, perfect adhesion with the deposit can be secured. Nitric acid, however, is out of the question in ordinary practice, it is messy, expensive and totally unsuitable for work where the acid could get inside, and moreover is decidedly injurious in a nickel plating bath.

This same state of "passivity" can be obtained by making the work anode in a solution of sulphuric acid for a few minutes and the result, as regards adhesion of deposit, is, if possible, even more perfect than the nitric acid treatment, and moreover does not so seriously affect the nickel bath if, inadvertently, some of the acid should be carried over. A solution of 25 to 30 per cent. (1·18 deg. to 1·22 deg. sp. gr.) sulphuric acid can be employed on this "electrolytic pickle" or "anodic treatment," as it is called. For hardened steels some operators vary the acid strength and add either sodium sulphate or ammonium sulphate to their bath, but their introduction into the solution is of doubtful value. Generally a current density of 75 to 100 A per sq. ft. is used.

Assuming now that we wish to nickel plate a piece of iron or steel and the preliminary cleaning to free from grease has been carried out, the work, which should be wired with a stout wire, is hung in the electrolytic pickle from a rod supported across the top of the vat; this rod is connected with a change-over switch where it can be either anode or cathode, the other connection being made to the lining of the bath, if a lead lined vat is being used, or to lead anodes. The current is switched on with the work acting as cathode; fairly violent gassing takes place, and this is continued for two or three minutes (in case of heavy scale longer), after which if the work be examined it will be found that any scale present has been removed. The switch is now changed over, the work becoming anode; there is much less gassing, and after a minute or two if the work be examined it will be seen to be perfectly clean and white and is now in the condition of "passivity" and ready for the plating bath after swilling as quickly as possible in clean running water. Here, however, an important precaution has to be observed; the work must not be in the nickel solution without current passing, and it is best for the work to be electrically connected so that on entering the plating bath the current is on and plating starts instantly. If this precaution be not observed perfect adhesion is not assured.

The success of the subsequent plating lies largely in this preliminary treatment and too much emphasis cannot be laid upon it.

Nickel Solutions.

There are many nickel solutions on the market and the ordinary man is well advised to go to a firm of repute and state his wants, when expert advice will be given as to suitable solution to meet his needs. However, many of us like to know what we are using and the proprietary article, though good, does not altogether satisfy.

Nickel solutions can be divided into two classes, the "single salt" solution made from the single nickel sulphate with various additions to aid conductivity and control acidity, and the "double salt" solution made up with the double nickel and ammonium sulphate, with additions as with the other type of solution. The single salt solution allows higher current densities to be used and the deposited metal is comparatively soft. With the double salt solution the metal is hard and only a very low current density can be used.

A very good single salt solution is made up with—

Nickel sulphate (single salt)	37 oz.	per gal.
Sodium fluoride	1 to 2 oz.	
Boric acid	4 oz.	

To make up the solution the salts are simply dissolved in warm water and made up to quantity.

This solution is a very good one for all classes of iron and steel, and current densities up to 30 A per sq. ft. can be used.

The double salt solution can be made to the following formula:—

Double nickel and ammonium sulphate	10 oz.	per gal.
Single nickel sulphate	4 oz.	
Sodium chloride	1 to 2 oz.	
Boric acid	2 oz.	

With this solution 5 A per sq. ft. would be the current density and the deposit is hard and, unless care is taken to control acidity "brittle." With iron and steel, however, it is best to avoid the chlorides in solution, or in any case to keep them as low as possible. The function of the chlorides is to promote a good anode corrosion. On the other hand, unless the plated article is subjected to a very careful

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washing in hot water, there is a tendency for the chlorides to "spot out" and cause corrosion. A simple control of the acidity can be maintained by using litmus and Congo test papers. If the solution be sufficiently acid to turn blue litmus a dull red, yet not sufficiently acid to turn Congo paper blue, the bath is in the condition of acidity for successful work.

The plater who is dealing with iron and steel goods for mere decorative effects can safely use a cyanide bath, but for "rust prevention" protective coats, it would be wise to avoid the use of cyanides and to nickel first, and then copper in the acid bath on the top of the nickel, observing the precautions mentioned above. Many cycle platers use this method and find it pays them as they get very few returns. They nickel and then copper on the nickel, and then again nickel on the copper. By this method they get perfect adhesion and a good lasting protective coat.

A good cyanide bath can be made to the following formula :—

Chevreul's salt (copper sulphite or pink copper salt)	4 to 5 oz.	per gal.
Potassium cyanide, 98 to 100 per cent.	8 oz.	

Dissolve the cyanide in some hot water and then slowly stir in the copper salt; when all is dissolved bulk up to quantity. This solution works well warm (but should not be heated to boiling, as boiling destroys the cyanide) and works at a current density of about 5 A per sq. ft. For the acid copper bath the usual copper sulphate bath containing 1½ lb. of bluestone and ½ lb. of sulphuric acid per gal., will be found to satisfy all requirements. The current density varies according to the work being plated and the conditions under which the plating takes place. For a still solution 10 A per sq. ft. is a safe figure, but for moving solutions 50 A per sq. ft. is not abnormal, whilst under abnormal conditions, e.g., both solution and cathode moving at high speed, 200 to 300 A per sq. ft. can be successfully used.

Chromium Plating.

Chromium has two properties which make it of interest to electroplaters—its great hardness and its resistance to atmospheric corrosion. Chromium plating is ideal for electrical fittings, motor and cycle fittings, and any class of work that has to stand hard wear and keep a bright finish, but at present this plating is not at all easy to effect and the actual process in vogue has many drawbacks. The first and foremost disadvantage is the large amount of irritating gas fume given off during deposition, and another is the complex nature of the solution, and lastly the high current densities which have to be used.

It does not come within the scope of this article to discuss the theory of either the solution or the deposition of the metal, it is sufficient to say that there are many solutions mostly patented and put forward as chromium plating solutions, but the following, published by the Bureau of Standards of U.S.A. will work and give quite good results on flat work :—

Chromic acid	33 oz.	per gal.
Chromium sulphate	0·4 oz.	
Chromium carbonate	1·0 oz.	

The chromic acid and sulphate are dissolved in water and the chromium carbonate is added to control the solution. With such a solution 90 to 100 A per sq. ft. gives excellent results, but the solution has no "throwing power."

As can be readily understood these high current densities (and some solutions require twice and three times the current densities given), practically put chromium plating out of court in an ordinary plating shop. It is undoubtedly a specialist's job, to be carried out in a specially designed plating shop.

For rust preventing properties cadmium plating is in the front rank, and coupled with the ease with which it can be deposited, makes it a metal that should be well considered. Cadmium can be deposited either from an acid or an alkaline solution, and in general practice the latter is given the preference.

At a recent meeting of the Electroplaters' and Depositors' Technical Society the following solution was recommended, and evidence was given of it having worked satisfactorily for over two years :—

Cadmium potassium cyanide	12 oz.	per gal.
Sodium hydrate	½ to 1 oz.	
Dextrine	½ oz.	

It was stated that even after the actual coating had worn off the protective properties remained, due to the fact that the cadmium deposit penetrated right into the iron and steel. Another important fact is that the deposition of cadmium does not bring about the embrittling effect on hardened steel—like springs—which is such a serious drawback to electro-zincing, and it certainly appears as if cadmium will replace zinc for protective purposes, in fact one firm has already replaced its zinc solution with a cadmium solution.

Tin Plating.

The electro deposition of tin is also of some importance to the plater of iron and steel goods. A very good and pleasing coating of tin (of course only a coating) can be obtained by dipping cleaned iron or steel articles held in an aluminium tray or basket, into a solution of tin in caustic soda or potash. This method is quite satisfactory for very cheap goods where the "oxidized" silver effect is wanted, for sufficient tin can be deposited in this way to stand the subsequent bronzing If, however, a heavier electro-deposited coat is required the following solution works quite well, but requires watching :—

Tin proto-chloride	1 lb.	per gal.
Caustic soda	½ lb.	

Dissolve the caustic soda in water, stir in the tin salts and make up to quantity.

This solution works better if heated. It has one great drawback, however, the action of the caustic alkali on the hands of the operators, which no gloves or other protection can prevent, but despite this the author has installed fairly large plants, one of which has been working for ten years with excellent results in retinning returned biscuit tins.

HEAVY *v.* LIGHT CURRENT ENGINEERING.

AT the first informal meeting of the Institution of Electrical Engineers this session the President, Dr. W. H. Eccles, F.R.S., took the chair and opened a discussion on "Does Heavy-current or Light-current Electrical Engineering afford the greater scope to a young man with electrical engineering ability?" A survey of the prospects of the different branches of the industry was given, and it was clearly Dr. Eccles's intention to evoke the differences of view which were manifested in the subsequent discussion.

The distinction made by the title of his remarks was, he said, not good because of the necessary confusion due to overlapping of the different branches, but broadly speaking, heavy-current implies all supply, driving and propelling plant, control and switchgear, where essentially efficiency is the watchword in design and manufacture, while light-current is concerned with communication by telegraph, telephone and wireless, together with the tremendous variety of instruments and recording apparatus for which convenience rather than efficiency is the main factor.

Dr. Eccles, however, held the view that the light-current side showed better prospects for the skilled technician because so much of the research and design of heavy-current apparatus is nearing finality—while the light-current work is only beginning.

As Dr. Eccles probably anticipated, this opinion was generally contested by the subsequent speakers. It was pointed out that the variety and types of switchgear and control gear hardly begin to approximate to standardisation nor could it be declared that electric plant and high-tension cables are yet in their final states.

Mr. M. G. Tweedie said a fair prospect was before a junior who would learn electric railway signalling. For electrical engineers with a good all-round knowledge and with common-sense there were a limited number of good jobs open, especially to those willing to go abroad.

Capt. P. Dunsheath, who subsequently took the chair, owing to the early departure of Dr. Eccles, said cable manufacturers did not feel that their investigations were ended, and the immense amount of research now carried out could be increased ten-fold if funds were available.

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NICKEL-IRON ALLOYS.

Some Remarkable Magnetic Properties—High Initial Permeability and Low Hysteresis Loss—Their Importance in Submarine Telegraphy.

By W. T. GRIFFITHS, M.Sc., F.I.C.

IRON and nickel being two of the three metals which alone show any well-marked magnetic properties, it might not perhaps be entirely unexpected that their alloys with one another would exhibit some interesting magnetic characteristics. The remarkable properties which the alloys do possess, however, both in extent and variety, could hardly have been

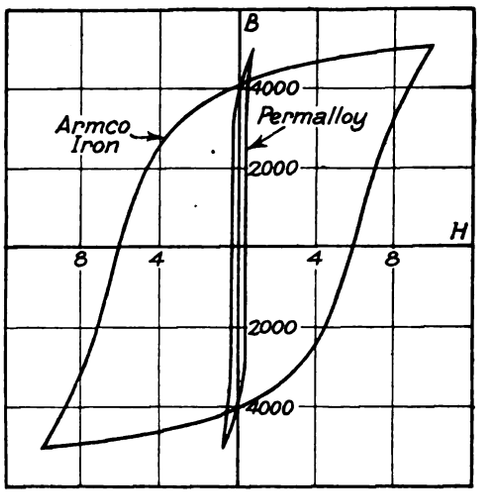

Fig. 1.

anticipated and indeed have only recently come to light. The reasons why these valuable features have not been discovered before will become apparent on reading the facts which are set out below.

Perhaps the most striking alloys from a magnetic point of view are those which contain from about 70 to 82 per cent. of nickel. The unusual properties obtainable from alloys in this range when given a suitable treatment were first pointed out by the Western Electric Co., of America, who, in 1921, took out patents in this country for the production of alloys of this type under the name of "Permalloy." The most advantageous heat treatment was also indicated, as well as the possible uses of the "Permalloy" series. The alloy first manufactured by them as giving the best properties was that having a composition of 78·5 per cent. nickel and 21·5 per cent. iron, all impurities being kept as low as possible. The heat treatment consisted of heating the alloy to 900 deg. C. for an hour, cooling slowly, reheating to 600 deg. C. and then cooling from 600 deg. C. to 300 deg. C. at a definite rate, this rate for the tape form in which the alloy is chiefly produced being little different from that given by cooling in air.

What striking results can be obtained from this alloy after this treatment may be seen from Fig. 2, which shows the values obtained by Yensen* for a 78 per cent. nickel alloy, a 50 per cent. nickel alloy, pure iron and a 4 per cent. silicon-iron alloy. It will be noticed how high a permeability is obtained for the nickel-iron alloys with very low magnetising forces, as compared with that given by the best materials known previously. Attention should also be drawn to the high "initial permeability," i.e., the permeability in fields whose strengths approach zero. The highest value for "initial permeability" recorded up to the present is about 13 000,† or more than thirty times that of the best soft iron. How extraordinary this is may be appreciated by considering that this material, although it has a saturation value of magnetic intensity comparable with that of iron, approaches magnetic saturation in the earth's field.

Other properties which "Permalloy" and similar alloys possess is that of low hysteresis loss and low coercive force, factors which are of considerable importance where the magnetising force and resultant flux are changed rapidly. Fig. 1, taken from the paper by Arnold and Elmen‡ shows hysteresis loops for "Permalloy" and annealed Armco iron carried to a maximum induction of 5 000 gausses.

The alloys also possess a comparatively high electrical resistivity which is of value in keeping down eddy current losses in fluctuating fields.

Similar properties to the above are possessed by an alloy made in this country by the Gutta Percha Co. This material, known as "Mumetal," contains 74 to 75 per cent. nickel, 20 to 25 per cent. iron and certain quantities of copper and manganese.

A study of the properties of the above-mentioned alloys will at once indicate what new fields they open out to the electrical engineer. The immediate use to which they might be put, indicated by the Western Electric Co. in their initial patents, was as a "loading" material in submarine cables. These cables are condensers of very decided capacity, the conducting core and the surrounding water or metal sheathing forming the "plates" and the insulating material the dielectric. The effect of this capacity, together with that of the cable resistance, results in a prolongation and retardation of signals due to the current "charging" the cable and to the accommodating electric absorption at "make," while at "break" the current only gradually dies away. As a consequence the "speed of working" is strictly limited. It has been known for some time that these difficulties could be largely overcome by enveloping the conductor with a sheath of magnetic material throughout its length. Unfortunately, owing to the low magnetising forces found in signalling conductors and the low permeability, at these forces, of even the best magnetic materials known until recently, the induction of the loading sheath was too slight to be of any advantage except in the case of very short cables. With the advent of the alloys mentioned above, continuous loading can be employed advantageously and readers will no doubt be aware that certain cables so loaded have recently been laid. It is anticipated that the speed of working will be increased four or five times

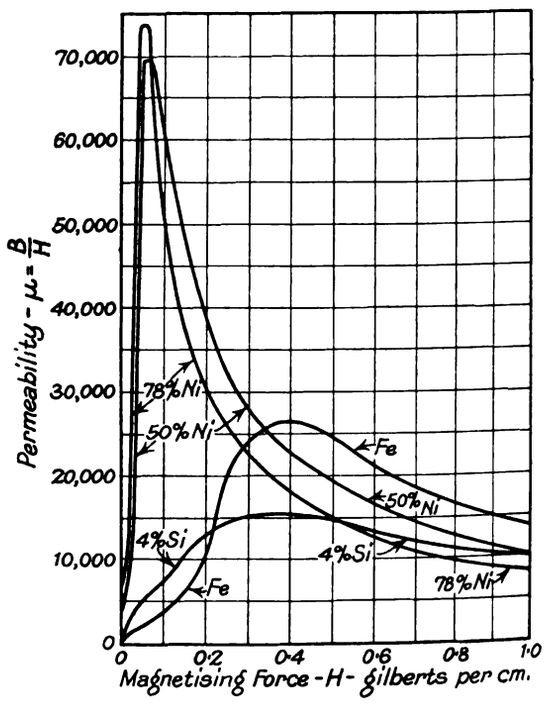

Fig. 2.

by the substitution of these loaded cables for those of the older type.

Other uses to which these alloys may be put will readily come to mind, especially in connection with telephone and telegraph electrical engineering. The high permeability combined with low hysteresis loss and high resistivity make them invaluable for such purposes as relays, telephone receivers, transformers, electromagnets and certain measuring instru-

* T. D. Yensen. Journ. Franklin Inst., 1925, 199, p. 333.
† H. D. Arnold and G. W. Elmen. Journ. Franklin Inst., 1923, 195, p. 621.
‡ loc. cit.

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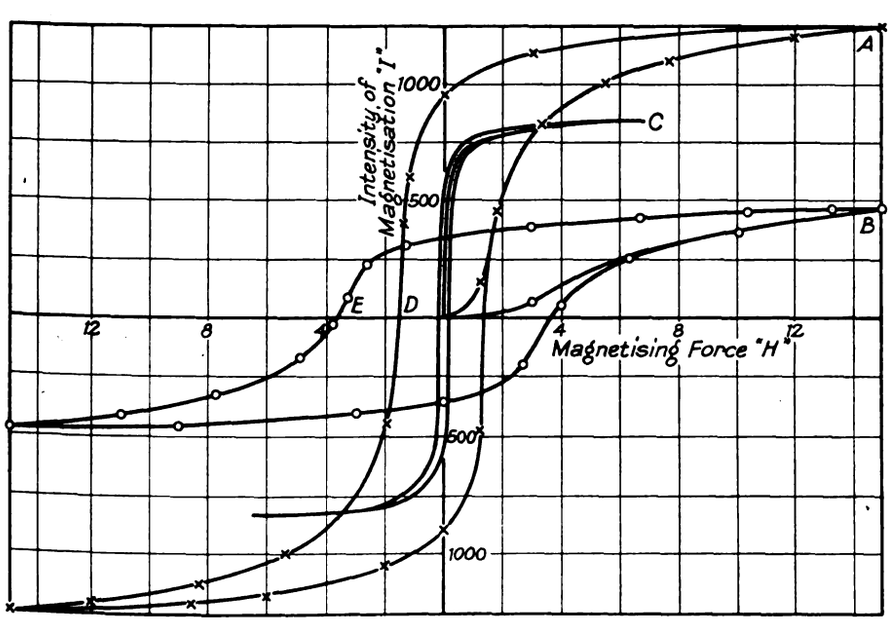
ments—everywhere in fact where the electro-magnetic effects of very small currents have to be utilised.

At the same time great care is necessary in the preparation, heat treatment and use of the alloys in order to obtain their valuable properties. In the first place, they must be made from as pure materials as possible, certain impurities, such as carbon, for example, being very detrimental. The importance of the heat treatment has already been emphasised but care must also be taken to protect the material from stress or "work" after treatment. Fig. 3, from a paper by Binnie,* shows how seriously the magnetic properties are affected by "overstrain," though further heat treatment will restore the best characteristics.† In the case of the loaded cable it is usual to heat treat the core after winding on the nickel-iron alloy tape.

Two methods have been adopted by the Western Electric Co. to obviate the sensitivity of the material to strain. In building up coils of the material, these are, after heat treatment, impregnated with one of the so-called phenol condensation products, such as "bakelite." This is applied as a semi-liquid which later solidifies to form a hard rigid mass which can be subjected to ordinary usage without danger of impairment of the permeability of the imbedded magnetic material. Additional research by the same company has also shown that, if the content is raised to about 81 per cent., although the magnetic properties are not quite so good they are not nearly so susceptible to the effect of slight strains.

It must not be imagined that the alloys containing 70 to 80 per cent. of nickel are the only interesting ones in this series. In fact a very wide range of properties from a practically non-magnetic material, containing about 30 per cent. nickel, to the high permeability alloys is obtainable.

The electrical resistivity of the alloys also varies considerably with composition, so that numerous combinations of resistivity and magnetic properties are possible. Figs. 4 and 5 show how the flux density and electrical resistance vary with the nickel content, and it will be seen how judicious selection will give alloys of very different properties. For example, if high resistivity combined with high permeability is desired an alloy of between 40 and 50 per cent. nickel might be selected, whereas if high resistivity and low magnetic permeability are needed, the 30 per cent. alloy could be used. For certain purposes the 50 per cent. alloy has advantages over that containing 78 per cent. nickel. The former alloy has, according to Yensen, a 50 per cent. higher saturation value and over double the electrical resistance, while it will be seen from Fig. 1 that at magnetising forces between 0·08 and 0·25 gilberts per cm. it has a higher permeability than either the 78 per cent. alloy or pure iron.



F.g. 3.—I—H Curves for soft iron (A), "Permalloy," severely "overstrained" (B), "Permalloy," heat-treated (C).

All the nickel-iron alloys containing between about 35 and 80 per cent. nickel show a low hysteresis loss and coercive force, and it is of interest to note that the 36 per cent. alloy known as "Invar," which is remarkable because of its low coefficient of thermal expansion, has also been used in certain delicate relays in virtue of its low coercivity.

Additions of other metals to these alloys may be made to enhance certain particular properties. Thus the Western

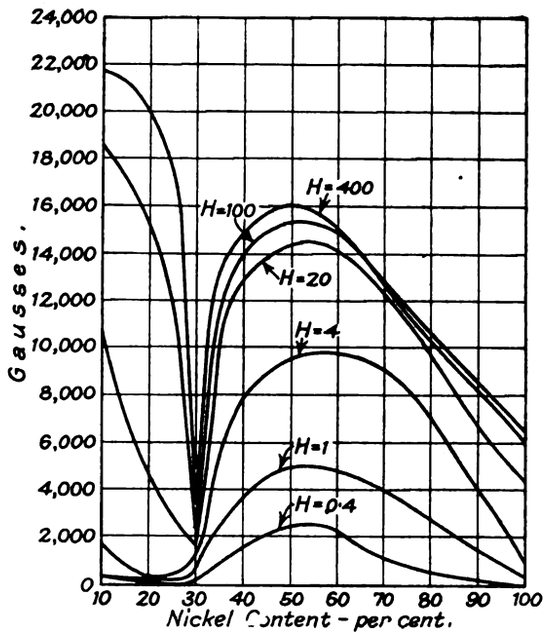


Fig. 4.—Flux density for various magnetising forces.

Electric Co. have patented an alloy containing 55 per cent. nickel, 34 per cent. iron and 11 per cent. chromium which they claim to give, after suitable treatment, a value of permeability much higher than iron or silicon steel and yet to have a resistivity of 100 microhms per c.c., that of iron being only 11 microhms per c.c. The Gutta Percha Co. also possess patents of alloy compositions containing, besides nickel and iron, varying amounts of copper, chromium, vanadium, tungsten, etc., and which combine comparatively high "initial" permeability with high specific resistance. An alloy known as "Permax," which is essentially a nickel-iron alloy containing additions of other metals, is produced by the Soc. Anon. de Commentry-Fourchambault et Decazeville. This, although not possessing the high permeability of the alloys mentioned earlier, is said to be remarkably constant in certain of its magnetic properties. For example, under fields varying from 200 gausses to 1 gauss the coercive force varies only from 0·48 to 0·45. One other alloy might be mentioned which is closely allied to nickel-iron alloys, namely the cast-iron "No-Mag," produced by Ferranti. This contains additions of 10 per cent. nickel and 5 per cent. manganese and it is claimed that although this cast-iron is practically non-magnetic and has a high resistivity, as well as being close-grained and of good mechanical properties, it is also easily machinable.

It might not be out of place to mention here that the nickel-iron series is notable not only for its magnetic properties, but also for the fact that it includes alloys having very varied coefficients of thermal expansion, from practically zero upwards. The alloys as a whole and others related show a considerable degree of resistance to corrosion of certain types, while other alloys such as "Elinvar," containing 36 per cent. nickel and 12 per cent. chromium, show very little change of elastic properties with change of temperature. No reference is needed to the useful mechanical properties which the nickel steels possess.

In conclusion it must be said that in spite of the remarkable diversity of extraordinary properties which this series of alloys

(*Concluded on page* 618).

* D. Binnie. Journ. Roy. Tech. Coll. Glasgow, Dec. 1925, p. 5.

† It was doubtless because of the necessity of taking these precautions that the valuable properties of these alloys were not discovered earlier.

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ELECTRIC HEAT TREATMENT OF STEEL

More Science in the Factory — Improvements in the Furnaces — Classification of Equipment.

By E. P. BARFIELD, A.M.I.E.E.

THE great developments now taking place in the employment of electric power for industrial heating are well exemplified by the rapidly extending use of electric furnaces in connection with the various processes to which steel is subjected for hardening, tempering, annealing, carburising and so forth. With the growth of metallurgical knowledge,

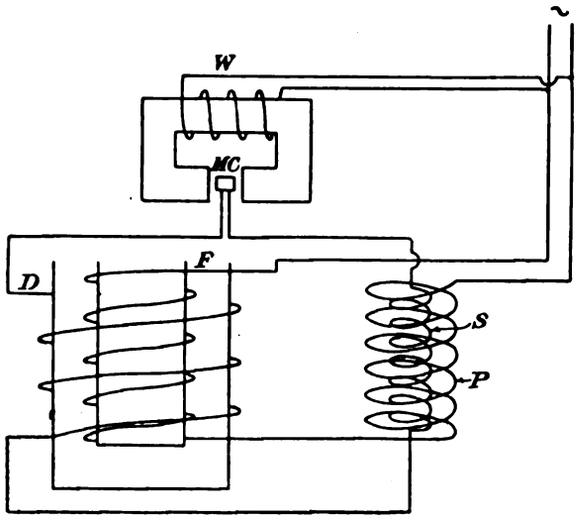

Fig. 1.—Diagram of circuits.

in recent years something of a revolution has taken place in the attitude of industry to these operations. Whereas in the past the heat-treatment shop would be fitted with any sort of a furnace and then left in the charge of a man who was expected to form and act on personal judgments of temperature conditions by using the naked eye, the heat-treater is now surrounded by pyrometers, controls and so on, and has the metallurgist continually at his elbow.

With the increase in the importance attached to scientific methods of heat treatment, came a call for improved furnaces. It was found that equality of heating and accuracy of temperature control were features of the modern furnace whose importance could not be over-emphasised. Added to this came the demand for some form of *automatic* working—either in the accurate maintainance of required degrees of heat or in the control of the whole of a given operation. As, for instance, it became known in the case of steel hardening that correct heating prior to the quench involved a time as well as a temperature element and that, in consequence, temperature measurements alone, however accurate, were insufficiently precise to secure the best results, the need for some form of master control of the process became apparent.

It was then found that the electric furnace provided the requisite conditions in an almost ideal manner. Its rapid adoption by the manufacturing community proved that it supplied a want which, if not "long felt," was at any rate urgent.

In the first place the general design of the electric furnace made for efficiency in operation. The compact and regular shape facilitated heat insulation, there were no flues with their attendant heat losses and the uniform spacing of the electrical resistance winding ensured the essential condition of uniformity in the heating chamber. Further, in the important matter of temperature control, the electric furnace had no equal. In the simplest form a rheostat in series with the heating winding provided a ready and reliable heat controller, but it was also a relatively easy matter to fit to the furnace a device so adjustable as to cut the main heating current off at a predetermined temperature and to switch it on again immediately the temperature started to fall, thus securing the enormously valuable advantage of *automatic stabilisation of working temperatures.*

It was also found possible to fit another, and from the heat-treatment point of view, even more important auxiliary device to the electric furnace. This was an indicator for recording the changes in the magnetic condition of the charge undergoing treatment. It had long been known that most steels, if magnetised and heated, suffered a loss of magnetic properties at the same moment as their molecules assumed that arrangement best suited to give the quality of hardness. Before the introduction of the electric furnace, however, no satisfactory means of announcing the para-magnetic condition had been devised, and hardening was invariably controlled by empirical temperature measurements which, owing to the interaction of the time element mentioned above, were mere approximations to accuracy. The introduction of the electro-magnetic hardening furnace (Wild-Barfield patents) which is fitted with the indicator in question, was alone of sufficient importance to make the electric furnace indispensable to the up-to-date manufacturer.

In the field of high temperatures, i.e., above 1 000 deg. C., the electric furnace has also an acknowledged supremacy. Whilst for the heat treatment of what may be called ordinary steels requiring temperatures up to about 850 deg. C., the wire resistance type of furnace is normally employed, for the higher alloy steels, requiring temperatures up to 1 350 deg. C., the furnaces are built with resistor elements of recrystallised carborundum. These furnaces have all the advantages of their low temperature prototypes, i.e., uniformity of heating, accuracy of temperature control, etc., and, in addition, they operate noiselessly, are free from fumes and obviate the use of mechanical blowers.

The electric furnaces now used in connection with the heat treatment of steel may conveniently be classified under four headings :—(*a*) Steel hardening furnaces ; (*b*) steel carburising, refining and annealing furnaces ; (*c*) high temperature furnaces ; (*d*) tempering muffles and baths.

Steel hardening furnaces operate on the magnetic principle as described above. The complete equipment consists of an electric resistance furnace (with the heating chamber either horizontal or vertical as may be required) and a control panel in electrical connection with it.

The furnace (Fig. 2) consists essentially of a special refractory chamber surrounded by a closely wound helix of alloy wire, the electrical resistance of which produces the necessary heat.

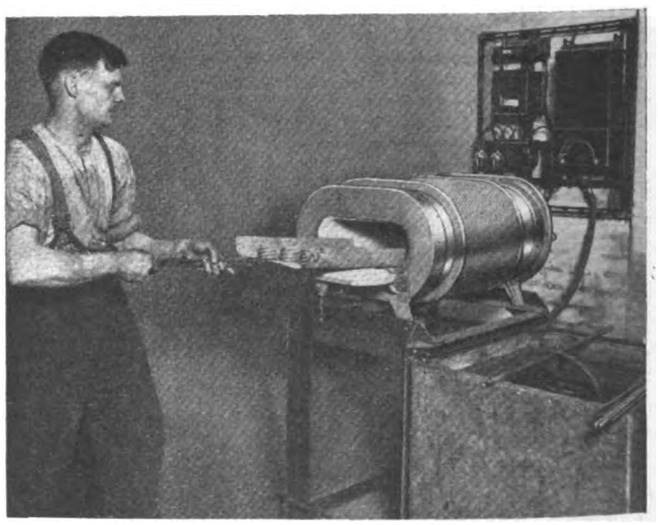

Fig. 2.—Flat type electro-magnetic furnace.

A controlling resistance in the circuit of this coil permits of varying the strength of the current and thereby the heat of the furnace. Superimposed on this main heating winding is the secondary or indicator winding electrically connected to the magnetic indicator on the control panel. The whole furnace unit as above is thoroughly lagged to reduce heat losses to a minimum, and is surrounded by a substantial case of polished aluminium with end castings of soft grey iron.

The control panel carries :—(*a*) The magnetic indicator by which a visual indication of the magnetic condition of the charge is given to the operator ; (*b*) the regulating rheostat for controlling the furnace temperature ; (*c*) the warning lamp of the excess temperature cutout (see below) ; (*d*) a

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pyrometer (if required) solely for regulating the superheat of the furnace.

The electrical circuits of the complete equipment are shown diagrammatically in Fig. 1.

F is the primary or heating winding on the furnace chamber.

D is the secondary or indicator winding on the furnace casing.

S and *P* are the secondary and primary windings of a coil generally designated the compensator.

Mc is the moving coil of the magnetic indicator. This has a pointer attached to it which moves over a scale like an ammeter or a voltmeter.

W is the winding on an electro-magnet between the poles of which the coil *Mc* moves.

Normally an electromotive force is induced in *D*, which is opposed and completely neutralised by an equal electromotive force induced in *S*.

As soon, however, as a piece of steel is introduced into the furnace, the electromotive force in *D* is augmented by the presence of the steel, the electromotive force opposing it in *S* is overpowered and a small current circulated through *Mc* causing it to move on its axis, the pointer generally being deflected right across the scale against a stop, against which it vibrates, giving rise to a musical note so long as the steel is in the magnetic condition.

As soon as the steel has nearly attained the non-magnetic condition, i.e., the correct point for quenching, the pointer leaves the stop and comes slowly down the scale till finally it stops when the steel has lost its last trace of magnetism.

Electric carburising, refining and annealing furnaces are all built with rectangular heating chambers arranged horizontally. The heaters are embedded in the refractory brickwork lining of the roof, floor and sides, running the whole length of the heating chamber. The outer casing is of heavy mild steel plate bolted to substantial angle pieces, the door is refractory filled and counterbalanced with a foreplate on floor level. Each furnace is fitted with a patent excess temperature cutout to safeguard the windings against excessive temperatures.

Automatic Temperature Control.

Further, unless otherwise specified, each furnace is supplied complete with an automatic temperature controller. This consists of a wall-type indicator (pyrometer) on the needle of which is fitted a light thermo-couple. A small electrically heated coil (attached to an adjustable red pointer) is set to the point on the scale at which it is desired to control the temperature. When this temperature is reached the needle of the pyrometer (with light thermo-couple attached) is brought opposite to the coil and becomes suddenly heated. The electromotive force thus set up energises a sensitive relay in the indicator, which in turn operates an automatic make and break switch through a second relay and cuts off the main heating current on the furnace.

As soon as the temperature falls slightly the thermo-couple leaves the heater coil and the process is reversed, the main heating current being switched on again.

With the above apparatus, temperature control to within an accuracy of 0·3 per cent. can be obtained.

The high temperature furnaces are built with resistors of recrystallised carborundum as the heating elements. They are normally made up into complete equipments for high speed steel hardening, each comprising a high temperature chamber, a preheating chamber (wound with resistance wire) a control resistance and main switch, all mounted together on a substantial angle frame (Fig. 3).

Three distinct types of tempering furnaces or baths are manufactured, one for tempering in hot air, another for oil and a third for salt tempering. The hot air and salt baths are suitable for tempering in the higher ranges, i.e., above 250 deg. C., whereas the oil baths are limited to the lower ranges by the flash point of the oil used.

The methods of heating vary with the type of bath.

The air muffle is rectangular in shape with a top entry and has resistance heaters arranged under a deflector plate in the base with due provision for air circulation.

The oil bath is also rectangular and has the heaters directly submerged in the oil, thus providing the most efficient oil circulation. In each of the above a metal basket carries the work.

The salt bath consists of a metal container, circular in shape, surrounded by an exterior circular heating chamber, the work being suspended from a tool-post.

All the above baths are fitted with automatic temperature controllers, these in each case being of the dial thermometer pattern. Temperature control is simplicity itself, a pointer on the dial being set to the temperature required, which is then maintained in the bath by a combination of switch and relay at exactly the point indicated for an indefinite time.

A final note on the question of costs. It is unfortunately still a prevalent idea that the industrial applications of electric power are limited by the expense involved. It is admitted that power costs are high, too high in some cases, but the fact

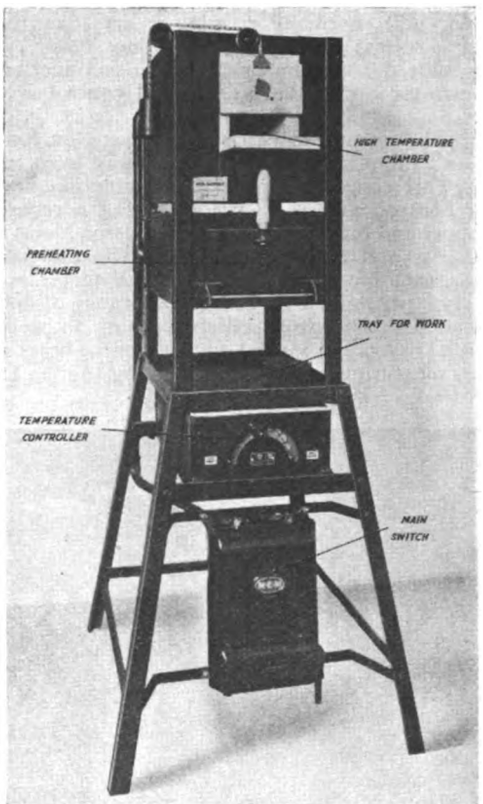

Fig. 3.—H.t. furnace and stand.

cannot be too widely known that in the majority of cases the electric heat treatment furnace is less expensive to run than a similar furnace heated by gas or oil, even with prices at their present level. What is more, owing to the far-sighted action of certain supply authorities, notably the Birmingham Corporation Electric Supply Department, in quoting specially low rates for power supplied on a furnace load, the advantage shown by the electric furnace will in the future be still further increased.

Standard D.C. Switchgear.

THE latest publication of the British Engineering Standards Association deals with British Standard switchgear equipments for direct-current circuits for pressures not exceeding 660 V. It is divided into the following sections :—

1. D.C. feeder equipments for single, two and three-wire service, employing circuit-breakers for overload protection.
2. D.C. feeder equipments for single, two and three-wire service, employing fuses for overload protection.
3. D.C. generator equipments for two and three-wire service.
4. D.C. rotary convertor equipments for two and three-wire service.
5. Paralleling voltmeter equipments.

The publication gives in tabular form full details of the standard equipment, together with the optional equipment which may be used in certain cases. In addition, a diagram is given for every type of circuit covered by the Specification, showing in symbolic form the lay-out of the equipment. There are in all forty such diagrams, covering the ground in a comprehensive manner. These diagrams illustrate very strikingly how it is possible to combine the British Standard symbols (as given in B.E.S.A. Publication No. 108 and as shown in the latest decisions of the International Electrotechnical Commission) into a comprehensive diagram.

Copies of this publication (No. 194-1926) may be obtained from the British Engineering Standards Association, Publications Department, 28, Victoria Street, S.W.1, price 1s. 2d., post free.

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ROLLING MILL ELECTRIFICATION.

A Break Away from Traditional Practice—Speed Control Arrangements—Easy and Rapid Reversal Possible—Low Initial Costs.

THE electrical operation of the main drive of rolling mills has become standardised to the extent that it is common practice for mills normally running in one direction to be driven by a direct current or induction motor, while for reversing mills d.c. motors operating in conjunction with a motor generator and "Ward-Leonard" control are usually adopted.

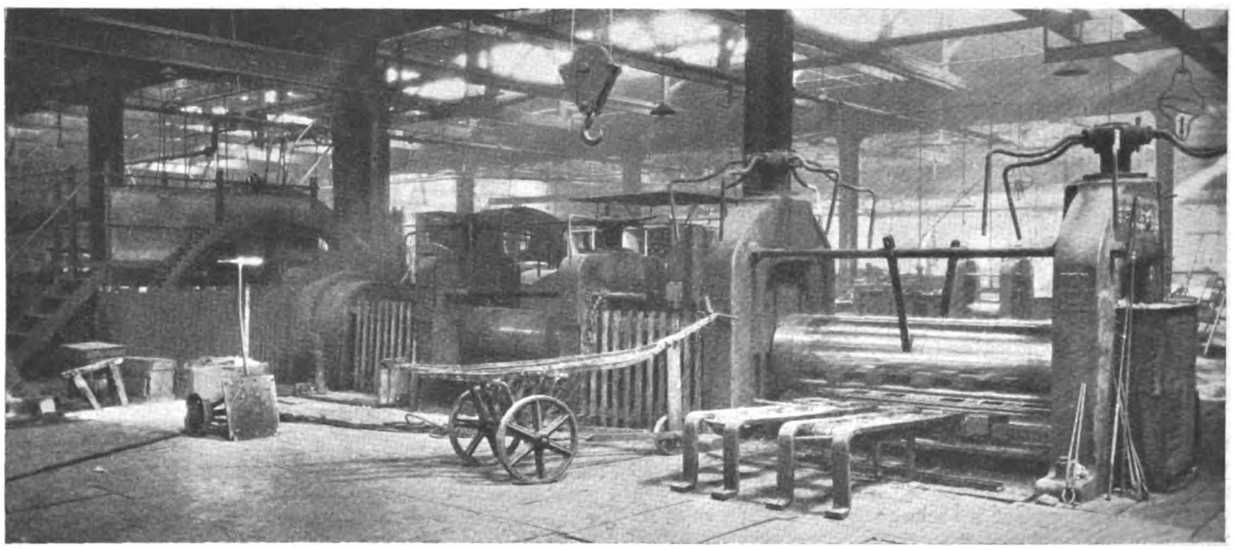
Recently, however, the British Thomson-Houston Co. has installed an equipment which is a breakaway from traditional practice. This comprises a slip ring induction motor with contactor control, and is used for driving a reversing mill rolling copper and brass sheets at the Kingston Metal Works of Allen, Everitt and Sons, Smethwick. The mill consists of two stands, each having two rolls 24 in. diameter, running at 28 to 30 revs. per min., by which a wide range of copper and brass sheets is rolled from billets varying in weight from 1 cwt. to 2½ tons, the largest finished piece-brass plate for condensers measuring 12 ft. by 7 ft. 6 in. by 1⅜ in. The motor driving this mill is rated at 650 H.P., with a full load speed of 290 revs. per min., the supply being 400 V, three-phase 25 cycles. It is a slip-ring induction motor provided with two pedestal bearings and cast iron base plate. Speed control is effected through an equipment of contactors which are mounted on slate bases carried on a steel pipe framework. The necessary resistances, which are of the "grid" type, are situated immediately behind the contactor panel.

The panel is equipped with two forward and two reverse line contactors mechanically interlocked, so that it is impossible for the reversing contactors to close before the forward contactors are open, and vice versa. There are 20 single pole rotor contactors, working in pairs, to give 10 points of resistance; one no-volt contactor, two overload trips, and three notching relays.

Direct current at 110 V is used for operating the contactors. This is supplied from a small motor generator set. Mounted on a driver's platform is an ironclad master controller provided with three points for forward and three points for reverse running. The first point closes the line contactors, full resistance being in the rotor circuit; the second point cuts out the first section of rotor resistance; the third point cuts out the next section of rotor resistance and also connects in two of the notching relays, so that if the controller is held on this point the remaining rotor contactors will close in sequence under current limit control, and run up the motor to full speed. An ammeter indicating the current taken by the motor is mounted on the pedestal carrying the master controller.

The main switch is in a separate main switch house, and can be tripped in emergency from the driver's platform by means of a push-button.

The operation of the mill is exceedingly simple. All that the driver does is to throw the master controller full over in either direction, when the mill runs up to speed. The metal is entered into the rolls, passes, and immediately afterwards the driver pulls the master controller to the first point in the opposite direction. The result is to reverse the line contactors and pull up the motor by means of reverse current braking. If the braking is not sufficiently rapid, the operator pulls the controller to the second point; the third notching relay then comes into action, and will only drop (and thus allow the corresponding contactor to close) when the current has fallen to a predetermined value. In this way excessive currents are prevented from being drawn from the line. By holding the controller in this position the motor will not only come to rest, but will reverse, and immediately this occurs the driver moves the controller to the third, or last, position, when the motor, as before, runs up to full speed under current limit control.



View of the electrically driven reversing mill at the Kingston Metal Works of Allen, Everitt and Sons, Smethwick.

It has been found by observation that the rotation can be altered from full speed forward to full speed in the reverse direction in about 11 sec., and, starting from rest, the mill acquires full speed in either direction in about 5½ sec. These results are obtained in the ordinary running of the mill; they are not as good as is to be found in up-to-date reversing mills using d.c. motors and Ward-Leonard control, where, for example, the change from 90 revs. per min. forward to 90 revs. per min. reverse can be made in 2½ sec., but for the case in point the acceleration and retardation is quite high enough to suit the output required, and the time taken, between passes, to manipulate the material being rolled. Slow speeds for "mangling" the sheets or plates are obtained in either direction by pushing the controller to the first or second point.

The great advantage claimed for an equipment of the kind described is the low initial cost (about half that of a Ward-Leonard equipment with flywheel), simplicity, and reduction in maintenance, when compared with a Ward-Leonard drive It is to be noted that the continuous running speed of the motor is fixed, and cannot be varied as in the case of Ward-Leonard equipment, and that the incoming line has to supply the peak loads of the motor. In the case of a Ward-Leonard equipment with flywheel the line load is fairly steady, anything above this due to peak loads being taken, of course, by the flywheel.

The mill is shown in the accompanying illustration, the motor and the driver's platform, with the ammeter, being on the right and, immediately behind, the master controller. The rope drive belongs to an adjacent mill. Some brass sheets produced by the mill are to be seen lying on the floor-plates.

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RURAL ELECTRIFICATION.

Dr. Ekström on Conditions in Sweden—Government *v.* Power Company Control—A Royal Commission on Cooking.

THERE was a large attendance at the meeting of the Institution of Electrical Engineers last week to hear Dr. A. Ekström, of Sweden, deliver a lecture on "Twenty Years' Practice in Rural Electrification." The lecture was illustrated by a number of lantern slides and by several films showing the actual application of electricity in Swedish farming. These were taken on the lecturer's own farm at Ahlby, Fittia, Sweden.

DR. EKSTRÖM first postulated that while there could be no controversy that cheap power must give an impetus to agriculture and the development of industrial enterprise in country districts, there were different views as to whether this work of rural electrification should be carried out by the State or by private enterprise. In Sweden, the northern and central portions of the country were served by a State scheme whereas in southern Sweden the work was being carried out by the South Swedish Power Co. A considerable portion of the lecture was devoted to an account of the manner in which these two enterprises were being developed.

The Socialist movement in the country favour the idea of the State acquirement of waterfalls and also of an ambitious State central power scheme interconnecting all the important water power stations in Sweden and making them dependent on the State as the dominating power producer. As a result, main transmission lines connecting Trollhattan and Alvkarleby were constructed and an endeavour was made to construct a State controlled line from Trollhattan to the South of Sweden, but these plans were fortunately frustrated. The State scheme was uneconomic owing to the lines on which it had been carried out. The area had been divided into a large number of small districts each of about 20 sq. miles in extent to which power lines had been run, leaving it to the local people to undertake the distribution. There were thus about 400 small local distribution districts the management of which had been placed in the hands of people unqualified for the work, so that the whole organisation would have to be amended to a considerable extent. Moreover, the fact that the State reserved the right to supply direct the large consumers in these local areas had militated against rapid progress, whilst much of the equipment of the local areas being bought as it was during the war, when good material was hard to get, was now in a condition which called for replacement.

Transmission Problems.

A very different state of affairs existed in Southern Sweden where the South Swedish Power Co. was in complete control of affairs. This company was the result of amalgamations of three large power companies and supply was now being given from about 20 separate water power plants and some steam power stations, these large systems co-operating with a number of other smaller independent power supply companies. The South Swedish Power Co. was also connected with Denmark by means of a cable under the Sound. The large power stations were planned for interconnection by means of 220 000 V transmission lines, the State plants in the north being at present interconnected at 130 000 V, but arranged for a future increase of pressure up to 220 000 V. The main transmission lines from the power stations of the company generally operate at 50 000 V, 50 periodicity. At suitable points on these main transmission lines were erected secondary transformer stations where the pressure was stepped down to 20 000 V for country lines and 6 000 V for the town supply. The country lines radiated from the transformer stations at 20 000 V and each such station was intended to serve the countryside within a radius of 15 to 20 miles. The total area operated by the South Swedish Power Co. represents about one-third of Great Britain. The lecturer regarded 50 000 V as rather low for a main transmission system. Special attention was drawn to the fact that the South Swedish Power Co. was the pioneer in adopting outdoor switch plant.

Coming to the costs, the author said that rural electrification was not always justified from an economic point of view. Economic electrification required a certain density of population as well as a fair standard of general prosperity together with a popular appreciation of the advantages of electricity in daily life. The determining factor would be the consumption of electricity per head of population and per acre of arable land, if not immediately, then at least within a reasonable period of time. However, in South-East of Scania (South of Sweden) it had been shown that rural electrification, if properly carried out, could be made profitable. This district was partly electrified in 1914 and partly during and after the war. The rise in prices due to the war, however, had been met by the consumers making a payment of a lump sum. The total area of this district was 200 sq. miles and it could have been electrified at the following costs at prices ruling at present. The entire cost of the plant necessary for this area including country lines, local network and transformers, but excluding the network in two municipal boroughs, would cost £60 000, an average of £23 per consumer or £2 per head of population. At present there were 2 600 consumers and the figures of income and expenditure showed a small margin, general administration and profit being given at £2 000 on a turnover of £14 300. The average consumption per head of population was 34 kWh, the average charge being 3¼d. per kWh, or an average of £5 10s. per consumer per annum. It was suggested that on these figures rural electrification, at any rate under the particular conditions in this part of Sweden, could be made to pay where the income was at least 20 per cent. of the capital expenditure.

Portable Motors.

The films showing the applications of electricity to farming operations dealt with milking of cows, butter making, chaff cutting, liquid manure pump, electro-mechanical transporter arrangements for hay lofts, electric exhauster for transport of straw, grain, etc., straw press, oil cake crusher, artificial irrigation, forcing plants by electricity, and uses of electricity in the house for cooking, etc. The uses of portable motors were well illustrated and an attempt has been made to standardise three types of motor which were referred to as small, medium and large. It was stated that cooking by electricity has attracted a great deal of attention in Norway, and the Storting (Parliament) has appointed a Royal Commission, composed of prominent scientists, electrical engineers, and culinary experts to study cooking by electricity from alimentary-physiological, labour saving and political economical points of view. At Oslo a school for housewives has recently been erected at a cost of several million kronor, and electric cooking is receiving particular attention there.

The cooking range shown in the film exhibited was the Seves range, marketed by the Stockholm Electric Works, which has been specially designed in an endeavour to reduce the load on the power station during the period of cooking operations. It is called a heat accumulating range and has on the top of it a block of iron which stores up the heat supplied to it during the time the range is not in use and a temperature of about 500 deg. C. is generally maintained. Thus the extra current necessary to carry out cooking operations is not very large. The upper face of the block of iron is machined and forms the cooking place of the range and this upper surface, when not in use, is covered by a heat insulating lid. The block of iron receives its heat not only from a heating element of about 300 W capacity, but also from another 300 W element which is only occasionally connected when the temperature of the block drops noticeably below 500 deg. C. A 500 deg. C. cooking plate is thus always ready and available for use. The heat supply from the cooking plate to the cooking pot or frying pan is regulated by altering the distance from the cooking place by means of a lever. The lower end of the block of iron transmits the heat to a heating oven which, by means of a special device is always kept at a practically even temperature of 90 deg. C., so that a saucepan filled with boiling water can be kept simmering.

Need for Suitable Material.

The importance of systematic wiring and suitable material for wiring on farms was emphasised. Rural electrification in Sweden was started 20 years ago and it has been very difficult, said Dr. Ekström, to maintain a satisfactory standard of installation work. In Farm the conditions are such that no two installations are alike and it was stated that in spite of the last 10 years' intense activity in rural electrification, the installations on the farms in Sweden, especially in stables and lofts, are very inferior, often dangerous from a fire standpoint, lacking a proper system of wiring and constructed with unsuitable material. Indeed, it was stated that these criticisms apply also to plants constructed during the last few years by firms prominent in other respects.

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Pure Metals in Electrical Engineering.

(*Concluded from page* 609.)

times as long as those materials, and is practically immune from that form of local corrosion known as "pitting."

The wide variation in the sizes and shapes of magnet cores themselves makes comparative figures recording their magnetic properties difficult and even misleading. The curves given in Figs. 1 and 2 are taken, therefore, from annealed bar used for cores rather than from actual cores themselves. Fig. 2 shows the normal induction of such a bar which, for solid core work is equal to the very best grades of Norway iron, and possesses a high permeability and low retentivity which makes it an ideal material for magnet armatures and solenoid plungers. The requirements in such parts are the development of a maximum pull and a correspondingly quick release for a given number of ampere turns. Bar ingot iron is used in solid sections in d.c. apparatus, while smaller appliances can be satisfactorily provided by making use of bundled and dead soft annealed wire of the same material. The critical point in "Armco" ingot iron occurs between 850 deg. to 1 050 deg. C. and annealing at about 700 deg. C. gives the best results. The saturation curve, Fig. 2, determined by the Burrows compensated double-yoke method, shows the values of magnetic flux density, or induction "B" in kilogausses per square centimetre, plotted vertically, and corresponding values of magnetising force "H" in gilberts per centimetre, plotted horizontally. Fig. 1 shows a typical hysteresis loop on annealed "Armco" ingot iron, from which the retentivity value and coercive force can be ascertained.

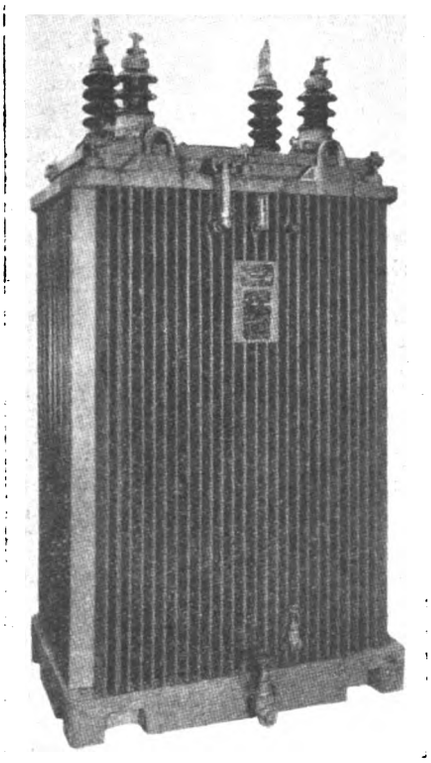

Fig. 4.—Welded ingot iron transformer tank.

The rust-resisting properties of commercially pure iron have already been referred to. They may be regarded as a function of the purity. For satisfactory welding the properties of ferrous metals are similarly proportional to their purity. Hence commercially pure iron both resists corrosion admirably and welds perfectly, a combination of properties which are usefully taken advantage of in building up transformer tanks. The properties referred to are those which are the natural consequence of the extremely homogeneous nature of the material which can be seen from Fig. 3, in which reduced sections of a normal mild steel and commercially pure ingot iron are contrasted. Fig. 4 shows a transformer tank of welded pure iron.

One final example of the many uses to which commercially pure iron, which in this connection means iron of the "Armco" quality, can be put is afforded by the fact that it is being extensively employed as one of the two elements in base metal thermocouples of the iron-constantan type. A popular couple of this kind is composed of "ferry" metal (a copper nickel alloy corresponding to constantan), and "Armco" ingot iron. The latter is found to be free from the parasitic currents which occur in less pure forms of iron, due to segregation, or to slag inclusions, and, within the limits of its critical point (at temperatures, that is, below say, 750 deg. C.) of remarkable thermo-electric constancy.

Nickel-Iron Alloys.

(*Concluded from page* 613.)

possesses it can hardly be considered that their possibilities have been completely explored. Now that the pronounced effects of heat treatment and of stress after heat treatment have become known, further investigation of the whole series would appear necessary, keeping in mind the possible rôle of such variables in determining the qualities of the finished product. Those properties which have already come to light are of so unusual a character that any further developments would certainly seem to merit the closest attention of all those connected with electrical engineering.

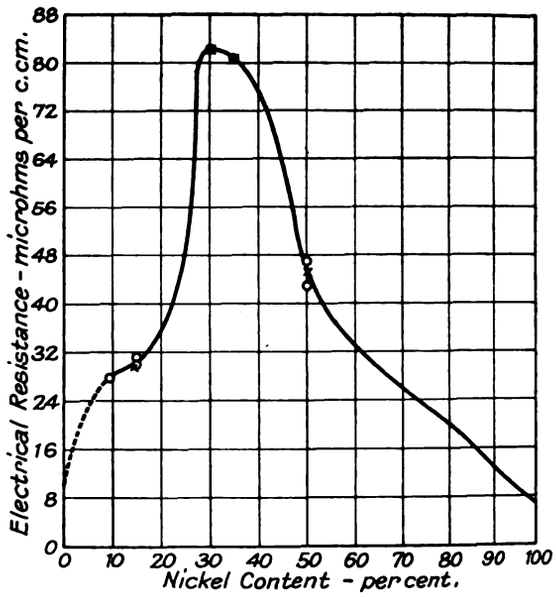

Fig. 5.—Diagram showing electrical resistance.

CORRESPONDENCE.

BRITISH ELECTRIC VEHICLES.

[To the Editor.]

Sir,—We notice in the commercial columns of your issue of November 12th particulars of the liquidation proceedings of British Electric Vehicles, Ltd., of Southport.

In this connection we would like to draw your attention, and that of your readers, to the fact that we have purchased the whole of the assets of British Electric Vehicles, Ltd., for cash, and are now carrying on the manufacture of all their standard vehicles in our Liverpool factory.

This company was registered in 1919, since when we have had a successful record of trading, principally as manufacturers of wireless apparatus, controllers, switchgear, and spiral and rod clock gongs. During the whole of this period we have made the whole of the controllers fitted by British Electric Vehicles to their vehicles.—We are, etc.,

Wingrove and Rogers, Ltd.
G. D. Ozanne,
London Manager.

63, Queen Victoria Street,
London, E.C.4.
November 19th.

Electricity Statistics.

We have received a long letter from Major T. Rich criticising the statistics given by Dr. W. H. Eccles in his Presidential Address to the Institution of Electrical Engineers, and the deductions drawn from them. We regret that pressure on our space prevents us from publishing this letter in the current issue, and we hope to deal with it next week.

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COLLIERY SWITCHGEAR.

Some G.E.C. Models to Withstand Arduous Conditions—Control Gear Details.

THE extensive application of electrical plant of large capacity in conjunction with the exacting requirements of the Home Office regulations for the use of electricity in mines has completely revolutionised the design and construction of colliery switchgear. In order to meet the increasing demand for reliable switchgear of substantial construction, the General Electric Co. has introduced a comprehensive range of both low and high tension switchgear, which has been specially designed to withstand the arduous conditions of service in mines, above and below ground.

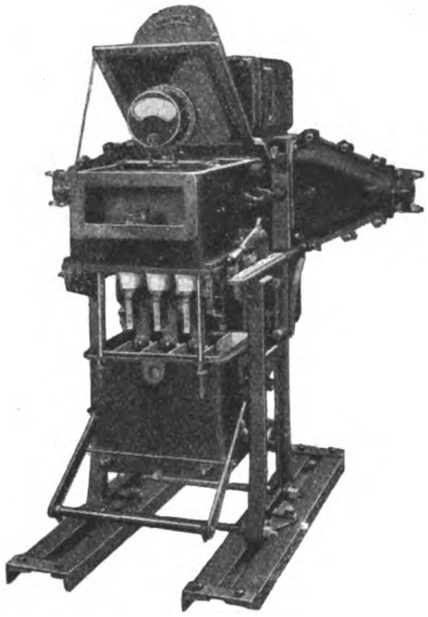

Fig. 1.—G.E.C. oil immersed draw-out type switchgear.

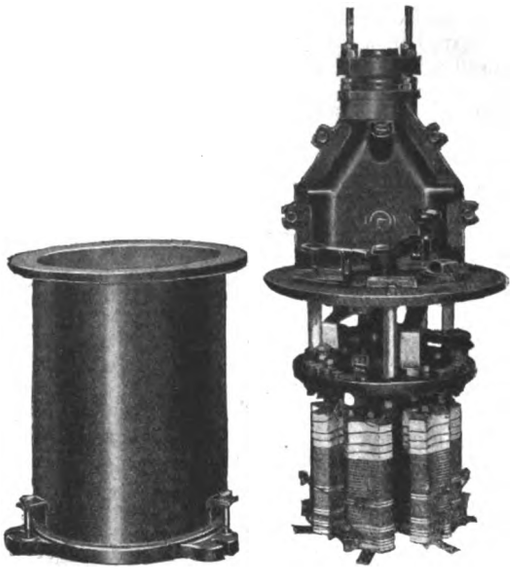

Fig. 2.—G.E.C. flame-proof oil immersed rotor starter.

Colliery switchgear may be divided into three distinct classes, viz. :—

(*a*) Main switchboards for controlling the output of the generating plant, or the input from an independent source of supply.

(*b*) Control gear for motors driving electric winders, pumps, compressors, etc.

(*c*) Ironclad and oil immersed flame-proof switchgear for distribution and motor starting purposes underground.

In the case of a colliery having its own generating plant, this will probably consist of one or more turbo-generators, and the main switchboard would be similar to those installed in an ordinary power station.

On the other hand an electrically driven winder requires control gear for starting and regulating the speed of the motor, the supply current being usually taken through an ironclad oil-immersed circuit breaker, for the purpose of isolating the whole of the winding motor switchgear from the line when necessary. This circuit breaker is generally of the pedestal type, and is equipped with overload and no-volt release features, and indicating and integrating instruments. The illustration in Fig 1 represents a typical unit of G.E.C. oil-immersed draw-out type switchgear. When the winder motor is of the three phase type, it is necessary to reverse the current in the stator circuit of the machine, in order to reverse the direction of rotation. For this purpose it is the custom to employ an oil-immersed reversing switch, which is generally of the pedestal type and similar to the unit just described. The variable resistance required in the rotor circuit for regulating the motor speed is obtained by means of a liquid controller, which functions by increasing or decreasing the amount of liquid or electrolyte between two plates inserted in each phase. When these plates or electrodes are fully immersed the controller is short circuited and the motor runs at full speed.

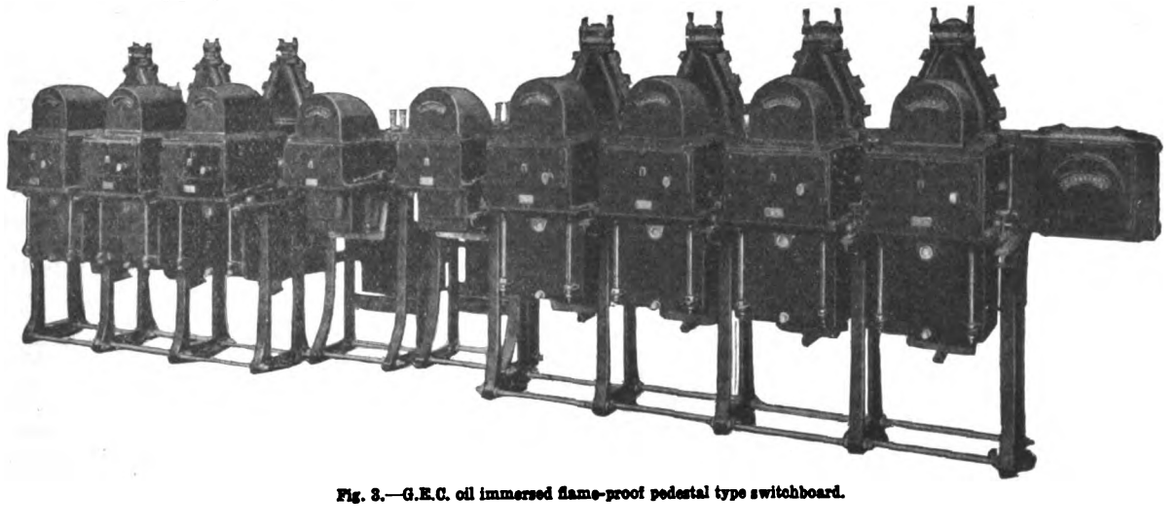

Fig. 3.—G.E.C. oil immersed flame-proof pedestal type switchboard.

In large controllers the electrodes are often stationary and the height of the liquid in the tank is varied to regulate the resistance, while controllers of medium size have moving electrodes. This equipment includes a G.E.C. oil-immersed switch and liquid controller of the moving electrode type operated by a single lever. The advantage claimed for this type of controller over those with metal resistances is that the change in resistance is very gradual, thereby ensuring that the motor runs up to speed more evenly.

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NEWS IN BRIEF.

Interesting Electrical Items from All Quarters.

A power house shift charge engineer is wanted by Hackney (London) Borough Council.

"Electric Refrigeration News" is the title of a new American fortnightly publication.

Lighting restrictions imposed under the Emergency Powers Act will shortly be relaxed.

Through telephone communication has been established between London and Stockholm.

Under the hire-purchase wiring system 3 000 Glasgow tenements have been electrically equipped.

A daily paper reports that the pavements of Vienna streets are to be heated electrically during the winter.

The Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board require a charge engineer.

The annual prize distribution of the Northampton Polytechnic Institute will take place on December 3rd at 7.30 p.m.

Electric fires and cooking apparatus and an electric lift will be included in the equipment of the new airship "R 101."

In certain parts of the Newcastle-upon-Tyne Electric Supply Co.'s area 95 per cent. of the residents are electricity consumers.

Electrical generating plant is to be installed in "Implacable," the only warship still afloat which took part in the Battle of Trafalgar.

Construction of a large power station at the rapids on the Dnieper River, near Kichkas is said to be contemplated by the Soviet Government.

It is recalled that the procession of mechanically-propelled vehicles from London to Brighton thirty years ago included a "Britannia" electric bath chair.

Imports of foreign electrical goods into Italy rose from 3 500 000 kilogs in 1924, valued at 55 000 000 lire, to 5 100 000 kilogs in 1925, valued at 97 000 000 lire.

The lowest tenders for telephone cables for Durban were from German firms, and these have been accepted by the Electricity Committee. Eight British firms made offers.

Contracts for a £300 000 hydro-electric station for the Peruvian Government are reported to have been given to the A.E.G. and the Bergmann Electricity Works of Germany.

An electrical engineer is required for service on Indian State Railways. Applications to Rendel Palmer and Tritton, 12/14, Dartmouth Street, London, S.W.1, by December 7th.

To link up under one roof the offices, works and distributing establishment of the Mid-Cheshire Electricity Supply Co., part of the premises was lifted 4 ft. and slid bodily a distance of 60 ft.

At a meeting of the Edinburgh Association of Science and Arts Miss K. St. C. Lindsay lectured on "Modern Lighting in the Home." The only modern way of lighting, she declared, was by electricity.

On the Hendon Electric Supply Co.'s quarterly accounts to consumers is a printed slip stating that "owing to the coal strike the minimum charge for the September quarter has been reduced by 50 per cent."

The British aluminium industry is associated with an international agreement among aluminium producers relating to price control, exchange of technical information and expansion of markets. The agreement is for two years.

Paisley Association of Electrical Engineers heard last week a lecture on "Electric Lighting for Motor 'Buses," by Mr. N. Allan May. Speakers in the discussion included Messrs. W. R. Bruce, J. Graham, P. Hamilton, J. Neil, and H. R. Heys.

Mr. F. W. Purse's interesting and comprehensive paper on the history and objects of the National Register of Electrical Installation Contractors, which was read at the E.C.A. Conference at Brighton has now been reprinted in pamphlet form by the National Register.

The North-East Coast E.T.B.I. Competition gold watch was wound up last Friday by Mr. H. A. Couves, placed in a box and sealed by Mr. Brackenbury, and handed to Mr. R. E. Robson, from whom a limited number of tickets (given free to donors of 6d) can still be obtained.

Attention is directed to an error in the recent declaration of the wages rates for the electrical contracting industry. These rates will remain in force up to and including the period covered by the first pay day in February, 1927, and not January, 1927, as stated in the original declaration issued by the N.F.E.A.

W.O.B. PROGRESS.

Electrical Trade Pleased with Immediate Business from the Campaign.

ONE of the pleasing surprises of the "Wiring the Homes of Britain" Campaign has been the large amount of immediate business directly due to its operation. The campaign was primarily designed to create cumulative business for the future, but in those districts where the campaign is being pushed vigorously there is no doubt that its results in actual business have already been remarkable and, by common consent, out of all proportion to the cost of the publicity.

We learn from campaign headquarters that the response to the "contact" suggestions in the last issue of the "Home Lighting News" has been very gratifying, and that over 250 000 of the cheque coupons (illustrated in THE ELECTRICIAN last week) have been circulated. Of the cardboard model houses nearly 150 have so far been ordered; but while fair demands have been made for the advertising electros, posters and cinema slides, the E.D.A. specially urges all contractors and supply undertakings to make fuller use of the slides and posters, the two simplest and cheapest means of keeping in close and continuous contact with the public during the whole period of the campaign.

The attention of the trade is specially directed to the next series of national press advertisements, beginning next Sunday, in which an effort is being made to extend the campaign appeal to an even wider public than has yet been reached.

Demonstration House Progress.

Progress continues to be made in most areas with the opening of further demonstration electric homes. The North-East Coast District, which has already run four demonstration houses announces that three more will be opened shortly. The first, at Low Fell, Newcastle, opens on November 30th, one at Bishop Auckland is expected to be ready by about December 3rd, and Sunderland will open a house about January 15th. The district has set a standard which, we hope, others will emulate.

Birmingham has opened its fourth house, two are in preparation in Nottingham (opening date about December 1st); Cardiff, Dundee, Whitby, Halifax, Batley, Dewsbury, and Heckmondwike have also opened electric demonstration houses, and plans are proceeding for the opening of many others in various parts of the country. In this sphere of campaign activity the London and Home Counties Area seems to be somewhat slow-moving at the moment, but there is still time for the leeway to be made up.

New electrical circles are still being formed, and since last week the grand total has been added to by Dartmouth, Weston-super-Mare and Belfast.

An extensive local advertising programme is being undertaken at Halifax in local newspapers and on trams, 'buses, hoardings, etc. Further publicity is being obtained by means of references to the demonstration house by the comedian at the Palace Theatre.

More Direct Results.

At Greenock, as a direct result of the campaign, considerable interest is being shown in the new wiring scheme, and the town is being divided into sections for the individual electrical contractors to canvass.

Reporting on progress in the Birmingham district, an ELECTRICIAN correspondent states that the demonstration houses at King's Norton and King's Heath, which were opened by the Birmingham W.O.B. Committee, have now been closed, after what the committee regard as a very successful run. Visitors, almost without exception, showed a keen interest in the electrical equipment, and the interest of women was particularly marked, not a few of them offering critical comment of a valuable kind.

Two demonstration houses now remain open in Birmingham—the one at Erdington, which is attracting a large number of visitors, and the other, which was opened on Tuesday last, at Hall Green, in Finmere Road. It is, like the others, a typical middle-class house, wired and equipped fully with apparatus supplied by local contractors.

Though Leicester has no demonstration house yet, the campaign is forging ahead there, and an ELECTRICIAN correspondent reports that arrangements are being made for some novel window displays.

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THE B.E.A.M.A. DINNER.

Colonel Morcom on the Result of Government by Statistics.

THE annual dinner of the British Electrical and Allied Manufacturers' Association was held at the Connaught Rooms, London, on Wednesday, November 17th, the President, the Earl of Derby, K.G., being in the chair.

In proposing the toast of the "National Development of Electricity Supply," Col. R. K. Morcom (chairman of the B.E.A.M.A. Council) said that if the word "national" meant "of" or "for," the nation, it should prove popular, but if it meant "by" it would fall flat. That the nation wished to be in the picture was shown by the eagerness of all parties to deal with the subject of electricity supply, but whether industry was quite so eager to have a foster mother foisted upon it was not so clear. Some thought it was a healthy fledgling which might have been allowed to develop without assistance. There was no doubt, however, that the cleanliness and comfort of electricity commended itself to every housewife; and as the housewife was a person who mattered that was important.

Continuing, he described the Bill as one result of government by statistics. Statistics were unprincipled and often immoral things. With statistics went a child-like faith in experts. And experts and statistics had been used to demonstrate that the country was backward in the utilisation of electricity. The man-in-the street, hearing this, put the blame on the supply industry. This was unjust. The flow of electricity depended not only on the voltage, but on the resistance and capacity of the current. The country could rely on the supply industry to look after the voltage if the Government would decrease the resistance and the consumers increase the capacity. Nevertheless the supply industry ought to thank the Government for the excellent advertisement they had recently been receiving. He had come back from the recent World Power Conference with the conviction that the electrical manufacturers of this country were second to none in regard to design, equipment and organisation, and better than any as regards quality and reliability.

Cheapening Generating Costs.

The Attorney-General (Sir Douglas Hogg, M.P.), in reply, remarked that disorganisation and lack of common policy were the chief causes of the unhappy position of British industry. Power to expand had not been lost, but the need for co-operative action was more than ever clear. The Government were proposing by the Electricity Bill to do something to remedy the disorganisation of which the Association complained. The Government were proposing to create and give effect to the common policy which industry so sorely needed, and to carry out those great objects by an appeal to the principle of co-operative action. They desired to see the generation of electricity take place on the sites which modern experience had shown to be the most suitable, and with modern machinery of the highest possible efficiency. They also wished, as far as they could, to do away with the vast waste of capital involved in stand-by plant. Those things must result in the cheapening of electricity, and the Government believed that by cheapening generating cost they could at once ensure that electrical power would be more generally used in this country. He agreed with the view that electrical power was the weapon with which British industry could meet foreign competition. The Government believed that there was no reason why electricity, so cheapened, should not be used by agricultural districts, and that by standardising frequencies they would encourage manufacturers to adopt mass production. Electrical manufacturers now exported eleven millions sterling more than they imported, and the Government believed not only that the Electricity Bill, when it was passed, would encourage them to render still greater service to the country in this respect but that it would enable us to rid ourselves of the stigma of being almost the most backward country in the use of electricity (Cries of dissent).

After the Earl of Derby had proposed the toast of "Our Guests," in an amusing speech, Sir Alfred Mond rose to reply. He said that the use of electricity in Canada and America was on a scale of which we in this country had very little idea. He was an advocate of cheap electricity for the village. The overcrowding of the towns and the depopulation of the countryside had deprived the villages of craftsmen who were also cultivators, and the reason for the concentration of industry in towns had been largely the lack of motive power.

WINDOW DISPLAY.

Reflections on Arrangement of Some Electrical Shop Windows.

AT the E.D.A. London Salesmanship Conference on November 19th, Mr. E. Willson (President of the British Association of Display Men), lectured on "Shop Window Display." Mr. H. T. Young, of Messrs. Troughton and Young, was in the chair.

The lecturer dealt with the general principles underlying effective and efficient window display, and then went on to discuss window displays in electrical shops.

So far as the display of electrical goods and apparatus was concerned, there was too often a desire to crowd a window or show room with as many articles as possible, and in a higgledy piggledy manner, with the result that there was far too much for the eye to take in, and a person passing along outside such a window failed to find anything which arrested his attention sufficiently to cause him to stop. Every window should tell the story of the goods it had to sell in as simple a manner as possible; windows should be changed at least once a week so that only a few articles need be shown on each occasion. The great thing in the electrical trade was to try and make people want electricity; many electrical displays had the effect almost of making people *not* want electricity.

The lecturer illustrated his points by showing lantern slides of many window and store displays of electrical goods, and although generally he was severely critical of the degree of efficiency so far achieved by those displaying electrical goods, he pointed to several such displays as being somewhere near to perfection. Some of the window displays at Magnet House, Kingsway, for instance, were warmly commended, although others were criticised. Other electrical displays in other parts of London and the provinces came in for commendation as well as criticism. At the same time, the lecturer did not disguise his disappointment at the general level of display, taking the trade as a whole, and comment was made on the very few electrical windows entered for competition in connection with shopping weeks.

Mr. H. T. Young said that some of the window displays of his own firm had taken prizes in various competitions, and the work was done by a member of the B.A.D.M., not on the staff, who dressed the windows regularly for a fee.

Mr. V. W. Dale said Mr. Willson's lecture should be extremely useful, because of the comparatively few electrical shops that attempted to make window displays in this country. Window display, linked up with national advertising, helped the retailer to obtain from it the greatest possible benefit. In this connection, he urged the use of the window display fitting designed for use in connection with the Wiring the Homes of Britain campaign. This display unit cost 35s., and 120 had already been sold. The E.D.A. had also sold 1 400 copies of the art print of the competition house, whilst a model of the house, which could be lighted up, was also to be made for distribution. As a matter of fact, 130 of these models had been sold, even before they had been made.

The chairman, in winding up the discussion, suggested closer co-operation between the E.D.A. and the British Association of Display Men, so that by application to Mr. Beauchamp, members of the E.D.A. could be put in touch with the right type of man for window display work.

Ebonite Panels.

Revised Standard List of Sizes for Wireless Work.

IN co-operation with the ebonite manufacturers the British Engineering Standards Association has issued a revised list of sizes of ebonite for panels for radio reception purposes. The standard thicknesses have been reduced from three to two by the elimination of the $\frac{5}{16}$ in. thickness, but the number of standard panels remains in the neighbourhood of twenty. The two sizes of standard strip are retained, these having been found particularly useful for the mounting of terminals at the back of the baseboard.

The original specification (No. 234—1926) remains unaltered as regards the composition and testing of the ebonite, and it is interesting to learn that two or three manufacturers have already obtained a licence to use the trade mark "BESA" in connection with their panels.

Copies of the revised list of panel sizes will be forwarded by the B.E.S.A. Publications Department, 28, Victoria Street, London, S.W.1, on receipt of a stamped envelope.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

COUN. H. K. Beale has been re-elected chairman of the Birmingham Electric Supply Committee.

Mr. D. E. Laing has been appointed resident civil engineer in connection with the extensions to Manchester power station.

M. Henri Spéciael, of Brussels, has been appointed a director of the Anglo Argentine Tramways Co., in the place of Mr. H. F. Gunning, retired.

Mr. W. G. Verdon Smith, of the Bristol Tramways and Carriage Co., has been elected a vice-president of the Chartered Institute of Secretaries.

Mr. C. A. Vandervell took eleven firsts, eight seconds, and six thirds at the Pangbourne, Berks, fruit, flower, vegetable and chrysanthemum show last week.

Councillor W. Greenwood and Councillor Major Jones have been elected chairman and deputy chairman respectively of the Salford Tramways Committee.

Mr. B. Innes, electrical engineer, of 4, Low Road, Sunderland, has been chosen as Grand Primo of the Royal Antediluvian Order of Buffaloes. He is a member of the Sunderland Town Council.

Mr. Herbert Sams, deputy director-general, will succeed Sir Ganen Roy when the latter retires on April 9th, 1927, from the position of director-general of Indian Government Posts and Telegraphs.

Vice-Admiral Henry W. Grant (joint managing director of the Eastern Telegraph Co., and a director of the Eastern Extension Telegraph Co.) has been elected to the board of the Western Telegraph Co., Ltd.

Mr. G. T. Phizackerley and Mr. E. B. Orme have been appointed directors of the Liverpool Overhead Railway Co., in the places of the late Col. H. Concannon and Mr. F. C. Bowring (Lord Mayor of Liverpool).

On his retirement from the post of rolling stock superintendent of Sunderland Corporation tramways, Mr. George Haswell has been presented with a chair by the staff of the Wheatsheaf Depot, and with a smoker's cabinet by the staff of the Hylton Road Depot.

Councillor F. A. Greet, of Messrs. Toomer, electrical engineers, Northbrook Street, Newbury, has been appointed to the Estates and Markets, Finance and Watch, Gas, Roads and Lighting, Parking Schemes, and Town Planning Committees of the Newbury Town Council.

Mr. A. Willey, who is leaving the Marconi Co.'s Chelmsford staff, after 15 years' service, has been presented with a gold watch, a silver salver, and a silver cigarette box. The gifts were handed to Mr. Willey on behalf of colleagues at Chelmsford and London, by Mr. H. M. Dowsett, chief of the testing department.

Mr. James Dalrymple, who has been general manager of the Glasgow tramways for 22 years, and in the service of the Department 46 years in all, tendered his resignation on November 17th, following the passing of a resolution by the Tramways Committee (on which there is a Labour majority) to reinstate 316 tramwaymen who were dismissed after the general strike.

Mr. W. R. Bower, head of the Department of Physics and Electrical Engineering at Huddersfield Technical College, and a past-president of the Association of Teachers in Technical Institutions, will retire at the end of the current term after holding his present post for 30 years. The College authorities are now creating separate departments of Physics and Electrical Engineering. The new head of the Physics Department will be Mr. H. Lowery, lecturer in physics at Bradford Technical College, and formerly assistant lecturer in physics in the University of Manchester, who has published several papers on spectroscopic and other subjects. Mr. W. M. Wilcox, now lecturer in electrical engineering in the College, will become head of the new Electrical Engineering Department.

Obituary.

The following deaths are reported :

Mr. JAMES GILBERT, aged 55, of Northwich, assistant manager of the Mid-Cheshire Electricity Supply.

Mr. ERNEST F. MOY, managing director of Ernest F. Moy, Ltd., electrical manufacturers, Camden Town, London.

MR. ARTHUR HIGGS, who had been for over 20 years manager of the instrument department at the works of Ferranti, Ltd., Hollinwood.

GAS *v.* ELECTRICITY.

Discussion on Merits and Prospects of Rival Commodities.

MR. F. W. Goodenough (Executive Chairman of the British Commercial Gas Association) and Miss C. Haslett (Director of the Electrical Association for Women) took part in a discussion on " The Relative Fields and Merits of Gas and Electricity," at the Efficiency Club, London, last Friday.

Mr. Goodenough admitted that there was an enormous field in which electricity had no rival. The gas companies themselves generated and used electrical power to a large extent in their own works. Gas had also an important place in the field of power, particularly where there was a long, heavy and constant load. In the lighting field electricity had an enormous place, but where cost was the prime factor gas easily held the field. If the working woman could get warmth at the same time as light she would prefer to pay for one source of light and heat rather than two sources. He saw no prospect of the gas cooking field being invaded in any considerable degree by the electrical industry.

Miss Haslett said it had been arranged that she should discuss with Mrs. Cloudesley Brereton (a member of the Efficiency Club) the subject with which they were dealing that evening, but she found that Mr. Goodenough had been substituted. The competition between gas and electricity, she said, was good for the consumer. Mr. Goodenough had not done justice to the high heating efficiency of electrical apparatus. She had figures which showed that electric cooking and heating appliances had an efficiency of 65 to 70 per cent., compared with 30 to 35 per cent. for the standard gas range, while the efficiency of modern gas fires was from 25 to 30 per cent., compared with 70 per cent. for electric fires of recent design.

For the quarter ended in June, during which she had used an electric radiator, five or six lights and a cooker, an electric fan, an iron and a lot of small " gadgets," her electricity bill came to £3. Previously, using a gas fire, cooking on two gas rings (and paying extra for electric light) the average put in the meter for gas was from 5s. to 6s. a week. Mr. Goodenough had said a working woman wanted light and heat from one source ; why not have electricity only ?

Mrs. Willson (who has built 270 homes in two years) said the gas fire, gas copper and gas cooker had been an immense help to thousands of women, but the gas service was growing a little old, and the gas people must know that as an illuminant inside the house the market was closing to them. Her opinion was that it was the dream of every woman to have electric light and an electric iron. The electric cooker was not yet within the reach of the majority of working women. The electrical people would have a better chance for their appliances if they adopted the methods adopted by the gas industry 20 years ago in regard to the supply of appliances. Many people would like to be able to cook without obnoxious fumes. Electric cooking was a boon and a blessing. On her housing scheme only one person wanted gas for lighting.

Meter Engineers.

M.E.T.A. Members Discuss Points of View in Metering Theory.

THE fourth general meeting of the Meter Engineers' Technical Association was held at the E.L.M.A. Lighting Service Bureau on November 18th, when Mr. E. W. Hill delivered a lecture on " Points of View in Meter Theory."

After briefly alluding to certain errors frequently perpetrated in test calculations, he proceeded, with the aid of illustrations, to propound his views upon sundry fundamental principles which govern motor practice, particularly with regard to induction meters ; the much discussed question of power factor ; quadrature compensation ; and the setting out of polyphase vector diagrams.

Mr. W. Holmes, in opening the discussion, offered convincing reasons for the inclusion of quadrature compensation in the series circuit of certain meters. The discussion was continued by Messrs. R. Hornby, C. W. Pike, T. C. Yates, A. J. R. Willingham, W. H. Lawes, A. V. Bland, and the President. Amongst the points raised were : Mechanical aids to induction meter theory ; the possible number of incorrect connections of polyphase meters ; a plea for co-operation between switchboard and meter manufacturers ; and the economic and safety factors governing current transformer design.

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IN LIGHTER VEIN.

A Coat of Arms Specially Designed for Registered Contractors.

ALTHOUGH the search for a suitable name for registered contractors has met with a check, it has been found possible to present this growing band with a coat of arms. It is the combined work of a famous heraldic expert and an equally famous electrician. Both, for obvious reasons (see design) do not wish their names to be divulged.

The design evolved is a noteworthy attempt to make the arms symbolic of the bearers, in short, to indicate the length, breadth and depth of the registered contractors. The illustration shows the design, which, of course, does not appear to advantage in black and white. Carried out in colour, the effect is like a fuse blowing on a foggy night; a dull subdued grandeur.

The arms are described technically as follows:—

A Shield, in conduit proper, quartered. 1ST QUARTER.—Azure, the Earth proper in distance, behind bars of iron with padlock, sable. 2ND QUARTER.—Or, the symbol of the Pound in money. 3RD QUARTER.—A cylindrical metal piece with hole throughout, bendwise, couped, sable (the bend sinister), on a ground of troubled thought. 4TH QUARTER.—Rose pink, the National Register proper with key.

CREST.—An arm proper holding tool issuing from cable carton, surmounting a wreath of stranded marooned cable.

SUPPORTERS.—*Dexter:* Reggie Strachter in attitude of ease, smoking cigar from which issues smoke rising upwards. *Sinister:* Reggie Strician, in attitude of ease, smoking pipe from which issues smoke rising upwards. MOTTO.—"De lux de luxe."

The interpretation is quite simple. The first quarter of the shield shows the earth kept at a distance behind bars, for all registered contractors have the earth under complete control. The symbol in the next quarter requires no explanation, being met with daily (on paper). The bend sinister is a black omen of warning. In the fourth quarter the National Register is shown, and the key to the earth alongside shows that proper earthing and control are well in hand. The supporters, Reggie Strachter and Reggie Strician, are too well known to need introduction, whilst the crest is self-explanatory. The motto is an excellent example of an apt Latin tag. Students will identify "de-lux" with (obvious) "de-light."

Points of View.

Interesting Pronouncements on a Variety of Electrical and Allied Subjects.

WHETHER successful or not, industry has to pay the local rates.—*Sir Robert Horne.*

* * *

It is within the Empire that we shall find the greatest outlet for our manufactures.—*Col. Wilfrid Ashley, M.P.*

* * *

The general strike has taught the working classes more in four days than years of talking could have done.—*Sir Arthur Balfour.*

* * *

Under-production is really the cause of loss of trade, and therefore of loss of wages, and to cure that you have only to work harder—and longer, if need be.—*Lord Cave.*

* * *

The sale of highly complex machinery and plant calls for an increased backing up by technical advisers; the salesman needs a technical adviser at his right hand.—*Mr. A. M. Samuel.*

B.E.S.A. SPECIFICATION.

New Standards for Fixed Condensers for Radio Reception.

A NEW B.E.S.A. Specification for Fixed Condensers for Radio Reception Purposes (No. 271—1926) deals with two types of "fixed" condensers—namely, those in insulating cases and those in metal cases. The types are sub-divided according to the nature of the dielectric, and each type is standardised in two grades, based on the closeness of the actual capacity value to the nominal capacity value marked on the condenser case. The condensers are therefore referred to as being of "normal" or "special" grade, this classification being based on accuracy and not on quality.

The electrical properties of the condensers are specified by means of power factor, insulation resistance and high-voltage tests, and the constancy of capacity is covered by a heat test. The dimensions of the fixing holes are also specified. Beyond this it has been considered inadvisable to attempt the standardisation of dimensions at present.

Copies of the specification may be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, S.W.1, price 1s. 2d., post free.

Business Items.

Changes of Address, Representatives, and Other Developments.

MR. N. P. Graham is opening a wireless business at Rotherfield, Sussex.

The General Vehicle Co.'s offices have been removed to 15, Devonshire Street, Bishopsgate, London, E.C.2.

The Mullard Wireless Service Co., Ltd., has opened a new depot at Corn Exchange Buildings, Burgh Quay, Dublin. Mr. J. Atkinson is manager of the branch.

The British Electric Transformer Co., Ltd., has opened electricity showrooms on the housing estate of the Great Western Land Co., at Elthorne Heights, Ealing, London.

The Parsons Motor Co., Ltd., Town Quay, Works, Southampton, has changed its name to the Parsons Oil Engine Co., Ltd. The directorate, management and policy of the company remain unchanged.

Mr. W. J. Treloar, an Australian electrical engineer, is now in England and is desirous of hearing from British manufacturers of electrical material (all classes) wishing to be represented in the Commonwealth. Letters may be sent to him c/o "River Deep," Cross Deep, Twickenham.

Reference has been made in recent issues to the opening of new showrooms and stores in Birmingham and Manchester by the British Thomson-Houston Co., Ltd. Another recently opened branch is at Post Office Buildings, Marston Road, Middlesbrough. In each branch special facilities are afforded to retailers for the demonstration of apparatus to their customers.

The Birmingham branch of Burndept Wireless, Ltd., has been removed from Winchester House, Victoria Square, to 2 and 4, Albert Street. It is under new management, Mr. Albert Illing, who is well known in the wireless and electrical trade in the Manchester district and the North, being the manager. About thirty new service agents have been appointed for the Midlands.

In connection with the statement of the Official Receiver regarding liquidation of British Electric Vehicles, Ltd., it should be pointed out that, as announced in THE ELECTRICIAN of September 10th last, the business formerly carried on by this company has been acquired by Wingrove and Rogers, Ltd., of Liverpool and London, who are carrying it on under the style of Wingrove and Rogers British Electric Vehicles, Ltd.

Midland Electrical Engineers' Ball.

THE annual ball promoted by the Midland electrical engineers, which was held at the Grand Hotel, Birmingham, last Friday, proves an increasingly popular event. There was an attendance of about 430.

The rooms were artistically decorated and illuminated, special spot lighting and flood and strip lighting being provided by the Birmingham branch of the Metropolitan-Vickers Electrical Co., Ltd., in conjunction with the Birmingham branch of the General Electric Co., Ltd. The proceeds are being devoted to the E.T.B.I. funds.

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THE NATIONAL REGISTER.

Continuation of the Latest List of Registered Contractors.

A FURTHER instalment is given below of the latest list of registered electrical installation contractors:—

London, W.—Bective Electrical Co., Ltd., W.1; Beresfords, W.1; Robert Brightwell, W.2; Brooks and White, W.14; Dalyte Electrical Co., W.10; T. J. Digby, W.1; Duncan, Watson and Co., W.1; Electric Productions Co., Ltd., W.1; Girdlestone and Co., W.1; S. Hellyar and Co., W.6; Henderson and Lawson, W.2; Hewson and Lown, W.1; Honor Brothers, W.5; Jackson and Boyce, W.1; Keeble (1914) Ltd., W.1; B. Levine, W.1; Mead and Jeffrey, Ltd., W.13; Ohms, W.1; Pigott, W.1; H. C. Poole and Son, W.5; Rashleigh Phipps and Co., Ltd., W.1; Smethurst and Co. (London), Ltd., W.1; Tredegars (1923), Ltd., W.1; Waring, Withers and Chadwick, W.1; Harold Edward White, W.1; Williams and Back, W.1.

London, W.C.—Alliance Electrical Co., Ltd., W.C.2; Barlow Bros. and Co., W.C.1; British Electrical Installations Co., W.C.2; Coleby and Co., W.C.1; Ellis and Ward, Ltd., W.C.2; Grierson, Ltd., W.C.1; G. N. Haden and Sons, Ltd., W.C.2; W. A. Hole, W.C.2; Malcolm and Allan, Ltd., W.C.2; H. A. Neale, W.C.1; Speedy and Eynon, W.C.2; Tyler and Freeman, W.C.2.

London, S.E.—John Biggs, S.E.1; A. Hawkins and Sons, S.E.1; Lund Brothers and Co., S.E.1; Mugford and Son, S.E.25; Samuel Reed and Sons, S.E.1; W. M. Williamson, S.E.22.

London, S.W.—Berkeley Electrical Engineering Co., S.W.1; Blackburn Starling and Co., Ltd., S.W.1; Brompton and Kensington Accessories Co., Ltd., S.W.5; Buchanan and Curwen, S.W.1; H. J. Cash and Co., Ltd., S.W.1; O. S. Choppin, Ltd., S.W.1; T. Clarke and Co., Ltd., S.W.1; Cowtan and Sons, Ltd., S.W.1; Crabb and Son, S.W.2; G. W. Cross and Co., S.W.1; H. Dakin and Co., Ltd., S.W.15; A. Dean and Co., S.W.1; Drake and Gorham, Ltd., S.W.1; Edmundson's Electricity Corporation, Ltd., S.W.1; Electric Power Installation Co., S.W.1; W. B. Erlebach, S.W.1; Farad Electrical Co., Ltd., S.W.18; W. J. Furse and Co., Ltd., S.W.1; A. V. Gifkins and Co., Ltd., S.W.1; Gilliver and Crouch, S.W.1; George Glumart, S.W.16; Higgs and Hill, Ltd., S.W.8; Howard Smith and Co., S.W.1; H. M. Leaf, S.W.1; S. H. Lewin and Co., S.W.3; J. B. Marr and Co., Ltd., S.W.1; V. G. Middleton and Co., Ltd., S.W.1; Rawlings Brothers, Ltd., S.W.7; Read and Partners, Ltd., S.W.1; John Richards and Co. (Electrical Engineers), Ltd., S.W.1; A. F. Roffey, S.W.1; J. Rugg and Son, Ltd., S.W.5; Simmonds Brothers and Sons, Ltd., S.W.7; Smith Major and Stevens, Ltd., S.W.11; G. J. Thornton, Alder and Co., Ltd., S.W.1; Toy and Winslow, S.W.1; Troughton and Young, S.W.1.

Luton.—Percy T. King; R. J. Stearn and Co.

Lyme Regis.—A. Paul and Son.

Lymington.—Lymington Elec. Light and Power Co., Ltd.

Macclesfield.—V. R. Brees; R. M. Carr.

Manchester.—John Adams, Ltd.; Wm. Anderton and Co., Ltd.; J. Armstrong and Co. (Manchester), Ltd.; J. R. Aspden and Son; V. A. Ayliffe; H. Bailey; Ernest Ball; Bartrum, Roylance and Co., Ltd.; Basson Electrical Co.; G. E. Beckett and Co.; G. Brady and Co.; A. Brennan; G. M. Brewster; Brindle and Kirby; Brookes and Co. (1925), Ltd.; Brown and Co.; R. H. Clampett and Co.; George Cooke and Co.; H. M. Cotsworth; A. Davies; Dean and Noble; C. Doherty and Co.; Drake and Gorham, Ltd.; James Dugdale; Electrical Repairs Co.; E. M. Evans and Son, Ltd.; John Fenna; Ferguson Pailin Ltd.; Fletcher and Thurley; W. J. Furse and Co. (Manchester), Ltd.; T. Garnett and Co.; Benjamin L. Hall; Hall Brothers; Halliwell and Good, Ltd.; Hanchett, Barrett and Currie; Harland Engineering Co., Ltd.; Harrison and Bullivant; Harrisons, Ltd.; R. G. Heaton and Co.; S. H. Heywood and Co., Ltd.; Geo. Hill and Co., Ltd.; H. V. Hird and C. A. Lamb; Sidney J. Howard; T. G. Hunter and Son; Jones, Morris and Co.; Kershaws; Lancaster and Bowen, Ltd.; G. F. Latham; John Lightfoot; William A. Lowick; Frank McElroy; Mather and Loft; Meta Manufacturing Co., Ltd.; James Molloy; Robert Moore; Northern Electric Co.; Premier Electrical Installation Co.; Thomas Pybus and Co.; H. Quarmby; John H. Rigby; Robson, Paling and Co., Ltd.

(To be continued).

IN PARLIAMENT.

Suggestions Relating to Fees for Wireless Broadcasting Licences.

IN the course of the discussion on the Appropriation Bill, in the House of Commons last week, Col. Harry Day suggested that there should be a higher licence fee for valve sets than for crystal sets, and that manufacturers should give notice of the sale of receiving sets so as to prevent purchasers from evading the payment of fees.

Viscount Wolmer agreed that the adoption of different fees for different classes of sets was an attractive idea, but it did not come within the scope of that Bill. The number of successful prosecutions for the use of unlicensed sets, up to date, was about 430. Elaborate measures were taken to see that the licences were paid, but he would not state what those methods were, for obvious reasons.

Wireless Telegraphy Bill (Irish Free State).

The Wireless Telegraphy Bill, which has been introduced in Dail Eireann, will confer powers on the Minister of Posts and Telegraphs to issue search warrants to the Civic Guard to enter by force, if need be, any place or ship where unlicensed wireless telegraphy apparatus is believed to be kept. The use or possession of unlicensed apparatus will be prohibited under a penalty of £10 and the forfeiture of the apparatus, and a further fine of £1 for every day during which the offence continues. Penalties are provided for operating wireless apparatus in such a way as to interfere with the working of a State broadcasting station or to affect injuriously any licensed apparatus. The Bill also provides for the establishment by the Minister of as many broadcasting stations as he thinks proper. He may charge fees for the distribution from such stations of broadcast matter. He is also empowered to establish an advisory committee.

Replies to Questions.

The following are points from answers to questions in the House of Commons this week:—

The cost of the Rugby wireless station, including the site, buildings and plant, was about £480 000.

Two Electricity Commissioners have resigned since the authority was first appointed. They resigned to take up appointments with electric supply companies. The question whether it was undesirable that they should take employment at increased salaries with electric light companies was stated by the Minister of Transport to be altogether different from the question which had been put on the paper, and it was not answered.

Forty Years Ago.

Brief News Abstracts from "The Electrician" of November 26th, 1886.

THE following are among the news items recorded in THE ELECTRICIAN of November 26th, 1886:—

Dr. R. Mullineux Walmsley was appointed Principal of the Sind Technical College at Kurrachee.

* * *

Cases were reported of the beneficial effects of electric light upon plant growth.

* * *

A new company, the International Cable Co., Ltd., proposed to lay further Atlantic cables, despite the fact that there were then ten such cables in operation.

* * *

An account of the running of a then "colossal" dynamo stated that it "was making 420 revolutions per minute, and, as the electricity was drawn off, it scintillated in a brilliant and continuous fusillade of sparks, varying in colour from white to emerald green."

Books Received.

"Electric Lighting, Starting and Ignition for Motor Cars." By Harold H. U. Cross. (London: Crosby Lockwood and Son.) Pp. xliii+328. 15s. net.

"The Terminology of Illumination and Vision." Technical Paper No. 1. Issued by the Department of Scientific and Industrial Research. (London: H.M. Stationery Office.) Pp. 21. 9d. net.

"Light Distribution from Industrial Reflector Fitting No. 1." (British Engineering Standard.) Technical Paper No. 3. By H. Buckley and C. J. W. Grieveson. (London: H.M. Stationery Office.) Pp. 26. 1s. net.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given.

CROYDON CORPORATION, November 26th.—(*a*) 10 complete bodies for electric tramcars; (*b*) 10 complete sets of maximum traction bogie trucks; (*c*) magnetic track and wheel brake equipments for 10 tramcars; and (*d*) 10 complete sets of electrical equipments for tramcars, with assembly of 10 car bodies, trucks, electrical equipments and brakes into complete tramcars in readiness for service. Specifications, etc., from the Tramways Manager, Tramway Offices, Thornton Heath; deposit £2 for either (*a*), (*b*), (*c*) or (*d*).

HAMMERSMITH (LONDON) BOROUGH COUNCIL, November 26th.—Two water tube boilers, each capable of supplying 45 000 lbs. of steam per hour, mechanical stokers, feed pumps, piping, conveyors, bunkers, etc. Specifications, etc., from Mr. F. Hill, Electricity Works, 85, Fulham Palace Road, W.6.

NORTH CORK COUNTY BOARD OF HEALTH, November 29th.—Electric lighting of Kanturk District Hospital. Plans, etc., from the secretary (Mr. M. Regan), Mallow; deposit £2 2s.

ERITH URBAN DISTRICT COUNCIL, November 30th.—Low tension cables. Specification, etc., from the Electrical Engineer, Walnut Tree Road, Erith.

HASTINGS CORPORATION, November 30th.—Pumping plants in two pumping stations, including turbine or centrifugal deep well pumps driven by electric motors, with all electrical equipment and connections inside buildings. Specifications, etc., from Mr. G. Midgley Taylor (John Taylor and Sons), Caxton House, Westminster, S.W.1; deposit £5.

DUBLIN PORT AND DOCKS BOARD, December 1st.—Supply and erection of a 4-ton level luffing electric portal crane. Specification from the Engineer of the Board (Mr. J. Mallagh), East Wall, Dublin.

SOUTH INDIAN RAILWAY CO., LTD., December 3rd.—Steam turbine driven generating plant. Specifications (10s.) from the company's offices, 91, Petty France, Westminster, S.W.1.

GREAT SOUTHERN RAILWAYS CO., December 6th.—Six or 12 months' supply of electric cables (under form 129), electric lamps (form 137), etc. Forms (6d. each) from the Stores Superintendent, Great Southern Railways, Inchicore, Dublin.

PRESTATYN URBAN DISTRICT COUNCIL, December 6th.—Underground cables, overhead lines, transformers, e.h.t. and l.t. switchgear and sub-station equipment. Specifications, etc., from Mr. J. Lloyd Hughes, Clerk of the Council; deposit £2 2s.

METROPOLITAN WATER BOARD, December 6th.—Two steam driven electric generators (one 100 kW and one 50 kW), switchboard, piping, etc., for Kempton Park Pumping Station. Specification, etc., will be supplied on deposit of £1 1s. with the Accountant, 173, Rosebery Avenue, London, E.C.1.

AYR CORPORATION, December 7th.—Twelve months' supply of stores to the Tramways Department, including trolley wire, guard wire, span wire, insulated wires, circuit breakers, etc. Forms of tender, etc., from the General Manager (Mr. W. Grant), Town Buildings, Ayr.

DUBLIN PORT AND DOCKS BOARD, December 7th.—Twelve months' electrical supplies. Tender form (No. 10) from the Secretary, Westmoreland Street, Dublin.

LAMBETH (LONDON) GUARDIANS, December 7th.—Twelve months' supply of incandescent lamps. Forms of tender from Mr. J. L. Goldspink, Clerk to the Guardians, Brook Street, Kennington Road, London, S.E.11.

MADRAS AND SOUTHERN MAHRATTA RAILWAY CO., LTD., December 7th.—Sixteen 35 B.H.P. and two 10 H.P. rotor motors, with pulleys, slide rails and star-delta starting switches. Forms of tender (£1 1s., not returnable) from the company's offices, 25, Buckingham Palace Road, Westminster, S.W.1.

OXFORD ELECTRIC CO., LTD., December 8th.—Supply and erection of 7 500 kW (M.C.R.) turbo-alternator, with condensing plant and auxiliaries. Specifications from Mr. F. H. Francis, chief engineer, Russell Street, Oxford; deposit £3 3s.

BELFAST CORPORATION, December 11th.—Penstocks for circulating water channels and ducts at the Harbour power station. Specification (W. 54) from Mr. Johnstone Wright, city electrical engineer and manager, East Bridge Street, Belfast; deposit £2 2s.

CLEETHORPES URBAN DISTRICT COUNCIL, December 11th.—Supply and laying of e.h.t. feeder and l.t. distributor cables, with section pillars and disconnecting boxes; supply and erection of transformers and switchgear equipment; and house services, including meters. Specification, etc., from Mr. A. S. Baxter, Council House, Cleethorpes; deposit £2 2s.

EAST LOTHIAN EDUCATION AUTHORITY, December 11th.—Electrical installation work in connection with the erection of a new Infant School at Tranent. Forms of tender, etc., from R. and A. K. Smith, 44, Queen Street, Edinburgh; deposit £1 1s.

SUTTON COLDFIELD CORPORATION, December 14th.—Supply and erection of 1 000 kW steam turbine and gear driven d.c. generator, with condensing plant, auxiliaries and piping. Specification from Mr. T. Bloore, Electricity Works, Sutton Coldfield; deposit £2 2s.

MELTHAM PARISH CHURCH, HUDDERSFIELD, December 31st.—Electric light installation. Particulars from Mr. W. R. Carter, secretary of the Church Council, Birchfield.

NOTTINGHAM CORPORATION, December 31st.—Two 30-inch electrically driven centrifugal pumps (section F.F.); one motor-driven twin booster; each for an output of 10 kW (section K.K.); and one storage battery of 256 cells, capacity 275 Ah at one-hour discharge rate (section M.3), for North Wilford power station. Specifications, etc., from Preece, Cardew and Rider, 8, Queen Anne's Gate, Westminster, S.W.1; deposit £2 for each section.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, November 26th.—Primary battery material.

SYDNEY CITY COUNCIL, November 29th.—High and low tension cables (contract 1 057). (Reference B.X. 2 959.)

SYDNEY CITY COUNCIL, November 29th.—Three-phase oil-immersed induction voltage regulator. (Reference B.X. 2 936.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, November 30th.—Supply of 110 kW transformers. (Reference B.X. 2 874.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, November 30th.—Two tons of galvanised building wire. (Reference A.X. 3 721.)

BELGIAN MINISTRY OF NATIONAL DEFENCE, December 1st.—Supply of 458 portable accumulator batteries of 150 Ah capacity for the Signalling Section of the Army. Particulars (Cahier des Charges Special, No. 709), from 15, Rue des Augustins, Brussels; charge 4½ francs.

EGYPTIAN MINISTRY OF THE INTERIOR, December 1st.—X-ray apparatus (Reference B.X. 2 999.)

SOUTHLAND ELECTRIC POWER BOARD, INVERCARGILL, N.Z., December 1st.—Supply of a 3 000 H.P. horizontal Francis turbine and 2 350 kW generator. (Reference B.X. 2 822.)

SYDNEY CITY COUNCIL, December 1st.—Tungsten filament electric lamps. (Reference B.X. 2 995.)

VICTORIAN RAILWAY COMMISSIONERS, December 1st.—Rotary converter or rectifier set, with switching equipment for its automatic operation.

EGYPTIAN MINISTRY OF THE INTERIOR, December 2nd.—Supply and erection of four pumps, filters, electric motors, etc., at the Sembellawein Waterworks. (Reference A.X. 3 764.)

EGYPTIAN MINISTRY OF THE INTERIOR, December 5th.—Electric motors and accessories. (Reference B.X. 2 996.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, December 6th.—Key switches. (Reference B.X. 2 962.)

STATE ELECTRICITY WORKS, MONTEVIDEO, December 6th.—Diesel-electric generating sets.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 7th.—Three-phase induction regulator for Waikato electric power scheme (section 206). (Reference B.X. 2 935.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 10th.—Electric motors. (Reference B.X. 2 861.)

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JOHANNESBURG MUNICIPALITY, December 11th.—High-tension cable (contract 714). (Reference B.X. 3 017.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 14th.—Sub-station cables and cable boxes for Arapuni (section 188). (Reference B.X. 3 010.)

CAPE TOWN MUNICIPALITY, December 15th.—Oil-cooled transformers. (Reference B.X. 3028.)

KEETMANSHOOP (SOUTH AFRICA) MUNICIPALITY, December 15th.—Supply and delivery of material for an electric lighting scheme for the town. (Reference B.X. 3 007).

NEW ZEALAND GOVERNMENT RAILWAYS, December 15th.—Switchgear, cable, motor-generator sets, junction boxes, etc., for Hutt Valley Locomotive Workshops. (Reference B.X. 2 949.)

SIAMESE POST AND TELEGRAPH DEPARTMENT, December 15th.—Telephone and submarine cable. (Reference B.X. 3026.)

VICTORIAN ELECTRICITY COMMISSION, December 15th.—Water tube boiler, with superheater, economiser, etc., for Yallourn power scheme. Specification (No. 28/8ε), from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.2 ; deposit £3 3s.

EGYPTIAN MINISTRY OF EDUCATION, December 16th.—Five a.c. motors and switchboard for Assiut model workshops. (Reference B.X. 3 016.)

INDIA STORE DEPARTMENT, December 21st.—Supply and erection of overhead transmission line, 110 000 V, about 280 miles in length. Specification (5s.) from the Director-General, Branch, 14, Belvedere Road, London, S.E.1.

INDIA STORE DEPARTMENT, December 21st.—About 280 miles of overhead transmission line (110 000 V.) Specifications (5s. each) from the Director-General, Branch No. 10, Belvedere Road, London, S.E.1.

VICTORIAN RAILWAY COMMISSIONERS, December 22nd.—Supply of a wheel lathe, with electrical and other equipment. (Reference A.X. 3 735.)

VICTORIAN GOVERNMENT RAILWAYS, December 29th.—Electric rivet heaters. (Reference B.X. 3 014.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 30th.—Switchgear, cables and transformers. (Reference B.X. 3 040.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 1st.—Supply and erection at site of Seru pumping and power station, of four Diesel engine alternator groups, three pumps and accessories. Specification (10s. 6d.) from Chief Inspecting Engineer, 41, Tothill Street, Londor, S.W.1.

INDIA STORE DEPARTMENT, January 4th.—Supply and erection of overhead equipment (1 500 V) and steel structures for about 140 miles of railway route, in connection with the Great Indian Peninsula Railway electrification. Specification (£2) from the Director-General, Branch No. 10, Belvedere Road, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 4th.—Supply of switchgear and transformers for Waikaremoana electric power scheme. (Reference B.X. 2 872.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 4th.—Bells and buzzers (schedule C147). (Reference B.X. 2 984.)

CHINA, January 15th.—Turbo-generators, condensers, boilers, switchgear, transformers, etc. Tenders are invited by a Chinese company holding a concession for water and electricity supply. (Reference B.X. 2 998.)

NEW ZEALAND GOVERNMENT RAILWAYS, January 17th.—Switchgear, cables, motor-generators, lamps, etc. (Specification E.14.) (Reference B.X. 3 020.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 18th.—Transmission line steel towers for Waikaremoana electric power scheme (section 31). (Reference A.X. 3 732.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 18th.—Switchboard cable (schedule C.151). (Reference B.X. 3 013.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, January 19th.—Electric bells and tumbler switches. (Reference B.X. 3 011.)

STATE ELECTRICITY WORKS, MONTEVIDEO, January 19th.—Supply of 100 500 metres of 250 V wires and cables. (Reference B.X. 3 042.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, January 20th.—Electric railway car equipments, including motors, control equipment, air compressors, etc. Specification (No. 1 065) from the Chief Mechanical Engineer, Wilson Street, Redfern, N.S.W.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 25th.—Telephone transmitters and parts. (Reference B.X. 3 012.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, January 25th.—Telephone receivers and associated parts (schedule No. C. 153). (Reference B.X. 3 041.)

NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMWAYS, January 26th.—Manufacture and supply of electric train equipment for 105 motor cars and 100 trailer cars. (Reference A.X. 3 810.)

NEW ZEALAND GOVERNMENT RAILWAYS, January 31st.—Electrical equipment for Otahuhu car and wagon workshops. (Reference B.X. 3 038.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 1st.—Storage battery and booster for Waikaremoana Electric Power Board (section 28). (Reference B.X. 2 937.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 15th.—Transformers, for Waikato (section 207). (Reference B.X. 2 985.)

Tenders Accepted.

GRAYS URBAN DISTRICT COUNCIL.—Crompton and Co., Ltd., rotary converters, £3 241.

PRESTON CORPORATION.—Cargo Fleet Iron Co., 75 tons of tram rails, £12 3s. 9d. per ton.

TENTERDEN CORPORATION.—Milsted and Sons, electric light installation at the Town Hall, £35.

RICHMOND (YORKS) GUARDIANS.—D. McLean, electrical lighting installation at the Institution.

GOLCAR URBAN DISTRICT COUNCIL.—Murrant and Smith, electric light installation in Council houses.

GREAT INDIAN PENINSULA RAILWAY.—British Brown-Boveri, Ltd., high-speed electric locomotive.

ROCHDALE BOARD OF GUARDIANS.—Fryer and Hartley, Ltd., electrical installation at Birch Hill Hospital.

CASTLEFORD URBAN DISTRICT COUNCIL.—Masterman and Co., electric light installation at the Town Hall, £47 7s.

METROPOLITAN WATER BOARD.—British Arc Welding Co., Ltd., repairs to boiler firebox at Lea Bridge Works, £11 10s.

BURNLEY CORPORATION.—General Electric Co., Ltd., new electrical fittings for the Council Chamber, at the Town Hall.

HULL CORPORATION.—C. F. Pardoe, electric wiring and fitting in general office, etc., at the electricity works, £450 14s. 6d.

SANTOS DOCKS CO.—Stothert and Pitt, Ltd., 36 patent electric level-luffing cranes for loading and discharging steamers.

WOKING EDUCATION COMMITTEE.—Woking Electric Supply Co. installation of electric bells at the Girls' Secondary School, £13 7s. 6d.

TROWBRIDGE ISOLATION HOSPITAL COMMITTEE.—Edwards and Armstrong, electric light installation at the hospital, £68 19s. 6d.

MINNEY STREET CONGREGATIONAL CHURCH, CATHAYS, CARDIFF.—R. Alger and Sons, Ltd., electric light installation, £142 5s. 6d.

BRISTOL DOCKS COMMITTEE.—Electric Power and Contracting Co., electric light installation in shed X, Welsh Back, Bristol Docks.

IRISH FREE STATE POST OFFICE.—Standard Telephones and Cables, Ltd., supply and equipment of a wireless broadcasting station for Cork.

ESSEX EDUCATION COMMITTEE.—Bailey and Ingledon, electric light installation at Monoux Grammar School, Walthamstow, £669 17s. 2d.

GENERAL MOTORS CORPORATION OF U.S.A.—British General Electric Co., Ltd., of Sydney, about 1 200 lighting units and reflectors for motor car factories in Australia.

GEORGE HERIOT'S TRUST.—B. Pilkington, electrical installation in connection with the erection of new mining laboratories in the Grassmarket, Edinburgh, £795 7s. 1d.

WIMBLEDON CORPORATION.—G. Longfield Beasley, one year's maintenance of Gamewell and Stuart and Moore fire alarm systems in the borough, £159 (recommended).

SHEFFIELD CORPORATION.—English Electric Co., Ltd., supply and erection at Neepsend power station of a 10 000/12 500 kW turbo-alternator, £28 423 (recommended).

SYDNEY CITY COUNCIL.—Ferranti, Ltd., 19 11 000 kVA (B.E.S.A. rating 12 500 kVA) single-phase transformers, to form 33 000 kVA three-phase banks, for Bunnerong power station.

MANCHESTER CORPORATION.—Metro-Vick Supplies, Ltd. Twelve months' supply of "Cosmos" medium-sized cookers

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fitted with totally enclosed boiling plate. The first order is for eighty cookers and boiling plates for existing cookers

DUNDEE CORPORATION.—R. Lindsay, electric light wiring and fitting in connection with extension of Child Welfare Clinic at Nelson Street, Dundee, £84 7s.

GLASGOW CORPORATION.—Heenan and Froude, Ltd., construction of generator house (£52 210) and supply and installation of electrical plant (£91 058) at the new refuse destructor works, Govan.

MANCHESTER CORPORATION.—J. A. Somerset and Co., rearrangement of electric lighting at the Municipal School of Art; R. Seddon and Sons, rearrangement of electric lighting at Ashton Old Road Municipal School.

HAMMERSMITH (LONDON) BOROUGH COUNCIL.—Electroflo Meters Co., Ltd., complete set of Electroflo recording instruments, to be fitted to No. 16 boiler at the electricity works, £242; F. and A. Parkinson, Ltd., stoker motor, £48 10s. (both recommended).

PERUVIAN GOVERNMENT.—Allgemeine Electricitäts Gesellschaft and Bergmann Electricity Works, equipment for hydro-electric power station at Ranboraque, near Callao harbour. The contract includes four 4 200 kW generators and 40 kilometres of h.t. cable, and the cost will be £301 200.

WALSALL CORPORATION.—Brush Electrical Engineering Co. Ltd., turbo-alternators, £48 840; International Combustion Co., Ltd., boiler plant, £91 881; British Insulated Cables Ltd., inter-connecting main between Birchills Station and Ocker Hills Station, £9 200 (all recommended).

NEWCASTLE (STAFFS) CORPORATION.—Callender's Cable and Construction Co., Ltd., laying new electric main in Brunswick Road, Newcastle, £685 6s. 11d. (recommended). Also tendered: W. T. Glover and Co., Ltd., £735 9s. 10d.; Standard Telephones and Cables, Ltd., £739 14s. 7d.; Pirelli-General Cable Co., Ltd., £744 3s. 9d.; MacIntosh Cable Co., Ltd., £746 1s.; W. T. Henley's Telegraph Works Co., Ltd., £748.

LONDON COUNTY COUNCIL.—W. Wadsworth and Sons, supply and erection of an electric goods lift and an electric service lift at the extension of the Hackney Institute. Other tenderers: Titan Lift Co., Ltd., £597; Holt and Willett, £600; Keighley Electrical Engineering Co., £617; J. Barker and Sons, £625; J. Bennie, Ltd., £682 10s.; Etchells, Congdon and Muir, Ltd., £710; Express Lift Co., Ltd., £732; Medway's Safety Lift Co., Ltd., £780; South Wales Lift and Hoist Co., £1 443 10s.

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—Hackbridge Cable Co., Ltd., 1 000 yards 0·40 cable, £420; 1 000 yards 0·0045 by 3 cable, £99; 1 760 yards 3/0·029 by 2 cable, £145, and 440 yards 0·20 cable, £106; Siemens Bros. and Co., Ltd., 2,000 yards 1·0 cable, £1 840; 700 yards 0·50 cable, £353, and 440 yards 0·25 cable, £130 4s. 10d.; Standard Cable Co., Ltd., 1 760 yards 0·04 by 3 cable, £454 1s. 7d., and 1 760 yards 0·0225 by 3 cable, £329 2s. 5d.; Pirelli-General Cable Works, Ltd., 880 yards 0·01 by 2 cable, £88 17s. 7d.

LONDON COUNTY COUNCIL.—Commercial Telephone and Electrical Co., Ltd., wiring and fittings for electric lighting, power, experimental circuits and bells at the Hackney Institute extension, £1 952. Also tendered: Bailey and Incledon, £1 899; C. Mortlock, Ltd., £1 983 10s.; Morris Electrical Co., Ltd., £2 025; Alpha Manufacturing and Electrical Co., Ltd., £2 150; J. M. Connare, £2 478 0s. 7d.; A. Hawkins and Sons, £2 675; A. V. Gifkins and Co., Ltd., £2 718; J. White and Co., Ltd., £3 167; Collins Electrical, Ltd., £3 540; and Borough of Hackney (Electricity Department), £4 137 15s. 5d.

WANDSWORTH (LONDON) BOROUGH COUNCIL.—Smethurst and Co., Ltd., electric light wiring and fitting of first two blocks of dwellings on third section of East Hill estate, £2 067 6s. 6d. Also tendered: Electrical Installations, Ltd., £2 091 2s. 8d.; L. G. Tate and Co., Ltd., £2 134 6s.; H. J. Cash and Co., Ltd., £2 169; Alex. Hawkins and Sons, £2 172; A. Dean and Co., Ltd., £2 232 14s. 6d.; Heath-Pritchard, Ltd., £2 246; T. Clark and Co., Ltd., £2 317; and Commercial Telephone and Electrical Co., Ltd., £2 348 17s. 6d. Chief engineer's estimate, £2 075.

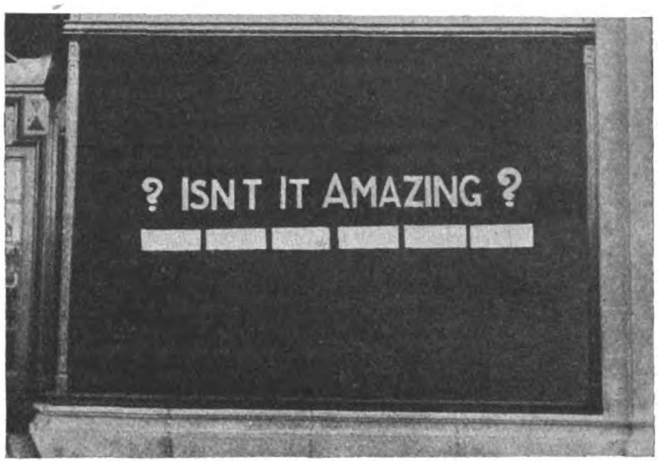
LONDON COUNTY COUNCIL.—Clarke, Chapman and Co., Ltd., stoker-fired boilers for Greenwich power station, £76 190 (accepted), pulverised-fuel boilers for Greenwich power station, £79 944 (alternative). Also tendered: Stirling Boiler Co., Ltd., £82 915; Simon Carves, Ltd., pulverised-fuel boilers, £84 764; Vickers Boiler Co., Ltd., stoker-fired boilers, £85 000; Richardsons, Westgarth and Co., Ltd., stoker-fired boilers, £85 000, pulverised-fuel boilers £100 000 (alternative); Babcock and Wilcox, Ltd., stoker-fired boilers, £86 976; International Combustion, Ltd., pulverised-fuel boilers, £93 100.

STUNT WINDOWS.

A Striking Electrical Display at Southport Showrooms.

ON an earlier page we give the views of a noted window display expert on electrical display work, and below we are able, by the courtesy of Mr. E. Moxon, borough electrical engineer of Southport, to reproduce two views of a striking window scheme which he has recently fitted up.

The whole of the window glass was covered on the inside



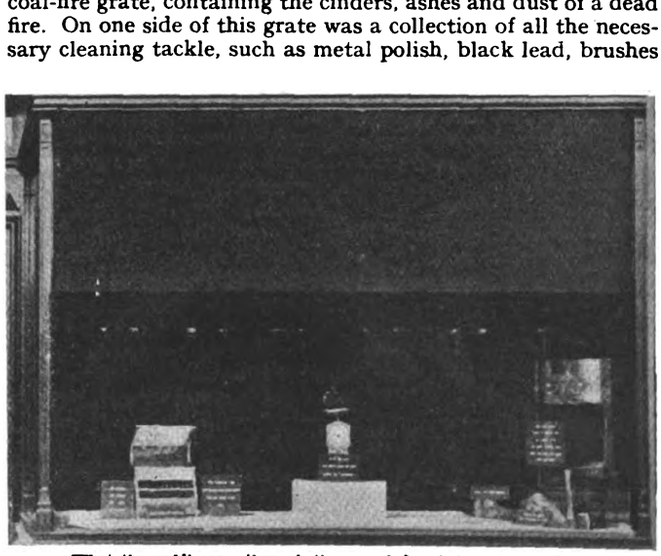
A remarkable Southport electrical display as viewed through peep-holes.

with black paper and, at a height of about 6 ft., the following query was cut out of the paper and the stencil covered from the inside with white paper, " ? ISN'T IT AMAZING ? " Immediately underneath were six slits or peep-holes, measuring 12 in. long by 6 in. wide.

The whole of the window bottom was covered with white glazed paper, and in the centre was placed an ordinary household spring balance with a circular scale reading and pointer. Upon the weighing pan of the balance was one piece of coal weighing exactly 7 lb.

Against this centre-piece was a card which stated, " At four shillings per cwt. this small piece of coal costs 3d., whereas "—there a piece of red ribbon carried the observer's eye to the left of the window where an electric " coal " fire of well-known make was blazing merrily, and a second card which was attached to the other end of the ribbon, stated: " This electric fire can be used for a full hour for the same cost and . . "

To the right of the window was an ordinary drawing-room coal-fire grate, containing the cinders, ashes and dust of a dead fire. On one side of this grate was a collection of all the necessary cleaning tackle, such as metal polish, black lead, brushes



What the public saw through the peep-hole window shown above.

and dusters. On the other side of the grate, a bucket of coal, a coal shovel, an axe, wood chips, paper and matches.

Amongst the cinders and ashes was placed a third card (connected in turn by a red ribbon with Card No. 2) which, completing the above message, stated: ". . . there is none of this kind of thing."

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ELECTRICITY SUPPLY.

Epsom's Municipal Wiring Proposal—New Sub-stations at Rhyl—Electricity Orders Approved—Farmers and the Electricity Bill.

HAWARDEN R.D.C. has decided, subject to modifications, to proceed with its electricity scheme for Penyffordd.

Portland U.D.C. has decided to oppose the application of Weymouth T.C. for an extension Order so far as it applies to the urban district.

A company has been formed for the supply of electric light in Hungerford, Berks, and the P.C. has asked the R.D.C. to support the scheme.

Wirral R.D.C. decided by eight votes to five to authorise the chairman to sign the agreement for the supply of electricity in Wirral by Birkenhead Corporation.

Epsom U.D.C. has decided, subject to the consent of the Electricity Commissioners, to undertake the wiring of domestic premises for lighting, heating and power.

Higham Ferrers T.C. has decided to refuse consent to the erection of overhead mains in the borough by the Rushden and District Electric Supply Co.

Three new sub-stations at Rhyl were formally opened by the Chairman of the Electricity Committee (Mr. Geo. Cain) last Saturday. Current is taken in bulk from the Dolgarrog works.

The Minister of Transport has revoked the powers of the Ormskirk Gas and Electricity Co. under its 1915 Act, so far as they relate to the supply of electricity as to the whole of the area of supply.

Lossiemouth T.C. has approved the proposal to instal new plant at the electricity station, including a crude oil engine with a 60 kW generator. One of the present 25 kW sets is to be thoroughly overhauled.

The Minister of Transport proposes to confirm the Special Order authorising Milford Haven U.D.C. to supply electricity in Milford Haven urban district. Objections to the Ministry of Transport by December 9th.

Kesteven County Council has decided to offer no objection to Greenfield and Son supplying electricity to Market Deeping by overhead lines provided the work is carried out to the satisfaction of the county surveyor.

The Electricity Commissioners have approved electricity orders relating to (1) the urban district of Porthcawl, (2) the urban district of Cwmamman and parts of the rural districts of Llandilo Vawr and Pontardawe.

Big German Loan.

It is stated that Dillon Read and Co., of New York, have arranged a loan of $20 000 000 for the Berlin Communal Electricity Works Co. The rate of interest is 6½ p.c. per annum, and the period of the loan is 25 years.

Mr. C. Thomas complained at a recent meeting of Bedwelty Council that Argoed, which had no lighting in its main street, was the only ward left outside the electricity scheme. The matter was referred to the Lighting Committee.

The Council of the National Farmers' Union has decided that any electricity supply schemes promoted under the Electricity (Supply) Act should be closely watched with a view of every opportunity being taken of pressing the claims of agriculturists.

Ripon Corporation has applied to the Electricity Commissioners for a Special Order to supply electricity in the city and the rural district of Ripon (except the detached part of the parish of Sawley) and part of Wath rural district. Objections to the Commissioners by November 16th.

Mr. J. E. Simpson, borough electrical engineer, Preston, states that the failure in the town's electricity supply, last week, was due to fuel of the poorest quality, which became thoroughly saturated by the rain, and choked the chutes. The failure was not due to any defect in either plant or organisation.

Edinburgh Corporation has applied to the Electricity Commissioners for consent to the alteration of the system and pressure of supply of electricity in the Corporation's area of distribution from three-wire d.c., at 230 and 460 V, to four-wire a.c., at 230 and 400 V, frequency 50. Consumers may make representations on the matter to the Commissioners before December 20th.

The Power Development Co., Ltd., has applied to the Electricity Commissioners for a Special Order to supply electricity in certain parishes in Chapel-en-le-Frith rural district and in Yeardley-cum-Wraley urban and Disley rural districts and parts of Macclesfield rural district. Objections to the Commissioners by December 7th.

A Glasgow firm has offered to supply an engine and dynamo and distribution system for the village of Eaglesham (Renfrewshire) at £885. The District Committee of Upper Renfrewshire is of opinion that it would be more economical to obtain a supply from the Clyde Valley Electrical Power Co., which is to supply electricity to the Weir houses at Eaglesham.

Dartford U.D.C. has been advised that the terms of the West Kent Electric Power Co. for a supply of electricity in bulk are not sufficiently attractive to justify at the present time a cessation of local generation, and unless the Electricity Commissioners are prepared to agree to the Council extending its own generating plant it is proposed to call for a public inquiry into the merits of its application for a loan for such extension.

As there is a prospect of a Government grant being obtained for the laying of an electric cable to Largs with a view to the relief of unemployment, the Electricity Board for the district is disposed to dispense with the usual guarantee of a certain revenue, provided the Largs T.C. undertakes to supply electric lighting in the streets within a year or two. Fairlie, a shipbuilding village through which the cable would pass, is still lit by paraffin.

Stafford R.D.C. has decided to object to the application of the Power Development Co. for an Order which would authorise the supply of electricity in Colwych. The Council states that the parish of Colwych is in the North-West Midlands Electricity District, and it is claimed that a combination of the authorities in the district would better and more cheaply serve the needs of the parish than it could be done by an outside company. It is understood that the Uttoxeter and Rugeley Councils will also oppose the company's application.

Electrical Travellers.

Sir Hugo Hirst Elected President of the E.T.C.T.A.

AT the annual general meeting of the Electrical Trades Commercial Travellers' Association, held at St. Bride's Institute, London, on November 19th, Sir Hugo Hirst was elected president in succession to Mr. C. W. Sully, past president.

Mr. A. S. Markes was appointed chairman with Mr. F. W. Peers as vice-chairman. Other officers were appointed as follows :—Mr. F. C. Chown (hon. treasurer), Mr. F. A. Moon (hon. insurance adviser); Mr. L. Moir (hon. entertainment secretary); Mr. H. Manning (hon. employment register secretary), Mr. A. I. Pidduck (hon. solicitor), Mr. E. Pidduck (auditor), Mr. V. Delebecque (hon. Press secretary) and Mr. R. F. Norris (hon. secretary).

The 1927 committee comprises Messrs. E. V. Askey, V. Delebecque, H. Manning, J. E. Mason, W. J. Wheeler, J. M. Woolnough, L. Ashman, R. F. Riley, W. T. Rushton, J. W. Ward, J. T. Taylor, and G. Ormsby.

A Newcastle Exhibition.

Special Display of W.O.B. Posters on Electrical Contractors' Stand.

A GOOD show of suction cleaners and refrigerators is made at the Better Housing and House-keeping Exhibition, which is being held in Newcastle under the auspices of the "North Mail." Robson and Coleman have an attractive display of electrical fittings mainly for hired-wiring installations, and a range of radiators, suction cleaners, and electric washing machines. Attention is drawn to the W.O.B. Campaign by special posters prominently displayed on the stand, and this effort has drawn many requests for competition booklets.

There is an all-electric café in which an ingenious toaster is used. Immediately the toast is cooked it is automatically ejected from the toaster. The machine can be set for the toast to be crisp or well-browned, as required. The cooking apparatus was supplied on hire to the caterers by the Newcastle-on-Tyne Electric Supply Co.

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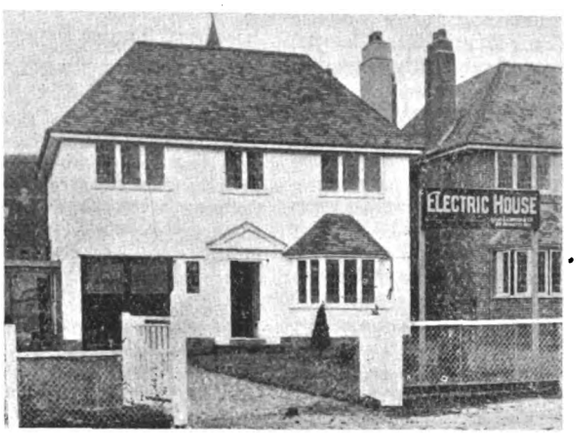
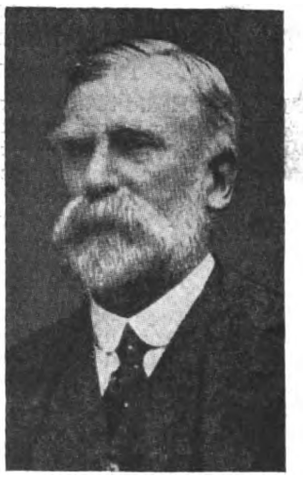
NEWS IN PICTURES

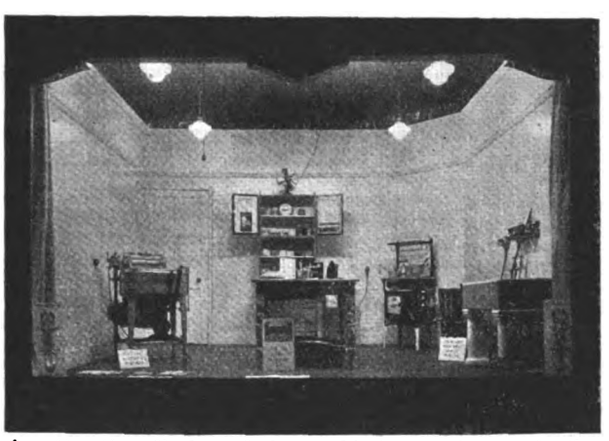
The Mayor and other members of the Corporation snapped outside the W.O.B. demonstration electric house at Lincoln after the official opening ceremony.



A view of the attractive W.O.B. demonstration electric house opened by the Birmingham Electrical Circle at Chester Road, Erdington.



Mr. J. Dalrymple, who has resigned the general managership of Glasgow Corporation Tramways as a protest against the reinstatement of dismissed tramwaymen.



An attractive display of electric kitchen equipment in the window of the Bradford Corporation electricity showrooms. This window was favourably commented on in a recent lecture on "Window Display."

This striking electrical stand at the Newcastle Better Housing and Housekeeping Exhibition prominently displayed W.O.B. posters and from it many competition booklets were distributed by the exhibitors.

TRADE PUBLICATIONS.

Details of Catalogues and Dealer-Helps Issued by Manufacturers.

AMONGST literature recently published by Brookhirst Switchgear, Ltd., Chester, are a folder illustrating Cantie distributive switches, for controlling numerous power, lighting or heating circuits, and an instructive booklet on "Voltage Control on Loaded Distributors." The latter contains useful diagrams and views of transformer regulators, motor operating gear, etc.

Brittain's Electric Motor Co. (formerly Langdon-Davies Electric Motor Co.) has issued new catalogues and price lists of single phase and polyphase squirrel cage and slipring type motors. Other periodicities than those dealt with in the lists will be quoted on application to the firm at the head office, 110, Cannon Street, London, E.C.4, where quotations for starters also will be supplied.

A pamphlet (Ta 159/2) containing a description of a Ferranti 300 000 V testing equipment for a porcelain factory can be obtained from Ferranti, Ltd., Hollinwood, Lancs., and Bush House, London, W.C.2. The description of the testing equipment (which has been supplied to Taylor, Tunnicliffe and Co., Ltd.) is accompanied by excellent illustrations of the transformer, spark gap, platform for wet and dry tests, oil tank for puncture tests, etc.

Delco-Remy and Hyatt, Ltd., 111, Grosvenor Road, London, S.W.1, have issued a leaflet containing descriptions and prices (ranging from 16s. to 75s.) for four electric Remy horns for motor vehicles or motor cycles. The Remy coil ignition unit is described in another leaflet sent out by the company. It is claimed that this equipment ensures immediate starting of automobile engines in all weathers, and it is stated that little labour and time is required for the removal of magnetos and the substitution of the Remy coil system.

We have received from H. W. Sullivan, Ltd., 368-9, Winchester House, Old Broad Street, London, E.C., a section, extending to 28 pages, of the firm's catalogue of d.c. testing apparatus. It contains descriptions and illustrations of Sullivan Universal galvanometers, scale and lamp stands for galvanometers, shunts, resistance boxes, Wheatstone bridges, keys, plug switches, cable testing and signalling sets, cable-testing milliameters, mica condensers, etc.

The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C., has issued recently Bulletin No. 14, describing and illustrating the G.E.C. (McColl Patents) system of protection; leaflet S.3 878, on tumbler switches with coloured ivoride covers and metal base rims; leaflets S.L.4 233 and 4 234, on stage lighting; a small folder (F.4 239) containing illustrations and stating prices of Gecofix electroliers, pendants and wall brackets; leaflet F.4 097, illustrating and describing the Geco dispersive enamelled steel reflectors for direct lighting; leaflet O.S.4 155, on Pearl Osram gasfilled lamps, and leaflet F.4 198, on industrial reflector fittings, Wembley lanterns, Gecoray shop window lighting reflectors and dustproof lighting units.

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WIRELESS NEWS.

New Radio Manufacturers' Association Now Functioning.

THE new Radio Manufacturers' Association, formed as the result of negotiations between the old N.A.R.M.A.T. and the Society of Radio Manufacturers is (THE ELECTRICIAN learns) now functioning as a properly constituted body with a steadily increasing membership.

In order that every member may have a voice in the election of officers the appointment of president and chairman and other officials has been delayed pending a general meeting to be held on December 8th.

The Association will continue to promote radio exhibitions as part of its general policy, and has aleady booked the New Hall, Olympia, London, for next year's Wireless Exhibition. Negotiations are proceeding for dates for similar Olympia exhibitions in 1928, 1929, 1930 and 1931.

Wireless News in Brief.

Wireless telephony is now being used for the first time in Burma—between the office of the Port Trust and the pilot vessel in the Gulf of Martaban.

The American Telephone and Telegraph Co. hopes to establish commercial wireless telephonic communication between America and Britain at an early date.

Following the erection of the new Swedish high-power broadcasting station at Motala, it is expected that relay stations will be set up at Boras, Halmstadt, Uddevalle, and Upsala.

Mr. H. D. Brown, Director of Australian Commonwealth Postal Services, hopes that tests of wireless communication with great Britain from the new beam station at Rockbank and Ballan will take place before Christmas.

At the Hull Wireless Exhibition, from December 4th to 11th, there is to be a competition open to amateur builders of crystal or valve receiving sets within 60 miles of Hull. Two silver cups and gold and silver medals will be awarded.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

PLYMOUTH Tramways Committee has decided to provide 15 new tramcars of the eight-wheel type to replace a number of old cars.

On the Dearne District Light Railway a new type of car, with transverse upholstered seats and heating equipment, is being used experimentally.

It is stated that before the end of the year the eight lifts at the Holborn and Leicester Square Tube Railway stations will run at a speed of 290 ft. per min., compared with the present 180 ft.

The Greenock Tramways Co. has informed the Corporation that owing to the changed conditions in road transport the company may not seek a renewal of the tramway lease, which expires next year.

Rotherham T.C. has decided to promote a Provisional Order to authorise co-operation with the Mexborough and Swinton Tramways Co. in their proposed extensions of the railless trolley vehicle service.

The draft of a Provisional Order for which Glasgow Corporation is applying includes proposals to extend the Knightwood tramway from the old boundary of the city to the new, and to link the Mosspark tramway terminus with the Paisley route.

A large new vestibule tramcar, fitted with automatic brakes, was run for the first time on the Walker-Intake (Sheffield) route last week. Owing to steep gradients, only the lighter type of vehicle has hitherto been run upon this route.

Sheffield Corporation is applying to the Ministry of Transport for a Provisional Order to construct, maintain and work new tramways in Ecclesall and Sheffield. Any objections or representations in regard to the application must be sent to the Ministry of Transport by January 15th.

Four new cars of the saloon type have been introduced on the Hounslow to Hampton Court routes of the London United Tramways. There are now 33 of these cars in service, and altogether 40 are to be built. The improvements include upholstered cross seats, a rubber floor, improved lighting, etc.

E.T.B.I. SUBSCRIBERS.

Further List of Contributions to Funds by Electrical Firms.

PUBLICATION is continued below of the list of subscribers in connection with the annual festival dinner of the Electrical Trades Benevolent Institution :—

A. C. Cossor, Ltd., £10 10s.; C. Combridge, £1 1s.; Wm. Coates and Son, Ltd., £5 5s.; S. H. Cowen, £1 1s.; R. Crittall and Co., Ltd., £2 2s.; Collier and Sons, Ltd., £1 1s.; Coward, Philipson and Co., Ltd., £1 1s.; Robt. W. Coan, Ltd., £1 1s.; E. Coules and Son, £1 1s.; Clarke Brothers (Leicester), Ltd., £5 5s.; Arthur Cort and Co., £1 1s.; Thos. Colson, £5 5s.; Cook and Co., Ltd., £1 1s.; Mrs. F. Crawford, £1 1s.; A. S. Cachemaille, £1 1s.; Collinson's Precision Screw Co., Ltd., £10 10s.; C. Horace Cox, £5 5s.; H. Chaplin and Co., £2 2s.; Charrington, Gardner, Lockett and Co., Ltd., £1 1s.; C. C. S. Corbett, £3 3s.; Coventry Chain Co., Ltd., £1 1s.; A. Cort and Co., £1 1s.; Clifford and Sons, Ltd., £1 1s.; J. Collier and Co., £5 5s.; Cash and Co., Ltd., £2 2s.; W. Curtis, £1 1s.; Crompton and Co., Ltd., £2 2s.; M. Coquantin, £2 2s.; Cellow (Richmond), Ltd., £5 5s.; Curtis Manufacturing Co., Ltd., £2 2s.; F. G. Collis, £1 1s.; J. Coales, £2 2s.; Chalas and Sons, £2 2s.; Wm. Cory and Son, Ltd., £5 5s.; Clark and Graham, 10s.; Callender's Cable and Construction Co., Ltd., £25; A. V. Cannon, 10s.; Chloride Electrical Storage Co., Ltd., £50.

Dalston Press, Ltd., £5 5s.; Dickson and Francis, £1 1s.; J. H. Deeble and Sons, 5s.; J. Dyson, £1 1s.; Dilworth and Carr, Ltd., £1 1s.; Dalyte Electrical Co., £3 3s.; F. D. Docker, £10 10s.; A. Deack, 5s.; Diamond Fibre Co., £1 1s.; Davidson and Co., Ltd., £2 2s.; B. G. Drummond, £1 1s.; Dewrance and Co., £5 5s.; Dawson Manufacturing Co., Ltd., £2; Dunford Bros., Ltd., 10s. 6d.; James Davey and Co., £3 3s.; J. Deed, £2 2s.; L. W. Douthwaite and Co., £1 1s.; Dubilier Condenser Co. (1925), Ltd., £2 2s.; J. O. Dick, £2 2s.; Duckham—(Alex. Duckham and Co., Ltd.), £5 5s.; Bernard M. Drake, £15; H. Dakin and Co., Ltd., £1 1s.; Davis and Timmins, Ltd., £5 5s.; Wm. Douglas, Ltd., £2 2s.; E. Dobson, £2 2s.; J. Dugdill and Co., £2 2s.; Dayzite, Ltd., £2 2s.; D.P. Battery Co., Ltd., £5; Geo. C. d'Albi and Co., £1 1s.; De Claremont and Donner, £2 2s.; Davies, Kent and Stewart, £1 1s.; Delta Metal Co., Ltd., £15; Delta Metal Co., Ltd., £10; Delta Metal Co., Ltd., £15; Sir A. Duckham, £1 1s.; Dussek Bitumen Co., Ltd., £2 2s.; L. A. Dennett, 10s. 6d.; Douglas and Co., Ltd., 5s.; Dickson and Williams, £1 1s.; J. Dodimead and Son, £2 2s.; Allen De Garrs, Ltd., £2 2s.; H. M. Davis, £10 10s.; Docker Bros., Ltd., £2 2s.; F. P. Driver, £1 1s.; W. B. Dick and Co., Ltd., £3 3s.; S. Davis and Co., £1 1s.; H. B. Duce, 10s.; Thos. Dutton, 10s. 6d.; Leaman B. Dennis, £1 1s.

Edwards and Barnes, £2 2s.; Engravers' Guild, Ltd., £2 2s.; W. Elson, £1 1s.; W. T. Ellison, 10s. 6d.; A. C. Eborall, £5 5s.; Ebdons, £1 11s. 6d.; P. Emanuel, £10 10s.; Edwards and Armstrong, Ltd., £1 1s.; G. Edmonds, Ltd., £1 1s.; Escombe, McGrath and Co., £1 1s.; Elliott, Fisher and Co., £2 2s.; Harry Ellis, 10s. 6d.; Enterprise Manufacturing Co., Ltd., £3 3s.; K. Edgecumbe, £1; Equipment and Engineering Co., £1 1s.; Eburite Paper Co., Ltd., £2 2s.; Electricity Services, Ltd., £2 2s.; Elliott's Metal Co., Ltd., £21; E. Elliott, £1 1s.; Ellis, Bradshaw and Co., £1 1s.; Allan, Edgar and Co., Ltd., £5; M. V. Ely, £5 5s.; R. E. V. Ely, £1 1s.; Edmundson's Electricity Corporation, £10 10s.; Ever-Ready Co. (Great Britain), Ltd., £105; Ericsson Telephones, Ltd., £5 5s.; W. S. Edwards, £1 1s.; Electrical Association for Women, £1 1s.; Ellis and Mort, £1 1s.; Earle, Bourne and Co., Ltd., £2 2s.; Evershed and Vignoles, Ltd., £100; Enfield Cable Works, Ltd., £25; Electromotors, Ltd., £10; Ellis and Son, 5s.; Electrical Installations, Ltd., £3 3s.; Empyrium Welding and Manufacturing Co., Ltd., £1 1s.; Eccles, Burrows and Co., £1 1s.; Effingham Steel Works, Ltd., £10 10s.; Eames Bros., £3 3s.; G. W. Edwards, £5; Electrical Press, Ltd., £5 5s.; Electrical Trades Commercial Travellers' Association, £5 5s.; East London Rubber Co., £5 5s.; J. R. English, 10s.; Justus H. Eck, £2 2s.

R. Howard Fletcher, £2 2s.; J. Fenton, Ltd., £1 1s.; Thos. Firth and Sons, Ltd., £10 10s.; Wm. Frisby, 10s.; Robert Fleming, £25; Farnworth and Masheder, Ltd., £1 1s.; Ford, Ltd., £1 1s.; W. Fuller, 10s.; Frodingham Iron and Steel Co., Ltd., £1 1s.; Edmund O. French, £1 1s.; T. M. Fairclough and Sons, Ltd., £2 2s.; A. Feld, £1 1s.; J. Fotheringham, £2 2s.; Falk, Stadelmann and Co., £10 10s.; T. M. Fairclough and Sons, £1 1s.; F. D. Frost, 10s. 6d.; T. W. Ferry, £1 1s.; Franco-British Electrical Co., Ltd., £3 3s.; Foster and Co., £1 1s.; E. and W. French, Ltd., 10s.; J. Fletcher, Ltd., 10s. 6d.; W. Falcon, 10s. 6d.; Farnan and Co., Ltd., £3 3s.; Frost and Sons (Moxley), Ltd., £3 3s.; H. Fletcher, £1 1s.; Fergusson, Wild and Co., Ltd., £5 5s.; Ferranti, Ltd., £50; G. H. Franklin, 10s.

T. H. Greaves, £1 1s.; B. L. Goodall, £5 5s.; T. J. Grainger and Co., Ltd., £1 1s.; W. B. Gunn, £2 2s.; Thos. Goldsworthy and Sons, 10s. 6d.; D. W. Greenhalgh and Son, £1 1s.; Gambrell Bros., Ltd., £2 2s.; H. D. Goudie, 5s.; Griffiths Bros. and Co. (London), Ltd., £5 5s.; Ganeval and Callard, Ltd., £1 1s.; Gardner and Sons, Ltd., (Gloucester), £2 2s.; H. Gardner and Co., Ltd., £26 5s.; General Transport Co., Ltd., £2 2s.; Grey and Martin, Ltd., £1 1s.; Gracie, Beazley and Co., £2 2s.; A. V. Gifkins and Co., Ltd., £1 1s.

(To be continued).

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COMPANY NEWS.

Market for Electrical Shares Quiet—Price Movements Irregular—Brazilian Company and the Loewenstein Proposals.

THE market for electrical shares—supply, transport and manufacturing—has been quiet during the past week, and price movements irregular. At the time of writing, Charing Cross shares show a decline of 1s. 3d. as compared with a week ago, and City of London shares a rise of the same extent. District Railway ordinary stock has lost part of last week's rise, but Met. preference has put on 10s. The fizz appears to have gone out of the equipment market, but Ferranti 7 per cent. second prefs. have changed hands at 18s. 9d., and English Electric ordinary are 6d. higher at 14s. 6d. British Thomson-Houston preference at 22s. 9d. are 3d. to the good, but Brush Electrical shares, which last week improved 7½d., have lost it this week. A couple of telegraph debenture stocks, Eastern 4 per cent. and Eastern Extension 4 per cent., have dropped a point.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest
	Electricity Supply.				
10	Brompton & Kensington Ord. ..	30/-	30/-	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	90	90	100	67
15	Charing Cross Elec. Ord. (£1) ..	46/3	47/6	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	40/-	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	50/7½	49/4½	52/6	20/3
6	,, ,, 6% C.P. ..	23/-	23/-	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	62/6	62/6	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£5)	17	17	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	35/6	35/6	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	40/7½	40/7½	41/6	8/-
4½	,, ,, 4½% C.P. ..	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	22/6	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord. (£5) ..	18½	18½	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	41/3	41/3	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
6	,, ,, 6% C.P. ..	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	144½	144½	123	24
6	,, ,, 6% Pf. Stk. ..	110	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd)	69	69	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	77½	77½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	57½	57½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	76½	76½	89	65
4	Lon. Un. Trams. 1st Deb. ..	40½	40½	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	65½	65½	101½	49
5	,, ,, 5% Deb. ..	66½	66½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	62	62	84½	19
3½	,, 3½ Pf. Stk.	64	63½	88½	40½
3½	,, 3½% Deb.	69½	69½	92½	51
3½	Met. Dis. Ord. Rly. Stk. ..	57	58½	58	12½
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb. ..	68	68	73½	48½
5	Yorks. (W.R.) Trams. Ord. ..	12/6	12/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	67/6	67/6	62/-	26/6
6	,, ,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	22/9	22/6	23/4	19/7
7	,, ,, ,, 7% Deb.	104½	104½	107½	92
10	Brush Electrical Ord.	26/3	26/10½	29/-	10/-
‡15	Callender's Cable Ord.	65/-	65/-	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref.	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)	12/9	12/9	28/9½	1/1
7½	,, ,, 1st Pref. ..	22/6	22/6	26/-	5/-
10	Elec. Construction Ord. ..	31/10½	31/10½	30/4	6/7
7	,, ,, 7% C.P. ..	23/1½	23/1½	25/3½	16/-
—	English Elec. Ord.	14/6	14/-	29/3	7/3
6	,, ,, 6% C.P. ..	17/6	17/6	21/3	10/6
—	Ericsson Telephones 7% Pref.	21/10½	21/10½	21/-	12/7
6	Ferranti 6% Pref.	19/3	19/3	18/6	16/9
7	,, 7% 2nd Pref. ..	18/9	18/-	19/-	13/9
7½	General Elec. Ord.	29/6	29/6	59/-	13/6
20	W. T. Henley's Ord.	80/-	80/-	86/6	23/3
17½	Johnson & Phillips Ord. ..	56/3*	56/3	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	23/9	23/9	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	46/3	46/3	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	29/4½	29/4½*	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	29½	29½	56/2/6	19
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	74½	74½	87½	60
10	Eastern Ord. Stk.	180½	180½	213½	113/2/6
3½	,, 3½% Pref. Stk. ..	66½	66½	84/17/6	49
4	,, 4% Deb.	77½	78½	103½	60
10	Eastern Extension Ord. (£10) ..	18½	18½	21½	10/12/6
4	,, ,, 4% Deb. ..	77½	78½	97½	60
22	Gt. Northern Telegraph (£10) ..	27	27	42/12/6	19
‖10	Indo-European (£25)	47½	47½	59½	25
—	Marconi's Wireless T. Ord. ..	16/3	16/3	9/16/3	20/9
7½	,, Int. Mar.	22/6	22/6	5/11/3	14/11
20	Western Tel. Ord. (£10) ..	17½	17½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	77½	78½	10	60/2/6

* Ex-dividend. ‡ Plus share bonus. ‖ Including bonus.

CHLORIDE ELECTRICAL STORAGE CO., LTD.—Intm. div. 5 p.c., actual, tax free, on ord. shs.

PENNSYLVANIA WATER AND POWER CO.—Div. $2 p. sh. on common shs. for quarter ending December 31st, payable January 3rd.

DUMBARTON BURGH AND COUNTY TRAMWAYS CO., LTD.—It is stated that the company is not at present in a position to pay the interest on the 5 p.c. deb. stk., due on November 11th.

CALCUTTA TRAMWAYS CO., LTD.—Directors have decided not to make intm. distribution on ord. shs., but to defer question of div. until accounts to December 31st next are prepared.

ADELAIDE ELECTRIC SUPPLY CO., LTD.—Existing shareholders have been invited to subscribe for an issue of 250 000 6½ p.c. cum. pref. shs. of £1, at par. Forms from the London manager. The list will close on December 1st.

SHAWINIGAN WATER AND POWER CO.—The directors have passed a by-law converting the shares into shares without par value, on the basis of four of the latter for each $100 share. The shareholders will meet on December 16th to consider the by-law.

QUEBEC POWER CO.—At a special general meeting last week, by-laws were confirmed providing for: (1) the redemption of the issued preferred stock, with an option in favour of the holders for conversion into common stock, share for share; and (2) increasing the capital stock from $10 000 000 to $15 000 000.

AMAZON TELEGRAPH CO., LTD.—Gross rev. for year ended June 30th, £70 684, working exes. £34 171; income tax, £346; deb. int., £6 773; sinking fund, £16 095; pft., £13 299, plus £3 438 brt. in. To gen. res., £3 000, to res. for renewal and maintenance of cable steamers, £3 000. Div. 4 p.c., less tax, fwd., £2 737.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—Gross earnings for September from operation of services operated by subsidiary companies: $3 412 431, increase $566 340, net earnings, $1 911 351, incr. $397 063. Aggregate from January 1st, gross, $29 447 035, incr. $7 327 184; net, $16 802 431, incr. $4 267 224.

WESTERN TELEGRAPH CO., LTD.—Rev. for year ended June 30th, 1926, £1 541 100, working expenses £839 881. Deb. stk. int. required £32 747, income tax £77 845, balce. £590 626, plus £300 440 brt. in. To gen. res. £250 000. Four divs. of 2½ p.c. each have been paid, making 10 p.c., tax free, for year; forward £329 171.

COMPANIES TO BE STRUCK OFF THE REGISTER.—The following will be struck off the Register of Joint Stock Companies unless cause to the contrary is shown before January 22nd:—Borra Magneto Repairing Co., Multi Electrode Radio Valve Co., Savoy Electric Construction Co., Wimbledon and Sutton Railway Syndicate, Woodhouse and Baillie, Riviera Electricity Co.

CHELSEA ELECTRICITY SUPPLY CO., LTD.—At the extraordinary meeting last week, resolutions were carried unanimously to increase the capital to £450 000 by the creation of 50 000 additional £1 shares, and to capitalise £148 308 of undivided profits and distribute it to ordinary shareholders in the form of £1 fully paid ordinary shares in the proportion of three new shares for every five shares held.

SOUTH AMERICAN ELECTRICITY CO., ZURICH.—Swiss financiers are promoting this company with a capital of 30 000 000 Swiss francs. It is stated that British capital will probably co-operate, and the Compania Italo-Argentina de Electricidad, of Buenos Ayres, will supply 10 000 000 francs. The acquisition of interests in light, power and traction undertakings at Lima, Buenos Ayres and Bahia Blanca is contemplated.

BRAZILIAN TRACTION, LIGHT AND POWER CO., LTD.—The gross earnings of the tramway, gas, electric lighting, power and telephone services operated by the subsidiary companies in October, 1926, were $3 200 476, increase $99 513, and the aggregate from January 1st is $32 647 511, increase $7 426 697. The net earnings for the month were $1 782 954, increase $97 211, and the aggregate was $18 583 385, increase $4 364 435.

EVER READY CO. (GREAT BRITAIN), LTD.—The directors have decided to offer a new issue of 71 200 ordinary shares to both the ordinary and preference shareholders in proportion

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to their existing holdings. The shareholders will be entitled to apply for one new ordinary share for every seven shares of either or both classes held by them, at 50s. per share. Applications to the Westminster Bank, Ltd., 490, Holloway Road, London, N.7, by December 4th.

SOUTHERN BRAZIL ELECTRIC CO., LTD.—Pft. for 1925, £334, compared with loss of £20 860. Improvement due to increased currency earnings combined with considerable rise in Rio exchange. Increase in loss in exchange has mainly arisen in connection with remittances to England. A sum of £32 986 owing on December 31st, 1925, in respect of one year's deb. int. has since been paid, and amount due for income tax arrears has been substantially reduced.

LOEWENSTEIN FINANCE.—Attention of directors of Brazilian Traction, Light and Power Co., Ltd., has been called to proposal made to its holders of ord. shs., by Mr. Alfred Loewenstein on behalf of new Canadian company—the Hydro-Electric Securities Corporation—offering in exchange for their shs., shs. in new Canadian Co., it being stated that such company will have controlling or important interest in other hydro-electric enterprises not in any way connected with Brazil. It is opinion of board that any such fusion or alliance of Brazilian Traction Co. with other companies not connected with Brazil would not only be no benefit to Brazilian Traction Co., but, on contrary, it would have most harmful results for company's undertaking and shareholders. The board announce that they will oppose any such project as company is gradually emerging from effects of conditions produced by war. There has been a steady improvement in its affairs, and board believes this will continue, but such result will not be hastened by carrying out of Loewenstein or other like proposal, but will probably be seriously retarded. Accordingly, board advises shareholders not to exchange their shares in accordance with proposal made, or any other proposal along similar lines.

Company Meetings.

SOUTHERN BRAZIL ELECTRIC CO., LTD.—Mr. E. H. Tootal, presiding at the meeting last week, said the balance sheet for the past year showed a small profit. But for the low rate of exchange in the early part of 1925 the result would have been more favourable. The installations of that company and the subsidiary companies had all been kept in good order, and were working with the usual regularity, and the earnings showed a steady increase. Brazil had lately gone through a very severe financial crisis, which reduced the purchasing power of the general community. An improvement was reported to have set in, and the financial crisis had not affected the companies' revenues. The report and accounts were adopted.

SUBMARINE CABLES TRUST.—Sir John Denison-Pender, presiding at a meeting of the certificate holders last week, said he had foreshadowed in May last that the trustees hoped to be in a position to terminate the Trust after the next drawing of certificates in May, 1927, but they had since decided to prepare for an earlier division of the net proceeds among the holders of the coupons of reversion. They had realised their holding in the American Telegraph and Cable Co., and the profit from the sale of the whole of their securities would be about £279 500. Provision had been made for the redemption of the 333 outstanding certificates at £120 per certificate, plus 10s. for interest. The report and accounts were adopted, and a resolution was passed authorising the trustees to deduct by way of remuneration since April 16th, 1926, and until the final winding-up of the Trust, a sum equal to 1 per cent. from the amount payable to the holders of the coupons of reversion.

New Companies.

E. A. MANUFACTURING CO., LTD.—Cap., £1 500. Manufacturing electrical engineers, etc. Reg. office: 105, Dollman Street, Vauxhall, Birmingham.

WOODSCOTT ELECTRICAL CO., LTD.—Cap., £200. Electrical and mechanical engineers, welders, etc. Reg. office: Manor Chambers, 26, Central Drive, Blackpool.

C. E. JACOB AUTOMOBILE ELECTRICAL SERVICE CO., LTD.—Cap., £10 000. Mechanical and electrical engineers, etc. A director, C. E. Jacob, South Hill, Blackrock, Dublin.

PRIORY ENGINEERING CO. (ACTON), LTD.—Cap., £200. Electrical, wireless engineers, dealers in engineering and electrical accessories, etc. Reg. office: 337, Acton Lane, Acton, London, W.3.

BURDETT WELDING CO., LTD.—Cap., £500. Repairers, by oxy-acetylene and electric welding systems, of motors for automobiles, etc. Reg. office: 35, Walbrook, London, E.C.4.

RUSKINGTON ELECTRIC SUPPLY CO., LTD.—Cap., £2 000. To carry on the business of an electric light company in all its branches. Secretary: J. B. B. Whelan, The Paddocks, Ruskington.

BRUNWEC, LTD.—Cap., £5 000. Merchants, brokers and factors and other businesses, especially those connected with the electrical trades. Reg. office: 14, The Pentagon, Sea Mills Park, Shirehampton, Bristol.

SHEFFIELD WIRELESS DEPOT (1926), LTD.—Cap., £500. To acquire business of wireless apparatus dealer now carried on by T. F. McDonald at 178, Norfolk Street, Sheffield, as the "Sheffield Wireless Depot."

WORK METERS, LTD.—Cap., £12 600. Manufacturers and salesmen of work meters and other recording apparatus of machinery, electrical, mechanical or otherwise, etc. Reg. office: 25, Victoria Street, London, S.W.1.

TYCHE, LTD.—Cap., £100. Electrical engineers, electricians, electrical and general wiring contractors, manufacturers of and dealers in electrical and wireless apparatus, etc. Reg. office: 175, Piccadilly, London, W.1.

SECOND ELECTRIC SUPPLY CORPORATION, LTD.—Cap., £5 000. To carry on the business of an electric light and power company in all its branches. Reg. office: 424, Salisbury House, London Wall, London, E.C.2 (Public company).

ALFRED VERNON POWER AND ENGINEERING CO., LTD.—Cap., £1 000. To acquire the business of electricians and dealers in electricity carried on at Irby Road, Heswall, Cheshire, as the "Pensby Estate Electric Supply." Reg. office: 18, James Street, Liverpool.

EUNICE WIRELESS CABINET WORKS, LTD.—Cap., £1 000. To acquire the business of Isaac Cooklin now carried on by him at 16, McGrath Place, Hoxton Street, London, N., as the "Eunice Wireless Cabinet Works." Reg. office: Walter House, 418, Strand, London, W.C.2.

FULLER ACCUMULATOR CO. (1926), LTD.—Cap., £50 000. The objects are to carry on the business of mechanical and electrical engineers, manufacturers of accumulators and primary batteries, wireless loud speakers and components, etc. Reg. office: Woodland Works, Chadwell Heath.

E. MERCER, LTD.—Cap., £2 000. To acquire the business of an electrical and wireless engineer and contractor now carried on by Eli Mercer at Bridge Street, Castleford, 67, High Street, Normanton, and Corn Market, Pontefract, as "E. Mercer." Reg. office: 37, Bridge Street, Castleford, Yorks.

EXCELSIOR ELECTRIC CLEANER CO., LTD.—Cap., £5 000. To acquire business now carried on as the Excelsior Electric Cleaner Co., to acquire trade mark No. 461 874, registered November 23rd, 1925, in the name of H. E. Chamberlin, known as "Excelsior," etc. Reg. office: 5, Robert Street, Adelphi, London, W.C.2.

GRAHAM AMPLION, LTD.—Cap., £100 000. To adopt agreement with Alfred Graham and Maria Graham (exors. of the late Edward Alfred Graham) for the acquisition of the business of manufacturers (*inter alia*) of the Amplion loud speaker, formerly carried on as Alfred Graham and Co., including amongst other trade marks the registered trade mark "Amplion" No. 408 176 of 1920, etc. Secretary: F. A. Philo, 25 and 26, Savile Row, London, W.

ALFRED GRAHAM AND CO., LTD.—Cap., £40 000. To adopt agreement with A. Graham and Maria Graham (executors of the late E. A. Graham) and to carry on and develop the business of manufacturers of naval and other telephones, electrical apparatus used in connection with wireless loud speakers, and other electrical apparatus, formerly carried on as Alfred Graham and Co., etc. Secretary: F. A. Philo, St. Andrews Works, Crofton Park, London, S.E.

Metal and Chemical Prices.

TUESDAY, November 23rd

		Price.	Inc.	Dec.
***Copper*—**				
Best Selected	per ton	£63 7 6	—	12s. 6d.
Electro Wirebars	,,	£65 15 0	—	7s. 6d.
H.C. Wire, basis	per lb.	9¼d.	—	⅛d.
Sheet	,,	9¾d.	—	—
***Phosphor Bronze*—**				
Wire (Telephone) basis	per lb.	1s. 0½d.	—	⅛d.
***Brass* 60/40—**				
Rod, basis	per lb.	7⅛d.	—	—
Sheet, basis	,,	10¼d.	—	—
Wire, basis	,,	10⅛d.	—	—
***Pig Iron*—**				
Cleveland Warrants	per ton	£6 5 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 0 0	—	—
***Lead Pig*—**				
English	,,	£30 10 0	—	10s. 0d.
Foreign or Colonial	,,	£29 0 0	—	10s. 0d.
***Tin*—**				
Ingot	,,	£312 2 6	12s. 6d.	—
Wire, basis	per lb.	3s. 11d.	—	—
Aluminium Ingots	per ton	£112 0 0	—	—
Spelter	,,	£33 6 3	—	13s. 9d.
Mercury	per bottle	£17 0 0	—	—

Sulphur* (Flowers)**—Ton £11 15 0 ***Sodium Chlorate—Per lb. 2½d.
,, (Roll-Brimstone)—,, £10 10 0 ***Sulphuric Acid*** (Pyrites, 168°)
Copper Sulphate— ,, £25 to £25 10s. per ton, £6 15 0
Boric Acid (Crystals) ,, £37 ***Sodium Bichromate***—Per lb. 3½d.
Rubber—Para fine, 1s. 7½d.; plantation 1st latex, 1s. 7⅛d.

The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

FAULKNER, J. F. and A. E., 20, Market Street, Penistone, near Sheffield, electrical engineers. £14 6s. 2d. October 15th.

GREGORY, Mr. B., 26, Britannia Street, Barnsley, Electrical engineer. £13 15s. 10d. October 8th.

HAWKINS, Mr. S., Russell Buildings, Frankfort Street, Plymouth, electrical factor. £18 15s. 2d. October 21st.

METCALF, William, 30, Mount Pleasant, Norwich, dealer in wireless goods. £16 4s. 9d. October 13th.

MODERN RADIO LTD., 43A, Grainger Street, Newcastle-on-Tyne, £16 12s. 10d. October 18th.

RILEY, Mr. A., 14, Slater Street, Great Bridge, electrical contractor. £12 6s. 7d. October 1st.

WOODROFFE, Frank, 247A, Kentish Town Road, N.W., wireless manufacturer. £23 0s. 3d. September 27th.

Deeds of Arrangement.

BYWATER, Stanley Charles, late trading as J. AND B. RADIO SUPPLIES, 34, Oxford Street Chambers, Reading, and now residing at Thirlmere, Sonning Common, wireless factor. Filed November 19th. Trustee, C. Latham, 78, New Oxford Street, W.C., accountant. Liabilities unsecured, £801; assets, less secured claims, £250.

HOLMES, Dennis George Frederick, 177, Lower High Street and 18, Witton Street, Stourbridge, electrical engineer. Filed November 18. Trustee, G. W. Sparrow, 3, Newhall Street, Birmingham, I.A. Liabilities unsecured, £1 200; assets, less secured claims, £752.

JONES, Walter Richard, trading as ASSOCIATED WIRELESS, 289A, King's Road, Chelsea, wholesale wireless dealer or factor. Filed November 15th. Trustee, A. E. Hepburn, 5, Winchester House, Beaufort Street, S.W., I.A. Liabilities unsecured, £873; assets, less secured claims, £125.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BRITTAIN (J. V.), AND CO., LTD., Stoke-on-Trent, electricians, —Registered November 3rd, £1 172 debentures, to G. G. Poppleton. 26, Corporation Street, Birmingham, C.A.; general charge.

CLAREMONT JOHNSON AND CO., LTD., London, W., manufacturers of electrical appliances.—Registered November 5th, £3 000 debentures (filed under Sec. 93 (3) of the Companies (Consolidation) Act 1908), present issue £2 000; general charge. *Nil. July 3rd, 1925.

RADIONS, LTD., Bollington, manufacturers of radio apparatus. —Registered November 2nd, £1 200 1st debenture, to R. Dobson and another. Mosley Street, Manchester; general charge. *Nil. January 6th, 1926.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Company Winding-up Voluntarily.

MODERN RADIO, LTD. T. M. Richardson, accountant, 54, Cloth Market, Newcastle-upon-Tyne, appointed liquidator, September 11th.

Bankruptcy Information.

BEBBINGTON, Harold, 14, Cestrian Street, Bolton, electrical engineer. Receiving order, November 16th. Debtor's petition.

FENTON, Reginald, electrical engineer, 514, Sheffield Road, Chesterfield. First meeting, November 26th, 11.30 a.m., Official Receiver's Offices, 4, Castle Place, Nottingham. Public examination, December 10th, 12.30 p.m., County Court, Market Hall, Chesterfield.

REEVES, Reginald Percy, trading as the LUXRAY SPOTLIGHT PROJECTOR COMPANY, 5, Say's Corner, North Quay, Great Yarmouth, electrician. Receiving order, November 18th. Debtor's petition.

WOODGATE, Ernest Frederick, 7, St. John's Terrace, Weymouth, electrical engineer. Receiving order, November 19th. Debtor's petition.

Notice of Dividend.

WOODHEAD, Laurence Arthur, trading as "L. WOODHEAD," 25A, Charles Street, Bradford, wireless dealer. First and final dividend, 7s. 2½d. per £, payable, November 26th. Official Receiver's Office, 12, Duke Street, Bradford.

Application for Discharge.

PARRIS, Harold Edward (trading as St. GEORGES ELECTRICAL MANUFACTURING CO.), 134, Upper Thames Street, London. Hearing, December 14th, 11 a.m., Bankruptcy Buildings, Carey Street, London, W.C.2.

Bankruptcy Proceedings.

BRITTAIN, Percival Frederic (trading as BRITTAIN'S ELECTRIC MOTOR CO.), East Down Works, Dermody Road, Lewisham, S.E., and 110, Cannon Street, London, E.C. At the public examination in the London Bankruptcy Court last week the debtor (liabilities £6 844 of which £3 026 is unsecured, and assets estimated by him as sufficient to realise a surplus of £12 877 after payment of all claims) stated that he had carried on business as an electrical engineer since 1898 with an office at 110, Cannon Street, E.C., and he had also traded as a bronze founder under the style of Armstrong and Co. In 1912 he bought the assets of an engineering company for £3 000 and began business as Brittain's Electric Motor Co., electric motor manufacturer, at East Down Works, Lewisham. The trading proved a success until 1921 but it had since been adversely affected by industrial disputes and foreign competition. In consequence of executions levied at his business premises in August last he was advised to file his petition, and this he did. The debtor, who has also acted as a director of two limited companies, attributed his failure to trade depression and to his inability to recover money to discharge the claims of the execution creditors. He had kept a complete set of books of account. It was a fact that he had lodged a scheme for the benefit of his creditors but this had been rejected. The following are creditors:—Airedale Electrical and Manufacturing Co., Ltd., Bradford, £45; Bull Motors, Ltd., Ipswich, £102; Electrical Apparatus Co., Ltd., London, £93; Electro-Dynamic Construction Co., Ltd., £61; Ellison, G., Birmingham, £105; Flather and Co., Leeds, £47; Midland Electric Wire Co., Lutterworth, £49; Premier Electric Control Co., Willesden, £320; Robinson, J. H., and Sons, Bromley-by-Bow, £54; Sankey, J., and Sons, Ltd., Bilston, £146; Walker, Brandon and Co., London, £510.

DE LEEUW AND CO., LTD., dealers in radio and electrical apparatus, Sentinel House, Southampton Row, London, W.C. Under a winding-up order made against this company on the petition of a moneylender with a claim of £230 the statutory meetings of the creditors and of the shareholders were held on November 17th. The Official Receiver said that the company was formed in April of last year with a nominal capital of £500, afterwards increased to £10 000. Harry de Leeuw was appointed managing director for one year at a remuneration of £20 a week, but resolutions were afterwards passed, although no confirmation could be traced, increasing it to £40 and the term of office to ten years. In consequence of the very imperfect condition of the books of account it had been impossible to ascertain exactly what had been paid to him, but the salary list, which showed the managing director's fees at £20 a week, the secretary's salary at £10, the technical advisor's at £5 and a fee of £8 a week to a director who had subscribed for £500 shares had amounted to £2 236 a year. On the other hand the trading account which dated from the inception of the company to May 22nd last showed that the business had been conducted at a net loss of £1 930. Continuing, the Official Receiver said that under an agreement dated May 4th, 1925, the company acquired de Leeuw's interest in certain agency agreements for £500 in cash, but by means of a book entry the cash was credited against 500 ordinary shares allotted to him. The issued capital consisted of such shares and of £2 650 preference shares allotted for cash. The business of the company had chiefly consisted of the sale of Freed-Eismann wireless sets and components. The Official Receiver added that in consequence of the unsatisfactory financial position of the company which had been brought about by the transactions entered into by de Leeuw he was requested to resign, the company's auditors being instructed to investigate the position and prepare accounts. It appeared from the report that had been made that extreme difficulty had been experienced in preparing accounts in consequence of the condition of the books of account and lack of the necessary documents and vouchers. It had been impossible to obtain an explanation from de Leeuw because he was stated to have left the country and although he was thought to be in Holland his precise whereabouts had not been discovered. The liabilities of the company, however, apparently amounted to £2 690, and it was anticipated that the assets would realise £100.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

245 264 J. F. Lister and H. W. Smallwood. Automatically oscillating electric fans. (13/12/24.) (Cognate applications 8 208/25 and 19 542/25.)
245 270 F. O. Helliwell. Electric circuit-testing and like apparatus. (24/12/24.)
245 272 R. Amberton and J. R. Walton. Electrical controllers. (31/12/24.)
242 937 General Electric Co., Ltd. Manufacture of translucent or coloured bulbs, more especially for electric incandescent lamps. (13/11/24.)
245 314 W. A. F. Pfanhauser and Langbein-Pfanhauser Werke Akt.-Ges. Withdrawal of vapours and gases from electrolytic tanks. (30/3/25.)
231 490 British Thomson-Houston Co., Ltd. Voltage regulation of exciters (26/3/24.)
245 319 E. A. Graham. Telephonic receivers. (31/3/25.)
235 150 Soc. d'Applications et de Fabrications Industrielles Safi. Electric machine with rotating magnets. (7/6/24.)
232 608 Soc. Lerolle et Cie. Systems for transmitting electric oscillations over power circuits. (16/4/24.)
245 330 C. R. Belling. Electric cooking and heating apparatus. (1/5/25.)
235 575 Kleinschmidt Electric Co. Inc. Motor control arrangements for type-printing telegraph systems. (5/7/23.) (Divided application on 218 643.)
238 528 Akt.-Ges. Brown, Boveri et Cie. Electrically driven ceiling fans (18/8/24.)
243 672 National Carbon Co. Inc. Electric flashlights. (1/12/24.)

Applications for Patents.

October 25th.

26 691 F. A. Andrews and L. D. Macgregor. Wireless receivers.
26 679 (Automatic Electric Co.). Automatic Telephone Manufacturing Co., Ltd. Telephone systems. (25/8/25.)
26 678 N. Blades and Sterling Telephone and Electric Co., Ltd. Electro-magnetic relays.
26 680 J. Bowyer and Callender's Cable and Construction Co., Ltd. Metal-sheathed electrical conductors.
26 621 British Thomson-Houston Co., Ltd. Regulators for electric machines, etc. (U.S., 28/10/25.)
26 624 R. C. Clinker and T. H. Kinman. Thermionic rectifier systems.
26 640 J. H. Cotton and J. W. J. Rogers. Holding device for electric glow lamps.
26 606 W. Dubilier. Spark-gaps and sparking-plugs.
26 627 and 26 629. Electric Furnace Co., Ltd., and G. E. Taylor. Electric furnaces.
26 628 Electric Furnace Co., Ltd., and G. E. Taylor. Electric induction coils.
26 658 J. Y. Fletcher and F. G. Quance. Electric fires.
26 684 K. E. L. Guinness. Sparking plugs.
26 593 G. S. Holland. Electrical earth connections.
26 590 W. J. Ricketts. Current-rectifying devices.
26 582 J. E. Ruthven. Electric switches.
26 646 P. M. R. Salles. Electrolytically sterilising water.
26 597 S. Strauss. Electric measuring apparatus. (23/1/26, Austria.)
26 740 and 26 741 Studienges fur Wirtschaft u. Industrie. Insulators. (27/10/25, Germany).

October 26th.

26 756 British Thomson-Houston Co., Ltd., C. F. Humphreys, R. D. Parry and W. Petch. Electric distribution systems.
26 728 C. G. Eden and General Electric Co., Ltd. Electrical measuring, etc., instruments.
26 709 J. W. Gillie. Electric logs for ships.
26 736 R. Hornby and E. H. Wratten. Prepayment electric supply systems.
26 766 E. C. R. Marks (Bruning u. Sohn). Loud speaker.
26 778 Metropolitan-Vickers Electrical Co., Ltd. Electrical signalling and/or controlling systems. (17/12/25, U.S.)
26 727 H. Russell. Thermionic tubes.
26 811 W. A. Stevens. Control of starters of electric motors.
26 742 Studienges fur Wirtschaft u. Industrie. Insulators. (17/7/26, Germany.)
26 731 A. V. Watson. Electrical accumulators.

October 27th.

26 875 R. H. Barbour. Electric circuit-breakers.
26 839 A. Bursill. Electrical resistance thermometers.
26 879 E. K. Cole. Thermionic valve holders, etc.
26 832 G. J. Duckett and M. M. Duckett. Electric current calculator.
26 904 A. Fox. Electric lamp-holders.
26 840 E. J. Gracie. Coil-holders for wireless receivers.
26 870 International General Electric Co., Inc. Controllers for electric motors. (27/10/25, Germany.)
26 933 H. P. Knowles. Variable electric condensers.
26 893 E. C. R. Marks (Poulsen and Co.). (Poulsen and Co., Ltd.). Reflector for incandescent lamps.
26 913 (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). H. Wade (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). Incandescent cathodes.
26 864 H. Quartermaine. Earthing switch, etc., for wireless sets.
26 929 Radio Patents Corporation, Inc. Controlling current in a circuit. (11/9/26, U.S.)
26 819 A. J. Ross. Dynamo-electric generators, etc.
26 889 Y. Sakakura. Incandescent electric lamps. (11/11/25, Japan.)
26 895 J. P. Scott. Electrolytic apparatus.

October 28th.

26 994 Brandes Laboratories, Inc. Electromagnetic sound reproducer. (13/9/26, U.S.)
27 017 British Thomson-Houston Co., Ltd. Electric incandescent lamps.
26 936 C. B. Kersting. Winding electrical coils. (27/4/26.)
27 007 Kock u. Sterzal Akt.-Ges. Electric transformers. (28/10/25, Germany.)
27 035 Marconi's Wireless Telegraph Co., Ltd. Means for mounting piezo-electric crystals, etc. (29/10/25, U.S.)
26 955 F. E. Minton, and A. B. Reeves. Electric switches.
26 959 F. Muir, and Etchells, Congdon and Muir, Ltd. Apparatus for operating electric lifts.

October 29th.

27 165 Automatic Telephone Manufacturing Co., Ltd., and W. O. Passmore. Telephone systems.
27 065 E. G. Beken. Electric switches.
27 120 British Thomson-Houston Co., Ltd. Incandescent projection lamps. (29/10/25, U.S.)
27 122 British Thomson-Houston Co., Ltd., and H. S. Petch. Electric signalling devices.
27 081 W. R. Cleaver. Automatic telephone receivers.
27 172 C. Cristesco. Electric incandescent lamps, etc.
27 142 English Electric Co., Ltd., and J. C. Wilson. Dynamo-electric machines, etc.
27 071 A. H. Ford. Fine adjustment devices for variable electric condensers, etc.
27 113 H. W. Franklin. Wireless receiving set.
27 072 G. W. Ironfield. Electric clothing presser.
27 068 Kapella, Ltd., and R. E. Reason. Arc lamps.
27 128 M-L Magneto Syndicate, Ltd., and E. A. Watson. Alternating-current motors.
27 129 M-L Magneto Syndicate, Ltd., and E. A. Watson. Ignition magnetos.
27 144 Siemens-Schuckertwerke Ges. Means for automatically cutting off electric current. (2/11/25, Germany.)
27 134 A. W. G. Tucker and Ferranti, Ltd. Oil-cooled electric transformers.
27 086 J. R. Yelf. Light sensitive cell for television, etc.

October 30th.

27 233 G. Allom. Reflecting devices for electric lighting.
27 250 P. W. Baker, R. M. Ellis and C. H. Stave. Means for suspending aerial wires.
27 213 F. R. Johnston. Telephone receivers.
27 230 H. Kuchenmeister. Head telephones. (17/2/26, Germany.)
27 203 J. P. Laker. Electrical earthing connections, etc.
27 217 S. G. Leach. Distribution boards for electrical installations.
27 210 J. C. Macfarlane and W. A. Macfarlane. Operating electric arc welding systems.

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Friday, November 26th (To-day).

Physical Society of London.—Imperial College of Science and Technology, South Kensington. Papers by Mr. H. C. Hepburn on "Electro-endosmosis and Electrolytic Water Transportation" and Mr. L. Hartshorn on "The Input Impedance of Thermionic Valves at Low Frequencies. 5 *p.m.*

Polytechnic.—Fyvie Hall, Regent Street, London. Lecture by Dr. E. Griffiths on "The Romance of Refrigeration." (In aid of King Edward's Hospital Fund for London.) 5 *p.m.*

Institution of Electrical Engineers. (London Students' Section).—Institution, Savoy Place, Victoria Embankment, London. Paper by Mr. H. J. D. Palfrey on "The Measurement of Light." 6.15 *p.m.*

Institution of Electrical Engineers. (South Midland Centre).—Grand Hotel, Birmingham. Annual Dinner. 7 *p.m.*

Manchester Association of Engineers.—Manchester City Art Gallery. President's Conversazione. 7.15 *p.m.*

Diesel Engine Users' Association.—Caxton Hall, Westminster. Paper by Mr. R. L. Quertier on "Modern Air Compressor Practice in Oil Engine Installations."

Junior Institution of Engineers.—39, Victoria Street, Westminster. Paper by Col. The Master of Sempill on "Petrol and Its Substitutes for Use in Internal Combustion Engines." 7.30 *p.m.*

Saturday, November 27th.

Paisley Association of Electrical Engineers.—Visit to the Glasgow Corporation Power Station at Dalmarnock. 3 *p.m.*

Royal Institution of Great Britain.—21, Albemarle Street, London. Lecture by G. C. Simpson on "Atmospheric Electricity." 3 *p.m.*

Sunday, November 28th.

Guildhouse, Eccleston Square, London.—Address by The Right Hon. Viscount Haldane, F.R.S., on "The Wider Meaning of Relativity." 3.30 *p.m.*

Monday, November 29th.

Institution of Welding Engineers.—Institution, Caxton Hall, Westminster. Paper by Mr. J. H. Paterson on "Thermal Disturbance in Iron and Steel during Welding." 8 *p.m.*

Royal Society of Arts.—John Street, Adelphi, London. Howard Lecture No. III., by Prof. Hugh L. Callender, F.R.S., on "Recent Experiments on the Properties of Steam at High Pressure." 8 *p.m.*

Tuesday, November 30th.

Hackney Electricity Department.—Demonstration Halls, 18–24, Lower Clapton Road, London. Free popular talk on "Economical and Hygienic Value of Good Lighting." By Mr. L. Gaster. 6.45 *p.m.*

Institution of Electrical Engineers (North-Western Centre).—Engineers' Club, Albert Square, Manchester. Paper by Mr. L. Miller on "The Design of Storage Battery Locomotives." 7 *p.m.*

Electrical Contractors' Association (Birmingham Branch).—Ordinary meeting.

Institution of Electrical Engineers (Scottish Centre).—Grosvenor Restaurant, Glasgow. Annual Dinner.

Wednesday, December 1st.

Electrical Contractors' Association (London Branch).—Ordinary meeting.

Electrical Association for Women.—Visit to Good Housekeeping Institute, 49, Wellington Street, Strand, London. Short lecture by Mrs. D. Cottington Taylor on "Modern Housekeeping." 3 *p.m.*

Institution of Electrical Engineers (Wireless Section).—Institution, Savoy Place, Victoria Embankment, London. Paper by Messrs. R. V. Hansford and H. Faulkner on "Some Notes on the Design Details of a High-Power Radio Transmitter Using Thermionic Valves." 6 *p.m.*

Institution of Electrical Engineers (South Midland Centre).—The University, Birmingham. Lecture by Dr. A. Ekstrom on "The Applications of Electricity to Agriculture." Exhibition of film entitled "American Agriculture and Farm House Electrification." By J. W. Beauchamp. 7 *p.m.*

Institution of Heating and Ventilating Engineers.—Caxton Hall, Caxton Street, Broadway, Westminster. Paper by Mr. H. C. B. Berkhout on "The Use of Special Slide Rules in Computing Hot Water Installations." 7 *p.m.*

Royal Society of Arts.—John Street, Adelphi, London. Paper by Mr. G. Constantinesco on "The Torque Converter." 8 *p.m.*

Thursday, December 2nd.

Electrical Contractors' Association (Newcastle Branch).—Ordinary meeting. 11 *a.m.*

Electrical Contractors' Association (Bristol Branch).—Ordinary meeting. 3.15 *p.m.*

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Paper by Mr. G. F. O'dell on "An Outline of the Trunking Aspect of Automatic Telephones." 6 *p.m.*

Friday, December 3rd.

Institution of Mechanical Engineers.—Institution, Storey's Gate, St. James's Park, London. Informal meeting. Discussion on "Industrial Ventilation," introduced by Mr. A. E. Harris. 7 *p.m.*

Institute of Transport (Yorkshire Local Section).—Town Hall, Leeds. Paper by Mr. R. Bell on "State Control of Transport." 7 *p.m.*

Electrical Power Engineers' Association (Southern Division).—Institution of Electrical Engineers, Victoria Embankment, London. Lecture by Mr. C. H. Naylor on "Choice of Turbine Plant." 7 *p.m.*

Junior Institution of Engineers.—Royal Society of Arts, John Street, Adelphi, London. Presentation of medals and awards by Mr. J. S. Highfield; induction and address of Engineer Vice-Admiral Sir Robert B. Dixon, entitled "The Progress of Marine Engineering." 7.30 *p.m.*

Electrical Trades Commercial Travellers' Association.—Victory House, Leicester Square, London. Carnival Dance. 7.30 *p.m.*

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THE ELECTRICIAN

ESTABLISHED 1861.

THE OLDEST WEEKLY ILLUSTRATED JOURNAL OF

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The Electrician.

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COAL AND ELECTRICITY.

TWO great disputes which have affected the outlook of the British electrical industry for the past seven months and longer are now almost settled. The accelerated return of the miners to the mines, with or without settlements to which their leaders can agree, and the progress of the Electricity Bill towards the last stage of the Royal Assent, both make it desirable to take stock and to consider how these two obstacles to progress have not only affected the industries most closely connected with them, but have definitely interacted on each other.

To take the electrical industry first. The uncertainty inevitably generated by the Electricity Bill has caused a slowing up in the erection of new stations and the extension of old ones, owing to the prudent desire of those concerned to wait and see what was going to happen. Now that the measure has almost reached the Statute Book that uncertainty no longer exists, and we hope that every effort will at once be made to recover the time that has been lost. In this connection we note with interest that the London Power Co., of which Mr. S. L. PEARCE is the new engineer-in-chief, has been applying for £4 000 000 of 5 per cent. redeemable debenture stock, an indication not only that the company proposes to do its share in setting London's electricity supply in order, but that it does not regard the passing of the Bill as the swan song of private enterprise in electricity supply. As regards its relations with the coal industry the immediate future of electricity supply will not however be without its difficulties. Stocks that have been carefully built up have disappeared, and for several months undertakings have had to be content with foreign coal, often of poor quality and frequently expensive and difficult to obtain. The reduction of the supply from the Lots Road station of the London Underground Railways is an example of what may happen under such conditions. What, therefore, electricity undertakings require from the mining industry is that supplies shall be resumed without delay and that the price shall be kept down to the lowest economic level, so that reaction of increased cost on the consumer shall be reduced as much as possible.

The interlinking of the two industries is such that the electricity supply undertakings can themselves help the coal trade to attain this end. As Col. LANE FOX, the Secretary for Mines, said at the opening of the coal treatment laboratory of the Birmingham University last week, the one chance of the recovery of the industry lies in the development by scientific application of the great opportunities which the mining industry in this country possessed. On the same occasion Mr. FRANK HODGES called attention to the need for research and said that cessation from internal strife was necessary if that research was to be progressively developed.

This important question of the interdependence of the electrical and coal mining industries and the need for the greater application of electric power in coal mining was well brought out by Mr. W. F. BISHOP in his Presidential address to the Association of Mining Electrical Engineers. He pointed out that though at first sight the Bill would affect the coal mining industry adversely, because it might reduce the demand for coal, in reality it would have the opposite effect, because the demand for electricity, owing to its being cheaper and more generally available, would increase at a greater rate than that at which the improvement in the methods of generation would reduce the quantity of coal per kilowatt hour generated. He illustrated this very just deduction by showing that while in 1924-25 the electricity generated increased by 11 per cent., the coal used increased by 6 per cent. over the previous year. Electricity was therefore being turned out more cheaply, and this reduction in price would benefit manufacturers generally and stimulate the demand for coal for other purposes.

Turning to the mines themselves, much has recently been heard of the need for their reorganisation. We agree with Mr. BISHOP that a great deal can be done in this direction by increasing the uses to which electricity is put in them. A difficulty in applying this remedy is undoubtedly the capital cost of the equipment, but here again the Bill will help by rendering private generating plant unnecessary and making a reliable source of power available at a price lower than that at which a comparatively small colliery station can supply. The capital thus saved can be usefully employed in increasing the electrical equipment of the colliery, and this in turn will often provide the network with a load of high load factor and tend to reduce the cost of supply. Here is a circle which, far from being vicious, is of the most desirable character, and steps should be taken to extend its circumference to the greatest extent possible.

Drawing the power required at a colliery from the mains is, it should be noted, an advantage to the mine

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owner in another way. There is a great deal to be said for operating the winding engines electrically, but the load they impose on a private generating station is not of the most desirable kind. The effect on a selected station will, of course, be much less, as the diversity factor is high, so that the switching on and off of a 1 500 H.P. winder would hardly be noticeable. Extensions to the electrical equipment, moreover, do not mean a parallel extension of the generating plant, so here again savings can be effected.

If with some trepidation we may be allowed to give some statistics, we should like to use them to show that what is wanted in the mining industry is a campaign analogous to the propaganda for wiring the homes of Britain which is now being so successfully undertaken. About 267 million tons of coal were raised in this country in 1924, and of this amount only about 11 per cent. was cut by electrically operated machines. Only 1 630 of the 2 855 mines in the country had electrical equipment installed, the capacity of the equipment working out at 1 H.P. per 180 tons raised. Putting the problem in another way, 16½ million tons are used each year by the collieries themselves in winning coal. Taking a consumption of 1½ lb. of coal per kWh this gives, according to Mr. BISHOP, about 100 kWh per ton raised. The amount of electricity actually required for this purpose varies from a maximum of 50 kWh down to about 7 kWh, so even on the highest estimate some eight million tons of coal could be made available for sale each year, if the whole of the output were raised electrically. These are figures which both mine owners and electrical engineers should seriously ponder.

Current Topics.

The Birmingham Dinner.

THE annual dinner of the South Midland Centre of the Institution of Electrical Engineers is beginning to rival the London function in the point of numbers. But its organisers might follow the example of those at headquarters and both reduce the number of speeches and insist that the length of those that are delivered should be shortened. It should be remembered that one good after-dinner speech is not only better than eight bad ones; it is also better than eight good ones. At Birmingham on Friday all the speeches were good, but they were nearly all much too long, and before the end the audience became justifiably restive. We, however, made an interesting discovery. The electrical industry possesses at least one witty and pertinent after-dinner speaker. Mr. GEORGE VERITY could be heard, and what he said was full of point and humour. He should no longer be allowed to languish in seclusion, but made to employ his eloquence in the cause of the electrical industry. For the rest, Sir PHILIP DAWSON made a well-documented speech in support of the Bill, and Mr. R. A. CHATTOCK opposed it with resignation. He added, however, that the proof of the pudding would be in the eating and that it was the duty of everyone to make the best of it. It may be remarked that in this matter the whole electricity supply industry are cooks (in the culinary, not the mining, sense), and it largely lies with them whether the fare is palatable or indigestible. Mr. H. C. LEVIS, another infrequent speaker, played the rôle of optimist, hoping only that some Government or other would do something to give our industries a measure of protection. In Birmingham, this was a popular remark to make, but it contrasted oddly with his other suggestion, received with even more enthusiasm, that in future legislative hands should be kept in legislative pockets. Altogether there was much food both for thought and of the other kind.

A Call for Electrification.

THE definite opinion of the London and Home Counties Traffic Advisory Committee is that electrification of the railways serving north, north-east, and east London, is necessary. As regards the first two areas, they say the London and North Eastern Railway cannot render any material assistance towards the solution of the problem so long as they adhere to "steam" working, while in dealing with the third area, they remark that until existing steam lines are electrified, no material improvement can be secured in the existing railway facilities. On the other hand, experience with electrification has shown that the capacity of a line can be increased from 100 to 200 per cent. by adopting it. Better through running facilities are also required. It is definitely proposed therefore that the Piccadilly Railway should be extended from Finsbury Park to Manor House and to Wood Green, the Great Northern and City Railway connected with the London and North Eastern Railway at Drayton Park, and the Highgate Railway extended to East Finchley. These steps are all suggested so that the existing congestion at Finsbury Park may be alleviated. It is further suggested that the line between Barking and Upminster should be electrified, and through trains from the District Railway run on it, while a number of other detailed proposals for improvement are made. Attention is called to the reluctance of the London and North Eastern Railway to electrify, and it is remarked that this might be removed if an assurance was given that the lines would be protected from unnecessary competition. The fact is, however, that a better service would be the best antidote to competition, and it is on these lines that the solution should be worked out. Electrical engineers have long known that they can provide the best solution of London's traffic problem. It is gratifying to learn that the Advisory Committee are of the same opinion.

Statistics and Progress.

IN his Presidential Address to the Institution of Electrical Engineers, Dr. W. H. ECCLES gave a number of statistics relating to the electricity generated in various countries and deduced therefrom both that Great Britain was backward and that the position could be improved by a scheme of interconnection such as is envisaged in the Electricity Bill. In our correspondence columns to-day we publish a letter from Major T. RICH traversing these conclusions and complaining that unfair use has been made of the figures to force the Bill through Parliament. We publish Major RICH'S letter not because we agree with his conclusions, but because he gives some very interesting information, and because it provides us with an opportunity to emphasise an important point which stands a risk of being forgotten. Let us admit that this country leads the world in the consumption of electricity. Is that any reason why every effort should not be made to increase its use, whether it be for domestic purposes, in the factory or for electric traction? The answer is that all the electrical interests concerned have thought it worth while to spend a considerable sum of money this winter to bring the benefits of using electricity for lighting home to the public. The success or failure of that campaign depends to some extent on the price at which electricity can be marketed. It is therefore worth while, even though we are selling more electricity than any other country, to take such steps as will enable electricity to be delivered at the consumers' terminals more cheaply than it is at present. This not only means that close attention must be given to technical improvements, so that each ton of coal may provide the maximum amount of electricity, but that steps must be taken to utilise each pound sterling's worth of plant so that it earns as large an income as possible, and that the kilowatts of plant installed generate a maximum amount of electricity. In all these ways there is room for improvement, and the Bill provides methods by which these improvements can be obtained. It is not a matter of statistics, but of business.

Submarine versus Wireless Telegraphy.

THE opening of the new cable of the Pacific Cable Board between Canada and Fiji, which we noted in last week's

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ELECTRICIAN, has revived the old controversy whether this form of communication will lose its present pre-eminent position and be gradually replaced by wireless. Supposing that the latter system had developed as it has done and no improvement s had been made in submarine cable working, the answer might have been very different from what it is. But in fact side by side with the "beam" and other improvements in the wireless field has gone the use of permalloy and regenerator circuits, with the result that a speed of working up to 100 words per min. has been obtained. This is illustrated in the article by Mr. G. N. PERKINS which we publish to-day. Against this, of course, the beam system can record some 250 words per min., so that its use for messages requiring speedy transmission and reply offers great advantages. But the problem is not altogether one of speed. There is no doubt that there is a large amount of potential traffic which could be dealt with on the "deferred" system. For there is now a great gulf fixed between the two-way message, whose completion is a matter of hours, and the ordinary letter, a reply to which can only be received after the lapse of several months. If certain impeding regulations could be got out of the way, and the "cabling habit" encouraged on commercial lines there is a great deal of business waiting, of which both wireless and submarine telegraphy could have their share.

The Bill—Another Stage.

BY sitting until 1.20 on Tuesday morning, the Lords concluded the Report stage of the Electricity Bill; but though the debate was so long drawn out no important changes were made. This was perhaps hardly surprising as much the same ground was covered in the Commons, much the same arguments were advanced by the same interests and the same replies carried the day. An amendment proposed by Lord ASKWITH, that the Board should be empowered to accept proposals by association of owners of selected stations for the delegation of the former body's powers was accepted, while another, moved by Lord MONTAGU OF BEAULIEU, that provision should be made for giving a supply from the main transmission line for agricultural purposes, though withdrawn, is to be brought up in another form on the Report stage. The Duke of MONTROSE moved an amendment to the selling powers clause, embodying the views of the Scottish contractors on this subject, but this was negatived on it being pointed out that it would vitiate an agreement come to by all important parties south of the Tweed, electrically, if not politically, a much more influential body. At the beginning of the debate it was proposed that the members of the Central Board should be appointed by the Treasury and not by the Ministry of Transport but this also was rejected. The prospects of the Bill reaching the Statute Book before Parliament rises for Christmas are therefore brighter than they have been at any time in its career, though the Lords have still a great deal of business to accomplish if the proposed legislative programme is to be carried out.

Electric Lighting of Locomotives.

THE electric lighting of railway carriages in this country, when electricity is used at all, is effected by a small dynamo slung under the carriage itself and operated from the running axles. To ensure the availability of light when the carriage is stationary a battery is also provided. The lighting of the locomotive itself continues, however, to be effected by oil lamps. Electrical engineers will therefore be interested in some tests made by the A.E.G. on one of the express locomotives of the German State Railways, which was equipped with an experimental turbo-dynamo for this purpose. This machine, which was fixed on one of the running boards, had a constant output of 0·5 kW at 32 V, and ran at 3 600 revs. per min. It was 28 in. long, 14 in. wide, 13 in. high and weighed 165 lb. The steam pressure was between 75 and 240 lb. per sq. in. The steam was supplied through a $\frac{5}{16}$ in. lagged pipe and the set could be started up or shut down from the footplate. The exhaust steam from the turbine passed into the smoke chamber in order to keep the back pressure as low as possible. The turbine was of the impulse type with two velocity stages and the steam consumption was moderate. The dynamo was of the ventilated-enclosed type and was cooled by a fan. Current was supplied to the headlights and to fixed bracket lamps, for lighting the motion, on the underside of the running board. A number of plugs allowed hand lamps to be used in addition. A ceiling light was fitted in the cab. This was normally covered so that only a shaft of light was cast on the pressure gauges, but when the cover was thrown back the whole of the cab could be illuminated. All the lamps were controlled from a switchboard on the fireman's side of the cab.

An Electric Locomotive Analysis.

IN a Paper which was read before the Institution of Mechanical Engineers last Friday, Mr. T. A. F. STONE, of the Indian North Western Railway, described a method by which electric locomotives, as well as steam locomotives, can be classified into types on a common basis so that their characteristics can be analysed and compared and their respective merits deduced. The following characteristics which are common to both systems were chosen as the most suitable basis for comparison: Average horse power, adhesive weight, weight of motive equipment and total weight in tons. It is the ratios between these characteristics and not their absolute values which give the required basis of comparison. The values of these characteristics were calculated for some 92 electric and steam locomotives and the results are fully set out in the Paper. Generally, Mr. STONE reaches the conclusion that the horse power per ton of adhesive weight is much higher for electric than for steam locomotives of same type, that the horse power per ton of equipment and of total weight is also higher in the case of the electric locomotive and that of electric locomotive types, the ratios of the single phase system most resemble those of the steam, and those of the three-phase types resemble it least. Passenger locomotives have the highest values of the ratios horse power to adhesive weight, weight of motive equipment and total weight and weight of equipment to adhesive weight, and the lowest value of the ratio adhesive weight to total weight. In shunting locomotives the conditions are reversed, while motor coaches have the lowest value of the ratio weight of motive equipment to total weight. Goods locomotives have intermediate values for all ratios. Of the types of motive power the three-phase locomotive has the greatest maximum horse power, the highest critical speed, the greatest accelerating force, the least range of economic speeds and the highest values of the ratios set out above. The direct current locomotive has ratios nearer to the three-phase locomotive, while the single phase locomotive has ratios nearer to the steam locomotive, which comes last in order of merit. The Paper is a good attempt to bring a particular factor in the discussion of a difficult problem on to a scientific basis. It is hardly necessary to add that it is not the only factor concerned, for this was amply pointed out by mechanical engineers in the discussion.

Water Power in Canada.

ACCORDING to the Report for 1924–25 of the Water-Power and Reclamation Service of the Canadian Department of the Interior, there were on March 31st, 1925, 3 569 275 H.P. of water power installed throughout the Dominion, of which 2 696 997 H.P. was in public power stations, 503 039 H.P. in pulp and paper mills and 369 239 in other industries. Over 95 per cent. of the plant in Canadian power stations is operated by water power. The generator capacity in the 291 hydro-electric stations concerned is 2 046 194 kVA, of these stations, 208 are privately owned. The largest turbine is the 55 000 H.P. set in the Chippawa-Queenston station, and the smallest is one with an output of 10 H.P.

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MODERN TELEGRAPH OPERATION.

The Removal of Distortion and Attenuation—Regenerator Working on the Cables of the Eastern Associated Telegraph Companies.

By G. N. PERKINS.

THE speed at which a long unloaded submarine cable may be efficiently worked is limited by the attenuation and distortion to which the signals are subjected in their travel. The disability of distortion may be mitigated by the application of suitable correcting devices at the terminal stations, but improvement in shape resultant therefrom is, in general, obtained at the cost of increased attenuation. As the speed is raised, the signals become more attentuated and more distorted. The limiting speed of a cable worked simplex is given by the condition that the signals are of legible amplitude and not so distorted that there is the slightest doubt as to the identity of any one of them. This critical speed will be slightly reduced in the case of duplex working, and again reduced if a relay replaces a recorder as the receiving instrument.

If the working of a chain of cables be considered on the basis of relays at intermediate stations, the distortion, to which reference has been made above, will become cumulative, and will lead to a further reduction of speed. On this account the efficiency of linking together more than two long cables by relays has hitherto been doubtful. The function of the regenerator is to restore the signals received from a cable to the undistorted condition in which they were transmitted at the original sending station. On this principle a number of cables may be linked together by relays; the signals, as they enter each successive cable, are of their original perfect formation, and the regenerating principle is finally applied at the terminal receiving station for the purpose of the preparation of the perforated tape for use in a printer.

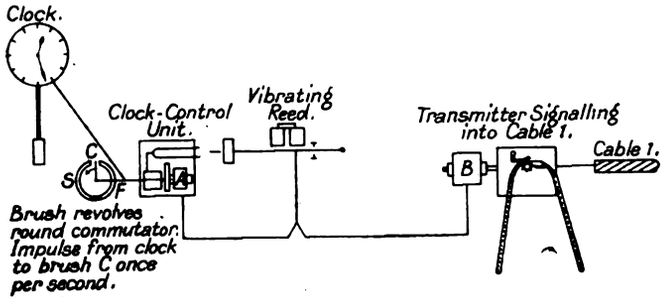

Fig. 1.—Diagram of the sending station on a regenerator system.

The function of the regenerator is, therefore, to replace human judgment by that of an automatic device which decides as to the identity, not of a signal as a whole, but of each component beat in turn. The principle of the apparatus may be likened to the provision of a razor edge, which is adjusted to chop regularly and precisely into the centre of each beat. In every case in which regenerator working has been installed a cable relay is used as prime receiver. The centre of each beat is the point of selection, for the reason that the signal will now be at its maximum strength, and the relay pointer therefore at the maximum amplitude of its movement from zero. Selection is thus made at an instant when the identity of the signal is least likely to be affected by bias, balance or other disturbing causes. The mechanism is such that, having once selected a dot or a dash from the relay, acting as receiver from the first cable, it sends on a dot or a dash, and is totally unaffected by the subsequent condition of the relay until the retransmission of the regenerated dot or dash has been completed, whereupon a fresh chop or selection takes place, and another well-formed signal is sent into the second cable. When, at the instant of selection, the relay pointer is on zero, an interval of spacing may be considered to be selected, and in consequence, for an interval of precise duration, no signal is sent into the second cable.

This method of midway selection permits the regenerating station to accept signals more distorted than has been possible hitherto, a condition resultant in increased speed. The restoration of signals at each regenerating station also eliminates the cumulative distortion previously inevitable on a relay system. Increase of transmitter speed, attendant upon the introduction of regenerator working, is, however, not completely representative of the gain, as, the regenerated signals being necessarily of perfect formation, it is found that the number of stoppages has been reduced, and, on account of the greater facility with which the causes of stoppages can be diagnosed, these stoppages are of shorter duration.

Let the signals from station A be received by a cable relay at B, and regenerated at that station. As the desideratum at B is to cause selection to be made as nearly as possible midway in every beat of the received signals, it is essential that the transmitter at A shall run regularly, that the selecting mechanism of a retransmitting unit (or of a perforating unit) at B shall function at the same speed, and that the speed of the motor driving the retransmitting unit (or the perforating unit) shall be corrected for every small variation in the speed of signalling, i.e., in the speed of the transmitter motor. This correction, in the form of a slight slowing-down or speeding-up of the motor of the retransmitting unit (or of the perforating unit) is made once per letter, and on the first beat of the letter. The instrument effecting this correction at station B is termed a synchronising unit. The transmitter at A and the synchronising unit at B are driven by phonic motors, each motor being actuated by a vibrating reed. The retransmitting unit (or the perforating unit) at B is driven by a phonic motor actuated by the synchronising unit.

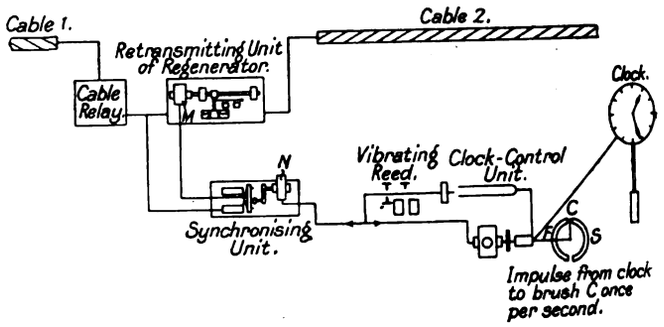

Fig. 2.—The regenerating station: The cable relay works the magnets of the retransmitting unit of the generator, and also works the correcting magnet of the synchronising unit. The clock-controlled reed drives two phonic motors, M and O. Motor M of the retransmitting unit is driven by the synchronising unit.

The transmitter is driven by a phonic motor, the current for the windings of which is supplied from contacts operated by a vibrating reed. The frequency of this reed, although very regular, is not entirely free from small variations due to temperature and voltage changes; hence, to ensure a constant frequency, the reed is brought under the control of an electric clock. The distance between the point of flexure of the pendulum of the clock and the centre of gravity of the pendulum is set so that one complete swing to and fro occupies exactly two seconds; the pendulum is made of a nickel-steel alloy, invar, with a very low coefficient of linear expansion with temperature. A toggle, pivoted to the pendulum, causes a magnet to be energised on each movement of the pendulum, to right or to left; when the armature of this magnet is attracted, i.e., precisely once per second, an electric impulse is caused to flow through the apparatus correcting the frequency of the reed, termed the "clock-control unit." The phonic motor A (Fig. 1) of this unit is driven by the clock-controlled reed. The sole function of this motor is to cause a brush C to rotate over the face of a commutator, the two segments of which are indicated as S and F. The gearing between the motor and the brush is such that the speed of the latter is one revolution per second. The correction which is to be applied to the frequency of the reed once per second depends upon the position of the brush on the commutator at the instant of the impulse from the clock. If the speed of the brush is exactly one revolution per second the brush will be in the same position relative to the commutator at the instant of each succeeding impulse, and it is arranged that this shall be the position midway between the segments S and F. If, however, the speed of the brush is more than one revolution per second, the impulse will arrive at an instant when the brush is definitely on one segment. In such case the impulse energises a magnet, from which motion is obtained in order

(*Concluded on page* 646.)

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COMPOUND-FILLED SWITCHGEAR.

Some Notes on the Latest B.T.-H. Designs—Compactness the Keynote—Complete Safety Secured by Interlocks.

IN some instances it is desirable that h.t. and e.h.t. switchgear equipments should be of the utmost compactness. This is one of the requirements which has led to the development of the metal-clad compound-filled equipments manufactured by the British Thomson-Houston Co.

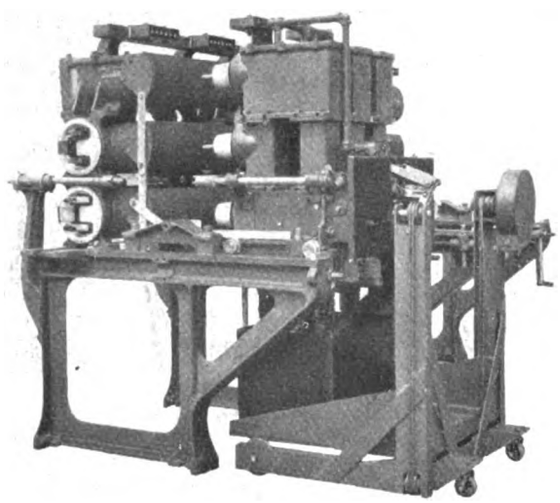

Fig. 1.—B.T.-H. compound-filled switchgear equipment for remote hand control, showing circuit breaker in the withdrawn position and tank lowered by means of the transporting carriage, which is capable also of removing the complete circuit breaker unit.

In addition to the usual features of safety and reliability, the equipments are so designed that they can be operated by semi-skilled labour, and extensions and alterations can be made with a minimum interruption of supply.

An example of this type of switchgear in use for circuits of 11 000 V is shown in Fig. 2, which illustrates a half-front view of an 11 000 V duplicate busbar equipment for operation by remote hand control. Fig. 1 shows the oil-immersed circuit-breaker in the withdrawn position and the tank lowered by means of the transporting carriage, which is capable also of removing the complete breaker unit.

Each equipment comprises two portions: (1) a fixed unit, consisting of main frame, busbars, circuit chamber, cable box and potential transformer, if required; and (2) a movable unit, consisting of an oil circuit-breaker arranged to plug into the fixed unit.

It will be noted that the circuit chamber is mounted above the busbar chamber, ar arrangement which enables a potential transformer to be mounted above the gear in a readily accessible position, and permits renewal of a potential fuse while the equipment is in commission and without danger to the operator.

The current transformers for metering and tripping are accommodated in the chambers carrying the top plugs, and it will be clear that this arrangement enables a current transformer to be changed without breaking cable joints and avoiding the necessity of decompounding any part of the equipment, a feature which is of considerable importance when the maintenance of service is vital.

Shutters automatically cover the live contacts when the breaker is withdrawn, and these are so arranged that the busbar and circuit shutters can be separately or collectively padlocked.

Int he case of duplicate busbars the breaker is connected to either set by means of removable self-aligning plugs which are inserted into the upper or lower plugging insulators, or, where desired, oil-immersed selectors are provided. These are situated on the fixed portion of the gear and are operated by handles which are interlocked with the circuit-breaker, so that it is impossible to break circuit on the selectors.

The breaker is moved into or out of engagement with the bus and circuit contacts by means of screws, on which are mounted travelling blocks to which the breaker is coupled by removable dowel pins; two screws per unit are provided, these screws being coupled by means of a chain and sprocket wheels at the back of the equipment. Either screw is available for operation by a detachable handle. When in the fully plugged-in position the wheels of the breaker engage under heavy restraining lugs which, together with the screw mechanism, hold the breaker firmly locked in position. It is therefore stated that it is impossible for the breaker to jump or move when it operates under heavy fault conditions.

The circuit-breaker operating handle is accommodated by a steel panel, on which may be mounted the instrument equipment, the size of panel being varied according to requirements.

The oil circuit-breaker has a deep top plate, which accommodates the operating mechanism and provides an ample air buffer, thus restricting the gas pressure when the breaker operates under fault conditions, while pebble-filled separating chambers and gas vents cool the gases and form an intricate baffle to prevent oil throwing.

The breaker contacts are of the finger pattern, reinforced by steel backing springs, substantial renewable arcing tips being fitted. Both main and arcing contacts are designed so that they maintain contact when subjected to the electromagnetic stresses set up when the breaker is heavily loaded, and they will not tend to lift when the breaker is operating on a fault.

As the breaker mechanism is entirely enclosed, with the exception of the separating chambers and vents, there are no slots or holes through which oil can be thrown. This enclosure of the mechanism also has the effect of avoiding any tendency for the breaker to reclose on a fault due to internal gas pressure. A new form of buffer ensures minimum stresses in stopping the cross-bar at the end of its opening stroke, and is equally effective whether the oil tank be on or off.

The plugging contacts are self-aligning and can be readily replaced if damaged, without decompounding a unit. Interlocks prevent the breaker being inserted or withdrawn while it is in the closed position, thereby preventing any danger of breaking circuit on the plugging contacts.

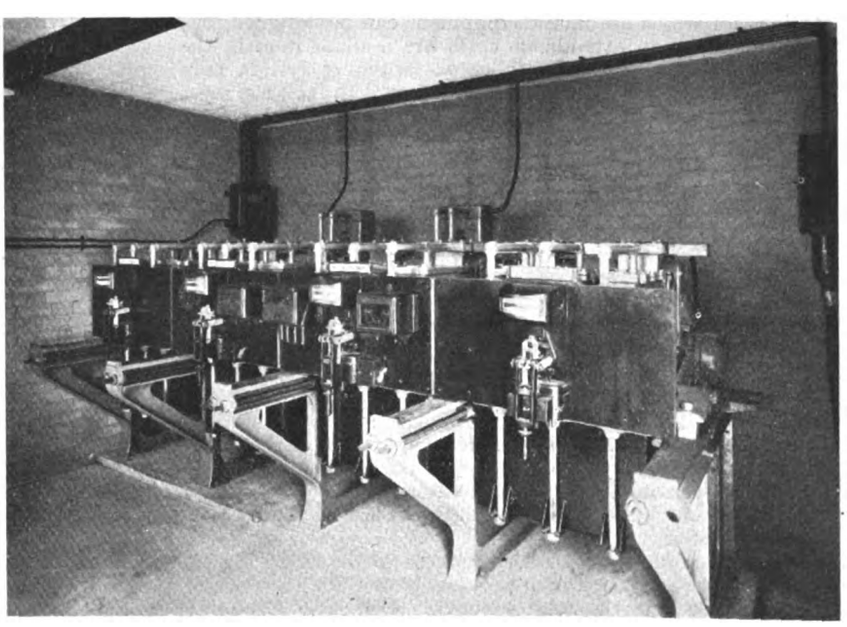

Fig. 2.—An example of B.T.-H. compound-filled switchgear in an 11 000 V sub-station.

The instrument and control wiring is enclosed in conduit on the movable portion of the equipment, and interconnections

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CONTROL OF HYDRO-ELECTRIC PLANTS.

Elimination of Attendance an Economic Factor—Automatic and Remotely Operated Systems—Extensive Protective Arrangements Necessary.

By F. JOHNSTONE TAYLOR.

WITH the continued development of hydro-electric power engineers are realising that small plants are often well worth while putting down as auxiliaries to a main plant, but in order that these small stations may prove a paying proposition, it is essential that they call for the minimum of attendance. This class of machinery has been brought to such a high stage of development that constant attendance is really unnecessary, and if suitable equipment can be installed by

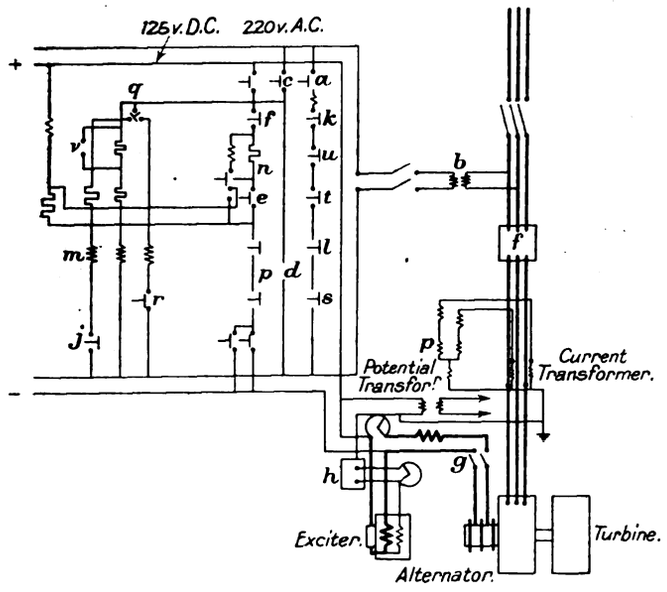

Fig. 1.—Lay out of a remote-controlled hydro-electric station.

which the plant can be put in or out of operation from the main station and arrangements made whereby abnormal conditions will shut down the set until it has been inspected and certain throw-out gear reset, small developments of this kind can usually be operated profitably. From a mechanical standpoint there is no limit to the capacity of generating stations for which automatic equipment can be designed, but in a small station attendance costs are a small item in the total and in addition a complicated switching system may require the attention of skilled operators. In fact, the most important future field for automatic stations would appear to be as parts of the large power system which has already one or more manually controlled plants in operation, but which will welcome the addition of as many automatic plants as can be constructed within reach of its transmission lines. Because of the general characteristics of such a system the addition of such plants will have practically no effect upon the total operating cost and will reduce unit operating cost materially. The automatically or remote controlled hydro-electric plant is now quite an established proposition in America, where some of them are of quite large dimensions. The largest yet attempted, which is situated on the Beaver River near Watertown, N.Y., has two units of over 9 000 kVA and is located six miles from the switching station. The turbines are of the usual vertical type which is prevalent in America, and they develop 10 500 H.P. on a head of 121 at 220 revs. per. min., and the generators produce three-phase current at 6 000 V, 60 cycles, which is stepped up to 10 000 V for transmission.

The lay-out of the control equipment is shown in Fig. 1. A transformer indicated at *b* provides power for the control system, while *a* is the master starting element. Assuming the various protective devices and the control power switch to be closed, the other devices are in the starting position and upon *a* being closed the master control contactor *c* becomes energised and closes. A circuit is now completed which energises the governor solenoid *d*. This, by opening the governor pilot valve, puts the turbine in operation. During the period that the generator is being brought up to speed the exciter field rheostat is short circuited so as to permit of the rapid building up of the exciter voltage. At about 95 per cent. synchronous speed the speed control switch *e* closes, which completes the circuit closing the oil circuit breaker *f*. The generator is thus connected to the line without field, but the closing of *f* also causes the field contactor *g* to close, and the field being thus applied the unit is pulled into step by the combined effect of its synchronising capacity and the acceleration of the turbine to normal speed. The voltage regulator *h* determines the normal voltage, which the generator will build up to while the setting of the governor determines the load that the machine will take. Closing down is effected by *c* opening upon *a* being closed, the gates then closing upon the de-energising of the governor solenoid relay. There is also a limit switch operated from the gates and so adjusted that when they reach a position that will reduce the load on the generator to a low value, a circuit is completed opening *f* and so disconnecting the generator from the line; *g* also opens and the station is then in the shut down position. Opening the h.t. line in the controlling station will also shut down the units by reason of the underload relay *j* closing its contacts and energising *m*, which is a time relay stopping device which will de-energise *c*. The closing of the h.t. line by energising *b* would re-start the station.

A plant of this class naturally calls for a comprehensive protection equipment against overspeed, overload, failure of field, heated bearings, heated windings, excessive voltage, low oil pressure, underspeed or undervoltage. For instance, an overspeed limit switch *l* will open *c*, but it will re-close on the speed falling to a pre-determined limit; *e* again makes provision against underspeed as its contacts remain open until approximately 95 per cent. synchronous speed is reached. It completes the circuit to the exciter relay *n* and so precludes the machine being put on the line until it attains approximately synchronous speed. The overload relay is indicated at *p* connected to the current transformers in the power line. This requires to be re-set by hand. In the event of the field current failing, the field relay *g* is de-energised. It closes *r*, which is a time delay auxiliary relay, which will open *a* and shuts down the station until it is re-set by hand. In the case of hot bearings *s* actuates *a*, while *t* is a device giving protection against overheated windings, *u* against over voltage, *v* against low oil pressure and *w* against exciter over voltage. It will be seen therefore that it is quite a feasible proposition to control a relatively large plant from a distance, although the equipment shown in Fig. 1 is merely a typical example of a controlling system.

Figs. 2 and 3 give views of a small plant comprising a 500 kW generator direct connected to a single overhung double nozzle Pelton wheel, the direct connected exciter being mounted upon an extension of the shaft. Besides the two power nozzles a third nozzle is provided to act as a by-pass, as no storage is available at this particular plant. All three nozzles are operated by electric motors provided with limit switches interlocking in order to maintain fixed relative action between the three and thus to obtain the maximum possible efficiency at all stages of load and water consumption. Speed regulation is obtained by means of governor operated jet deflectors. The operator at the main plant controls the equipment shown by means of a double throw switch. When the plant is operating on full load, both power nozzles are full open and the by-pass nozzle is closed. If all the load is to be rejected the operator throws the switch to the closed position. A series of relays actuates the nozzles, closing the upper one first and at the same time gradually opening the by-pass nozzle, limit switches being used to preclude any jamming of the mechanism. In starting from no load, the operations are reversed. Any load condition between full-on and full-off may be reached and held by manipulating a switch at the main plant. Synchronising is accomplished through remote control of the power nozzles, the synchroscope and main generator switch being on the panel along with the nozzle control switch.

A plant may be controlled by means of an automatic dial telephone system such as the Westinghouse audible type of supervisory control. This is quite a standardised system,

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which it is not necessary to discuss in detail, suffice to say that it provides for—

(1) Controlling and supervising of the opening and closing of circuit breakers.

(2) Supervising the operations of apparatus units of any contact making type.

(3) Obtaining signals indicating the gate opening or the governor setting.

(4) Obtaining through a float switch an indication of the operating head at any moment.

(5) Operating or releasing lockouts.

In addition, certain indications can be given to the operator as follows: General trouble is indicated by a howl, breaker tripped or closed, high tone and low tone buzzer respectively, water level or gate opening, a definite number of buzzes corresponding to units of head or gate opening. Normal operation is indicated by a low hum in the transmitter.

Assuming the speed of a unit to have been brought up to about 98 per cent. of normal, transfer relays are arranged to connect the speed matching device and the automatic synchroniser to it, while a control will at the same time lock out the transfer relay of the other units and prevent them being transferred to the speed matcher until the first has been synchronised. The speed matcher controls the operation of the turbine gate mechanism and regulates its speed to that of the line frequency. When the voltages are in phase, the automatic synchroniser closes the oil circuit breaker which places the generator unit on the system. Certain relay operations then occur which de-energise the closing coil of the circuit breaker which remains closed until released by the trip coil. The synchronising equipment is then released for use on the next unit to be put on the line. On the oil circuit breaker being closed a contactor gives full gate opening on the turbine, which then comes under the control of the governor, but prior to the contact breaker being closed it is running idly with resistance connected in the field circuit to keep the generator voltage down to a suitable value for proper synchronising. If two or more units are in operation, and it is required to stop one of them, the necessary sequence

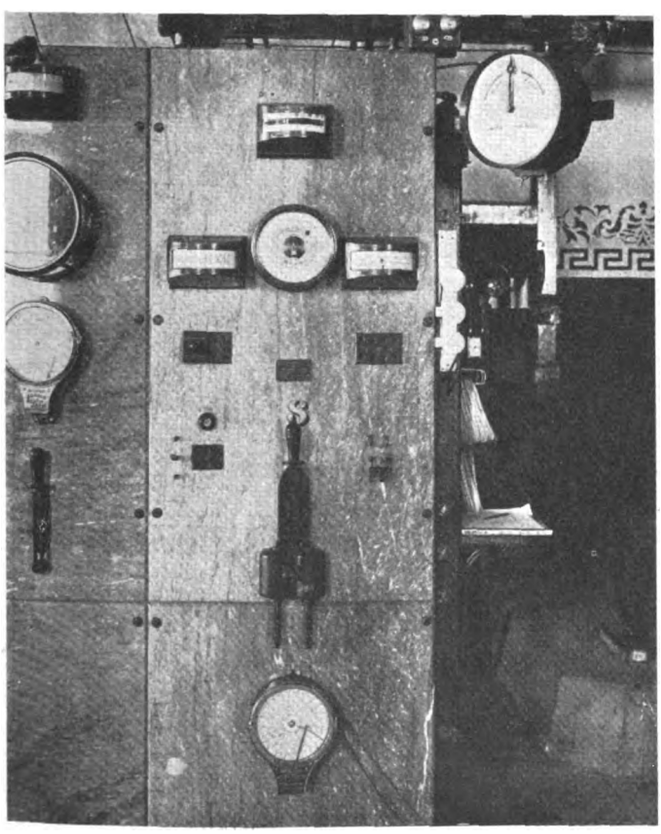

Fig. 2.—Switchgear for automatic control of Pelton wheel shown in Fig. 3.

of control operations causes a closing of the turbine gates to a point where the generator has dropped its load, when a cam-operated switch connected to the gate mechanism closes its contacts in the circuit of the trip coil. The latter being energised, the oil circuit breaker of the generator opens. The synchronising equipment, which includes the aforementioned speed matching device, is operated from two potential transformers, one on the busbars and the other on

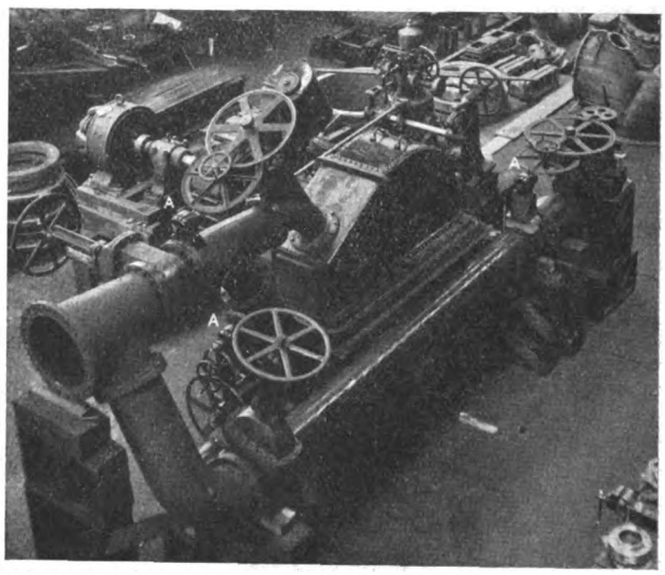

Fig. 3.—Pelton wheel with automatic control. A A are the operating motors.

the incoming machine. The speed matching device comprises two motors which drive a differential actuating a brake band which travels through a small angle. The motion of the brake is transmitted by a rod to a system of levers having contacts which carry current for an anti-limiting coil. One of the motors is connected to the potential transformer on the bus and the other to that on the machine to be synchronised. Being so connected that they run in opposite directions, obviously the differential will be stationary when the motors are running at the same speed. But presuming the incoming machine is running too fast, the slight difference in speed of the two little motors causes a movement of the differential which is transmitted to the brake. This, through a system of contacts, causes the governor synchronising motor to slow down the unit by closing the gates, and as the latter do close, relays operate to drive the governor motor for several revolutions at intervals, "inching" it out until the two small motors run at the same speed. If the incoming machine is running slow the mechanism will function in the reverse order.

"Garcke."

WE regard the arrival of Vol. XXIX of the "Manual of Electrical Undertakings, 1925–26," on our table as a sure sign that Christmas is near. The latest edition of this well-known work, familiarly known as "Garcke," bears every indication that its usefulness to the electrical industry will increase as the years go on. It contains general information relating to about 3 430 electrical undertakings. Incidentally, the first edition, published in 1896, dealt with 200 undertakings. Or, put in another way, the capital invested in electrical firms, including the amount borrowed by municipalities, but excluding Government telegraphs, was £61 109 525 in the former year, and £767 307 224 in 1925–26, about one-tenth of the National Debt in the present period. That electricity is in its infancy is, therefore, a fallacy. The information given is arranged in the usual way, and is of course familiar to our readers. A useful feature is the twenty-eight maps. These, among other things, show the areas of the Electricity Districts that have been provisionally determined by the Electricity Commissioners. The Electricity (Supply) Bill in the form in which it left the Standing Committee of the House of Commons, is reproduced in full, and some well written prefatory observations outline the extent of the measure. For the rest, there is nothing about any electrical undertaking in the country or about many abroad that "Garcke" cannot tell the anxious enquirer, and it will therefore continue to be in the future what it has been in the past, an invaluable book of reference.

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AUTOMATIC TELEPHONY AT EDINBURGH.

Four Exchanges with 15,000 Subscribers—Details of New Equipment and its Operation—Siemens Brothers' System Used.

ON Sunday, October 3rd, at 12.5 a.m., the Edinburgh telephone system was changed over from manual to automatic operation. The change-over involved the transfer of some 12 000 working subscribers' lines and 2 100 local and trunk junctions, and is the biggest "cut-over" yet made by the British Post Office. Four new automatic exchanges were brought into service simultaneously and most successfully. The smoothness with which the actual transfer was effected and absence of any serious faults reflect great credit on the organising officers of the Post Office, on its local construction staff and on the contractors who installed the exchange equipments.

The Edinburgh network comprises 10 exchanges. The four automatic exchanges are :—

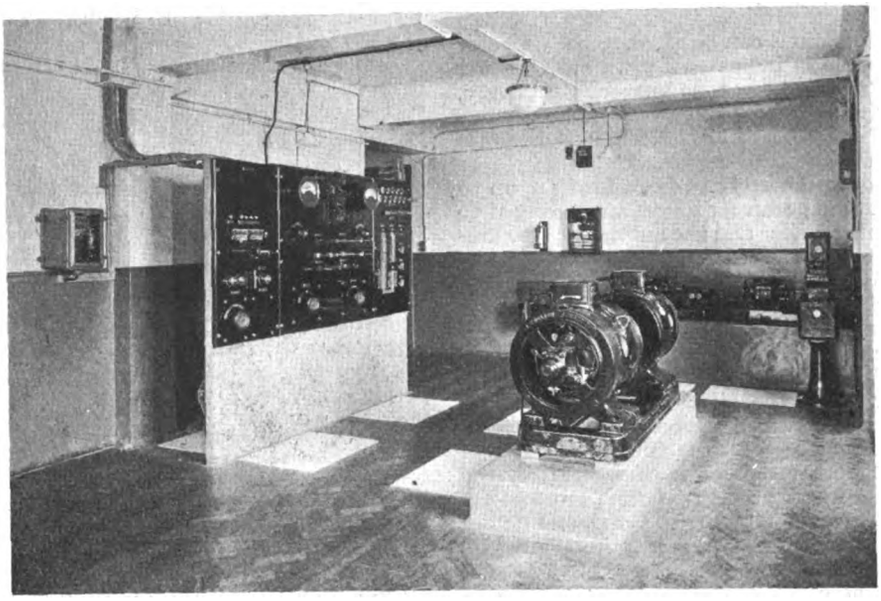

Fig. 1.—View of power plant at the Morningside automatic exchange.

Type of Exchange		Number of Lines Initial Equipment	(Multiple) Ultimate Capacity
Central ..	Main	9 300	14 600
Morningside	Satellites with	2 500	4 400
Newington	Discriminator	2 100	3 600
Murrayfield	Repeaters	1 700	2 900
Total		15 600	25 500

The other exchanges within the local fee area remain manual at present and automatic subscribers will be placed in communication with an operator at such exchanges by dialling one or two numbers. The subscribers on these manual exchanges ask their respective operators for the five-digit automatic numbers and the operators complete such connections by dialling direct into central exchange either for numbers on central or its satellites—only one group of junctions from each manual exchange to central being provided for all connections to automatic subscribers.

Automatic subscribers requiring other exchanges outside the local fee area (toll or trunk calls) dial "O" and are attended to by operators on the manual board located in central. Special services are all centralised at central exchange and are obtained by dialling special two-digit codes. Short-distance trunk lines are taken to first selectors and the distant trunk operators dial automatic subscribers direct. Other trunk lines are taken to trunk positions on the manual board, all trunk positions being provided with dials to complete calls direct to automatic subscribers.

The system is built up of Siemens Bros. and Co.'s auto-

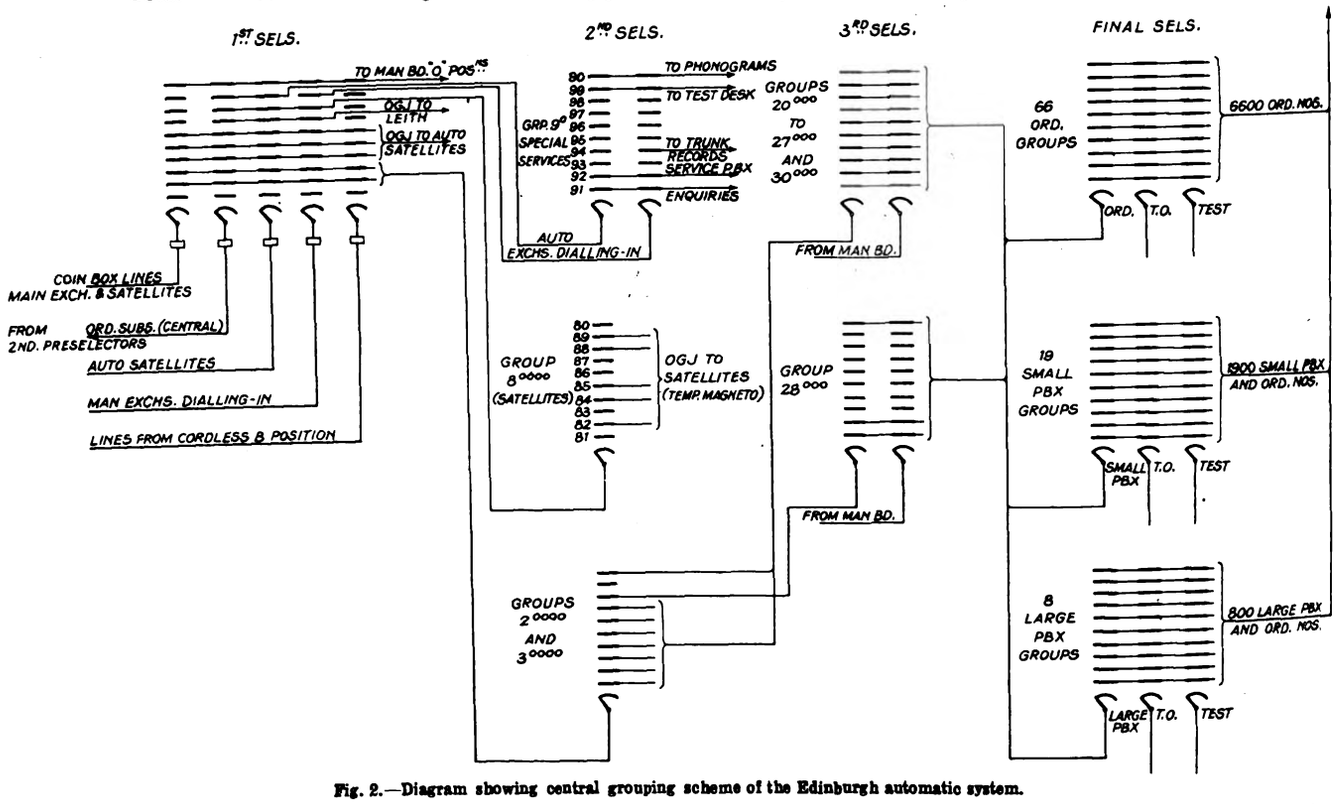

Fig. 2.—Diagram showing central grouping scheme of the Edinburgh automatic system.

The actual equipment of first preselectors at each exchange is less than the multiple numbers in the above table and the difference represents the preselectors not required for those numbers which are either unavailable for directory reasons or

matic equipment No. 16. It embodies several interesting features, viz. :—

First preselectors, one for each subscriber's line, second preselectors for concentrating the originating traffic on to first selectors,

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so materially increasing the traffic loads which may be carried by the selectors and providing a most efficient scheme by the use of simple 10 point preselectors.

The transmission bridge is located in the first selector from which transmitter current is supplied to calling and called lines on local ocnnections. The transmission bridge for incoming calls supplying current to the called line is located in the incoming selector to which the junction is connected.

Links between selectors are graded on a link distributing frame. The design of this frame is that originally introduced by Siemens Bros. and Co.

Intermediate distributing facilities are provided by a " sectional " type of intermediate frame placed between the first preselector racks and final selector racks which are arranged in one line. The design of this frame provides for jumpering between lines in the same row of racks and gives easy access to the jumpering field of the adjacent rows of racks, but naturally its sectionalised form does not give the full facilities obtained by a separate manual type of frame.

All racks are of the open type on which the apparatus is mounted on one side and the wiring carried out on the other so that all parts of both apparatus and wiring are freely accessible.

The automatic equipment at the central exchange is arranged on two floors, but only the ground floor with 8 300 numbers is installed at present. As soon as the old manual switchboard is recovered, another 1 000 numbers will be arranged on the second floor, completing the initial equipment, which will then comprise :—First preselectors, 8 720 ; second preselectors, 1 340 ; first selectors, 1 328 ; second selectors, 945 ; third selectors, 1 075 ; final selectors, 1 329 ; test and trunk offering selectors, 203. The grouping scheme is shown in Fig. 2.

The main distributing frame has 89 verticals with 220 circuits per vertical on the line side and 200 on the exchange side. Two travelling ladders are fitted along each side of the frame.

The test desk (Fig. 3) consists of eight testing positions and provision is made for extension to 12 positions. The desk is of standard type having a filing section between each pair of testing sections. It is designed for centralised testing and test junctions are provided to all automatic exchanges.

The power plant comprises :—Two motor-generator sets, each having an output of 1 000 A at 69 V. Two batteries, each consisting of 30 cells, having plates for 3 666 Ah and boxes for 6 038 Ah. Counter e.m.f. cells are fitted for providing 30 V power leads to 330 (ultimately 480) P.B.X. switchboards. Two ringing machines, one off the power

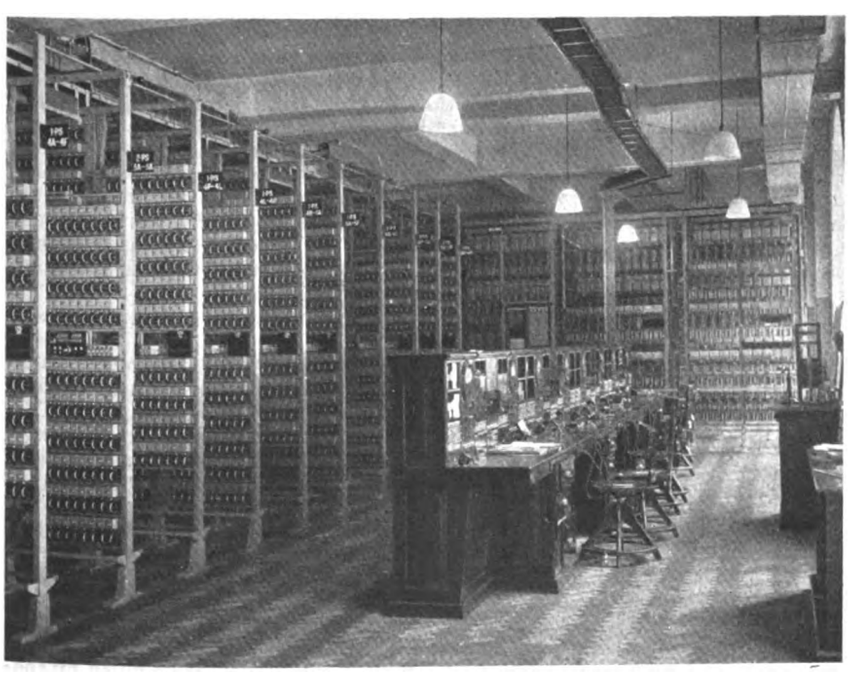

Fig. 3.—Central auto room showing test desk.

mains and the other run off the exchange battery. One power board, arranged with single pole switching.

The starters for the motor-generators are mounted on separate framework near sets. A view of the power plant at the Morningside satellite exchange is given in Fig. 1. Temporary manual equipment is arranged at the central exchange pending the installation of the permanent suites in the old manual switchroom.

The three satellites exchanges are of the same type. They are arranged with discriminator repeaters which, in conjunction with finder switches, direct each call, prior to commencement of dialling, to a junction to central and to a local

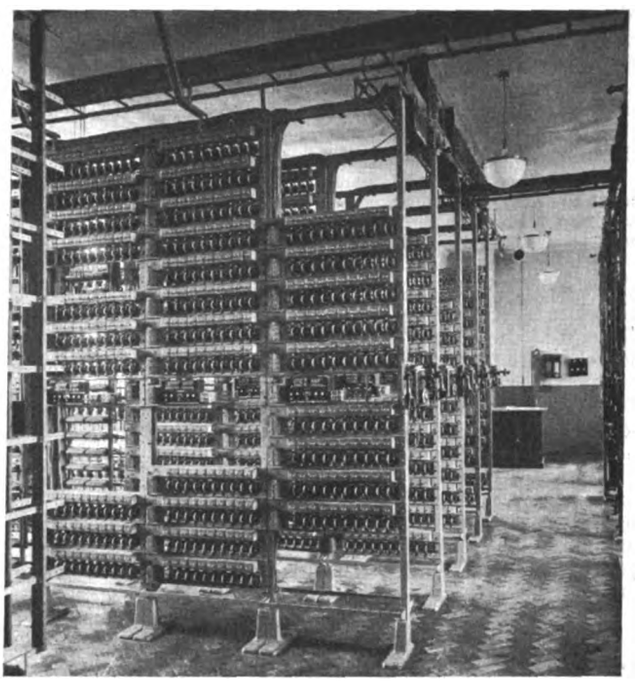

Fig. 4.—View of auto room, Murrayfield exchange.

discriminating selector. As soon as the digits dialled determine the call to be a local one, then the junction is freed for another call. If the call is not local, the discriminating selector is freed and the call is completed over the junction to central. All calls between the satellites are routed through central.

Apart from the discriminating equipment, all switches are of the same type as at central.

Equipment which has been recently developed for centralising observation services at the central exchange will be installed shortly. A two-position desk will be installed at central and the equipment initially will provide for observing the service on any selected 50 subscribers' lines at central and 25 subscribers' lines at each of the satellite exchanges. With this equipment a single junction between the distant exchange and the observation centre suffices to enable the service of 25 subscribers to be observed.

We are indebted to the Engineer-in-Chief of the Post Office for permission to publish details and photographs of the equipment.

Ebonite.

A CHARACTERISTIC of electrical manufacturing during recent years has been the increasing knowledge of the properties of the materials used. This applies particularly to insulating products, a useful addition to the literature of which is the pamphlet on ebonite issued by Siemens Brothers and Co. This deals not only with the origin and manufacture of ebonite, but with its subsequent treatment by vulcanization, machining and polishing and gives a great deal of valuable data regarding its electrical properties and the various forms (rods, tubes, and mouldings) in which it is made up. A series of tables provide information on standard dimensions and weights and tolerances, while formulae for calculating weights are also given. It is a real mine of knowledge about this important material.

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CORRESPONDENCE.

DR. ECCLES AND THE ELECTRICITY BILL.

[To the Editor.]

Sir,—I was present when Dr. W. H. Eccles, the President of the Institution of Electrical Engineers, read his inaugural address on October 21st before an audience largely composed of wireless men, and immediately the meeting was over I expressed my regret to him that in it he had drawn parallels which to my mind were not justified. Within a few days the address was used in the Press to forward the interests of the Electricity Bill. I thereupon wrote to the Secretary of the Institution asking that a special meeting be called to discuss the address, my reasons being :—

Its highly controversial character, the damage which might well ensue to our trade through complaints regarding our alleged "backwardness," and the publicity that the address would be further used to promote in Parliament that very policy about which the Council of the Institution a few months ago had sent a protest to the Prime Minister.

Before I received the decision of the Council, the Attorney-General in the House of Commons utilised this address in his speech on the third reading. He described Dr. Eccles as the "expert" who is President of the Institution, whereas this gentleman is an expert in wireless matters and, with all due respect to his high office, hardly an expert in electric power matters at all.

I am now informed that the Council cannot accede to my request for a special meeting on the ground that it is without precedent for such a meeting to be held. Now that I have had my reply I feel justified in taking up some of the points in your columns, especially as such an extensive report of it was made in The Electrician.

The first part of the address is, to a material extent, a repetition of the arguments of the highly criticised Weir Report. With unqualified statistics, with the very best intentions, one can prove almost anything; without an analysis and numerous footnotes national statistics of electricity generated become a delusion and a snare. Perhaps the best statistical table published is that of the "Electrical World" of January 9th, 1926. It deals with 47 countries, has 14 columns of analysis and 36 explanatory footnotes. The particulars in this table are sufficient to knock the bottom out of many of the arguments in the address and in the Weir Report.

To those who have studied electric power affairs, the influence of water power, and of power from low heat value fuel like lignite (which has many water power characteristics), is very important as a factor regarding output per head of population, output per kW installed, price per kWh sold, and mileage and voltage of networks or "grids" connected up. Another factor is the cost of steam coal, cannel coal, and even fuel oil, in the different countries or provinces to be compared, and their existence or otherwise within the political borders; as strategy has much to do with such matters. If statistics are to be used at all to prove progressiveness or backwardness, then the above factors should be pointed out.

Again, owing to the variations in bases of national power statistics appeals were made at the congresses at Bâle and Rome for an international convention to arrange a common basis. For example, it could be proved that the coal merchants of Birmingham were "archaic" as compared with those of Wolverhampton, if prices at pit-head or on truck at the coal depot were compared with prices put into a private cellar.

It is only logical that like should be compared with like, as an American might take the availability of "iced water" as an indicator of civilisation, and prove that we were far behind the "Esquimaux."

Taking some examples :—Switzerland is mentioned nine times in the tables or text of Dr. Eccles's address. Dr. Wyssling at Bâle pointed out that in a normal year not one thousandth part of the public electricity supply in that country comes from fuel, while with us less than half per cent. comes from water. About 100 kWh per head are exported and over 200 kWh are used for electrochemical work. In many areas for many services where no water storage is available, for lighting and water heating no meters are installed. To-day about 0·8d. a kWh is being asked for some new heavy traction contracts. So far from the influences of water power being explained, as in the Weir Report they are discounted.

Taking Germany, this country is mentioned about 16 times in the address. It is pointed out that "Germany generates only 10 per cent. of its electricity hydraulically," a statement calculated to give the impression that the remainder was produced under steam conditions comparable to those at home. This point was made by the Attorney-General in the House of Commons. Dr. Eccles may not know that near Cologne and near Bitterfeld beds of lignite exist 60 to 90 ft. in thickness. This wet, low grade, bulky fuel is burned under boilers on the spot and the power transmitted electrically because rail truckage would kill its value. About 50 per cent. of German power comes from this source. So far from the development of water power and most efficient utilisation of fuel (the latter a hint, of course, at our uneconomical methods) in Germany being due to "the loss of many of their hard coal areas" Dr. Eccles must guess again.

The largest power stations in Germany, at Knapsack and Golpa, on the lignite beds, were developed during the war, the latter largely for the making of synthetic nitrates and other electrochemicals required for war work; before the loss of any coal areas due to the Versailles Treaty. To a large extent the same thing applies to the South German Water Power. Table 1 does not fit in with Table 2. In the first the annual consumption of electricity per head was 230 kWh, in 1925 the *output* was only 185 kWh. The much-vaunted German improvement was therefore positively "Hibernian." (The Attorney-General, quoting from the same table via "The Economist," conveniently omitted this figure of 185 for Germany, while ours was 190.)

We are told that "Belgium, which is more highly electrified than Britain, has no hydraulic stations." If Dr. Eccles buys a school geography he will learn that Belgium is the most densely populated industrial country in the world, so that to compare it with Great Britain including Caithness is absurd. A fairer comparison would be with Lancashire and Yorkshire combined. The allegation that 250 kWh a head were consumed in 1923 would startle some of those who have followed continental developments. Dr. Uytborck of Brussels, at the World Power Congress at Bâle, gave a detailed analysis for Belgium for 1925, and, taking comparable figures divided by the population we get not 250 consumed kWh but 125 generated; less than that of poor "old out of date" Britain.

It is possible with unchecked statistics to include private works plant in one case and not in the other.

Regarding comparisons with the U.S.A. and Canada and some other countries, I beg to refer your readers to the recently published Report of the Advisory Committee on Domestic Supplies of Electricity, paragraph 39, which urges "full consideration of all the facts and circumstances." In a table of units per kW installed we are, of course, placed at the bottom, the influence of water or lignite power is not pointed out. I presume the "Elektrowerke" is one of the companies included with Germany, with its power mainly from lignite, and some very large electrochemical works working 8 350 hours per year out of a possible 8 760. The Water Station at Tögung, in Bavaria, with 90 000 kW installed, produced 465 millions of kW (apparently in 1924).

These figures show how lignite power and water power influence output.

The address sings the praises of the wonderful principles of interconnection on Weir Report lines; there is in the figures hardly a shred of evidence to support this contention. The "avalanche" of conversion to electric power in Germany only require an output of 185 kWh (apparently including electrochemical work). Where 90 per cent. of the farms in that country (a very tall order) get their power from one cannot tell; at any rate, makers of farm oil engines in that country have not yet "put up their shutters."

I do not wish further to trespass on the space of The Electrician, but think that it is hardly fair to build up a structure of "backwardness" on the quicksands of unqualified statistics; and only regret that, although the address is of a highly controversial character, no opportunity is to be given by the Institution to thrash the matter out in open discussion. Is it too much to expect that this same address will not be used in the House of Lords to defeat those who do not believe that our power engineers have failed in their stewardship?—I am, etc.,

Theodore Rich.

London.
November 22nd.

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TURBINE BLADE MATERIALS.

Some Notes on Their Development—The Effect of Modern Steam Conditions—Causes of Deterioration.

MUCH steam has flowed through turbines between the time when brass blades were in use and the employment of the new non-corroding and heat-resisting steels. Not only have better materials replaced the older ones, but there has been a considerable increase in the severity of the operating conditions.

The original material used for turbine blading was brass containing 71·9 per cent. copper, 28 per cent. zinc, and 0·1 per cent. lead. The tensile strength of this material falls as the temperature increases and its resistance to fatigue deteriorates even more rapidly. Its breaking strength under load is less at high temperatures than that indicated by the ordinary tensile tests, and the material also suffers from an increase in the crystalline size as the temperature rises. If the brass

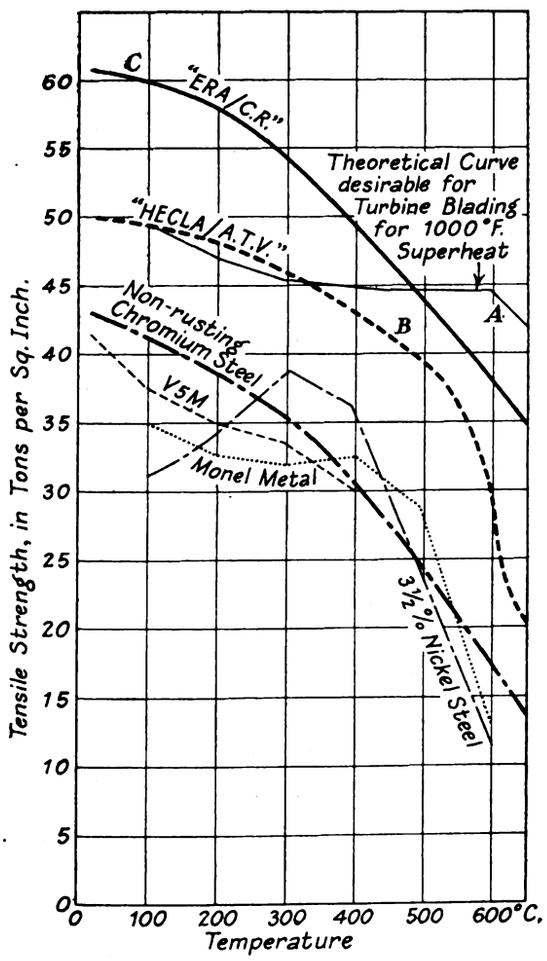

Fig. 1.

is too soft the surface is rapidly washed away by the steam, while if it is too hard there is a tendency to crack and ultimately to break. It is non-resistant to chemically impure steam, and can only be used satisfactorily with temperatures up to 200 deg. C.

Nickel bronze containing 50 per cent. copper, 40 per cent. zinc, and 10 per cent. nickel was also used, while other materials employed were a nickel-copper alloy and Monel metal. The latter usually has a composition of 67 per cent. nickel, 28 per cent. copper and 5 per cent. iron. It has been fairly extensively employed, and though it possesses good tensile strength, the yield point is relatively low, while there is a distinct deterioration of its physical properties at superheated steam temperatures. It is also badly attacked by erosion. Nickel-steel containing 5 per cent. nickel has been widely used, as it can be satisfactorily worked, and resists vibration well. On the other hand it rusts rapidly, and its resistance to erosion is not high. At one time it was thought that many of the blading troubles could be cured by the use of 25 per cent. nickel-steel, but great care is necessary in drawing and working this material, and it is liable to transverse cracks owing to lack of uniformity in the structure. Nickel-steel containing 30 per cent. nickel has also been tried with unsatisfactory results, and though non-rusting chromium steel has given a good account of itself in some cases, it has proved unsatisfactory where the water conditions are bad.

A blading material must be judged by its non-corrodibility properties, resistance to erosion, strength, convenience of manufacture and cost. In future the turbine builder, therefore, will almost certainly have to choose his blading material from among the non-corrodible alloy steels, among which special mention may be made of the Hecla/A.T.V. steel introduced by Hadfields.

In choosing a material to resist corrosion it must be remembered that this phenomenon, apart from any chemical action from the high pressure steam itself, is primarily due to dissolved oyxgen, and secondarily to volatile acidity which may be generated in the boiler. Purification processes may sometimes put harmful components into the water which result in carbon dioxide being carried over wtih the steam from the boiler thus rendering the back of the blades liable to attack.

Bronze blades in particular are attacked by sea water, and if chlorine enters with the steam all parts made of ordinary steel and iron are attacked, though it has been found that the Hecla steels are resistant. During running the corrosion which occurs is mainly confined to those stages where the steam is wet, and reaches a maximum where saturation begins. The corrosion is less under constant load with no temperature changes than under varying load. Standing turbines are inclined to rust, but in this case all parts are more uniformly attacked. The corrosion is increased if there is a small leak of steam through the valves or stop cocks, and this would in turn be increased if carbon dioxide vapours entered the turbine. Experience has shown that thin edged blades made of steel, which is subject to the slightest corrosive action, have a relatively short life. Chemical and mechanical tests to determine the suitability of the material for blading should be carried out at the working temperatures.

With regard to erosion, some blading materials, which are non-corrodible, are not very resistant to erosion. In fact each type of attack assists the other, as erosion may be due to the effect of wet steam on the convex sides of the blades, boiler dust which erodes the concave sides of the blades, and metallic particles.

Owing to the increasing steam pressures and the higher speeds at the low pressure ends erosion tends to proceed more rapidly than hitherto. In the ordinary steels resistance to wear by erosion increases with the hardness, and tests have shown that the resistance to wear of rustless chromium steel of 400 ball hardness is about four times as great as when the material has a ball hardness of 230. This resistance is, however, more than offset by the difficulty of working. Steels of the newer nickel chromium type have been shown to have twice the durability of the hardened rustless chromium steels, although their Brinell hardness is only of the order of 200. This may be partly attributed to their austenitic character.

The use of steam with a high degree of superheat necessitates that the blading at the high pressure end shall be of a material which retains the necessary mechanical properties at the full temperature of the steam, while the high peripheral speeds of long blades at the exhaust end demand high tensile strength. It is claimed that Hadfields' new steels provide the designer with materials that have almost the theoretical required properties, and constitute a considerable advance on the alloys used for blading at the present time. The accompanying curves show the tensile strengths of the various materials including the V.5M alloy designed for use on the Continent, and a curve which is considered by an American expert to show a tensile strength desirable for working at a superheat of 1 000 deg. C. At the high pressure end of the turbine blades are also subject to mechanical fatigue at high temperatures, so that a heat resisting steel is obligatory. The blading is also liable to sudden differences in temperature and shocks, so that the blading material must not be modified either in structure or condition by these changes, and must also be rigid and tough.

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It is desirable to have turbine blading of a material whose characteristics remain constant when exposed to a comparatively high temperature for a long time. This is not the case with all materials—for instance, ordinary steel blades which can be bent cold have been known to break off short when bent at 300 deg. C.

The development of a satisfactory blading material has also been found to depend on its resistance to vibration, or in repeated and reversed stresses.

The practice of specifying the elastic limit of turbine blading material at ordinary temperatures is not correct practice. What is required is the mechanical property corresponding to the elastic limit at the temperature at which the blade will be working, and it has even been argued that ordinary mechanical properties have little or no meaning under prolonged load at high temperatures. At the inlet end of the

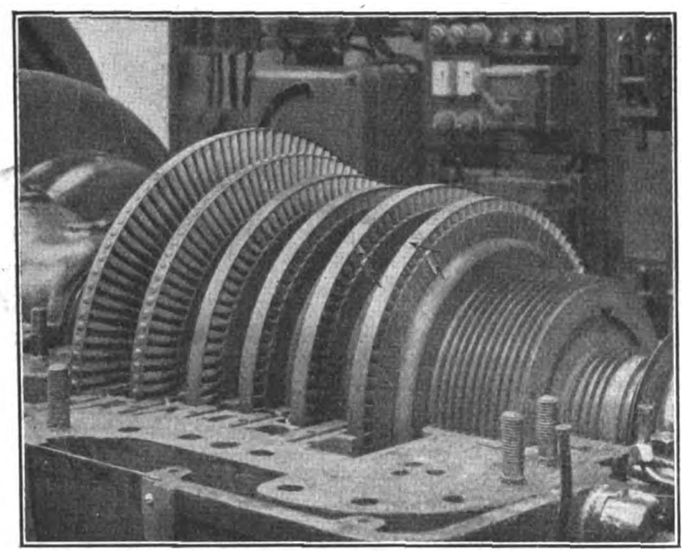

Fig. 2.—View of an opened-up turbine. The arrows indicate unaffected Hecla steel blades.

turbine, in fact, the critical property is the stress which the blading material will support indefinitely without creep, and the new steels have the highest values of creep strength that can at present be obtained. The stresses which they can support indefinitely at 842 deg. F. are as follows :—

"Era/C.R."	20½ tons
"Hecla/A.T.V."	16 ,,
0·3 carbon steel	7½ ,,

The fact that 25 turbines have now been constructed with blades of the above special Hecla steel, and appear as good as new after having been in operation for six years, indicates, it is claimed, that the properties of this material are a great advance on those usually employed.

Modern Telegraph Operation.

(*Concluded from page* 638.)

to effect an adjustment of the reed in such a direction as to decrease its rate of vibration and thus to slow down the speed of revolution of the motor A. If the speed of the brush is less than one revolution per second, the impulse will operate through the other segment, and will effect an opposite adjustment of the reed and motor A. In this manner the speed of the transmitter is kept as constant as the clock, since the transmitter motor B (Fig. 1) is in parallel with the motor A, and is therefore under the same control.

Distorted signals received by the relay (Fig. 2) from one cable are made regular and sent on into the next cable by the retransmitting unit of the regenerator. It is essential that the speed of the motor M driving the re-transmitting unit shall agree precisely with that of the motor B of the transmitter at the sending station. The reed at any regenerating station will be clock-controlled. If the clocks at the sending station and at each regenerating station could be set so as to be permanently in agreement, the motor M could be driven directly from a clock-controlled reed, as a means of fulfilling the condition that it must revolve always at the same speed as the motor of the transmitter at the sending station. It is impossible, however, to obtain such agreement, and it becomes necessary to utilise the signals themselves as the means of comparing and adjusting the difference between the rate of the clocks. This is effected by the agency of the synchronising unit, which judges from the time of arrival of the first beat of each letter signalled whether it is necessary for the speed of the phonic motor of the retransmitting unit under its control to be slightly increased or decreased to be in agreement with that of the transmitter motor at the sending station. The method employed is that an electric impulse, dependent upon this time of arrival, takes one path through the synchronising apparatus if the signal is relatively early (thereby causing the speed of the controlled motor to be increased), and another path if the signal is relatively late (thereby causing the speed to be reduced). In analogy, the phonic motors of the transmitting unit at the sending station and the retransmitting unit at the regenerating station may be considered as two trains running on parallel lines. The synchronising unit is the driver of the second train, and its function is to keep this train running always at the same speed as the first train. The path taken by the electric impulse stands for the recognition by the synchronising unit, as driver, that the train under its control is running a little too fast or a little too slow, and, in consequence, the brake is applied or the train is accelerated automatically.

The arrangements at the receiving station are similar to those at a regenerating station, except that the retransmitting unit is converted by a small substitution of parts into a perforator producing cable-code or morse slip as desired.

Effects of Regenerator Working.

Regenerator working has been installed on certain main-line cables for sufficient time to enable the effects of its introduction to be gauged. As already indicated, its installation has resulted in an increased speed of working, and in a reduction both of the number of stoppages and of the average duration of each stoppage. By providing a means of restoring received signals to their original perfect formation for retransmission into the next link of a chain of cables, the regenerator stands for direct working over longer distances. Where a regenerating or relaying station displaces a station hitherto acting as a terminal, the station is worked by a smaller staff. An outstanding feature of the regenerator is that human judgment is eliminated, each beat of each signal being assessed automatically at the most favourable instant in its development, a condition productive of increased accuracy. The results of regenerator working to date on the Associated Companies' cables have been so satisfactory that the installation is being extended as quickly as manufacture will permit.

Compound Filled Switchgear.

(*Concluded from page* 639.)

between units are carried in an easily accessible channel conduit, which accommodates also the auxiliary plug and socket contacts for the connections between fixed and moving portions.

Busbar sectioning and paralleling equipments are standardised, and an earthing device suitable for earthing the circuit or bus through the oil circuit-breaker is supplied when required. This device ensures that if a live circuit be inadvertently put to earth, injury to the operator will be avoided.

These equipments are made in various sizes for use on circuits up to 33 000 V and with rupturing capacities up to about 1 000 000 kVA. Both single and duplicate busbars are provided for in the designs, and in the latter case selection may be by means of movable plugs, or, alternatively, by oil-immersed selectors, so arranged that a circuit may be transferred, when required, from one bus to the other without shutting down.

The Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester, and 137, Victoria Street, London, S.W.1, has issued illustrated publications on "The Battery for Country House Lighting" and "Chloride Batteries Aboard Ship." The former (No. 81), besides setting forth the advantages of using the company's batteries, gives particulars and illustrations of engines, generators, etc., made by many well-known firms. The second publication (No. 92) also contains details and prices of Chloride and Exide batteries, and a number of interesting pictures of vessels upon which they are used.

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NEWS IN BRIEF.

Electrically-heated Aerials—New Branch of E.A.W.—Proposed International Electrical Information Bureau—Volta Centenary Exhibition.

STALYBRIDGE telephone exchange is to be cut over to-morrow (Saturday).

An Electrical and Hardware Merchants' Association has just been formed in Toronto.

It is estimated that there are 339 046 electric refrigerators in use in the U.S.A.

To hide a transformer kiosk in Africa Gardens, Cardiff, the Electricity Committee will surround it with shrubs and trees.

Chesterfield Electricity Department has been notified that its coal suppliers will resume fuel deliveries at pre-stoppage prices.

To protect them from damage by intense cold, the aerial wires of a new Swedish radio broadcasting station will be electrically heated.

Two men were injured when a crane toppled over the side of a wharf into a barge at the North Woolwich works of Standard Telephones and Cables, Ltd.

A new branch of the Electrical Association for Women has been formed at Cheltenham. Mrs. Atwell Lane is president and Mrs. Charles Marshall vice-president.

Fifty men of the electrical department, Portsmouth Dockyard, left under notice last Friday, and it is rumoured that more are to go before the end of the financial year in March.

New public baths to be built at Bethnal Green, one of the poorest districts in London, will contain electric baths for workpeople and an electric laundry to do the washing " while you wait."

The trans-Pacific cable connecting San Francisco and Honolulu was cut by a rum-running schooner. It is presumed that the cable fouled the ship's anchor and was cut to avoid delay.

The South Eastern Jersey Club visited Mr. R. Borlase Matthews's all-electric farm at East Grinstead last Saturday. Members were particularly interested in the new model Hanovia ultra-violet lamp designed for the treatment of cattle and poultry.

A Leeds toy trader, advertising a Christmas bazaar, announces that a complete scale model electrified railway will be demonstrated, and that model ships entering and leaving model docks and loading and unloading cargoes will all be electrically controlled.

A dance and concert is being given by the staff of the Normand Electrical Co., Ltd., at the Constitutional Hall, Balham, London, on December 22nd. Tickets (4s., including refreshments) can be had from Mr. G. Goad, Normand Electrical Co., Ltd., 3, North Side, Clapham Common, S.W.4.

Mr. W. C. Roy, manager of the Kirkwall power station, in an address to members of the Orcadian Agricultural Discussion Society at Kirkwall said that, given a central point of generation and control it would be possible to give a supply to most of the farms on the mainland of Orkney at 3d. per kWh.

Mr. E. Gomersall, superintending telephone engineer for the North Midland District, informed the Nottingham City Business Club last Friday that the new automatic exchange in Nottingham, with three " satellite " automatic exchanges would probably be opened next summer, and Leicester would follow with two (or possibly three) new exchanges towards the end of next year.

Members of the Hartlepool and West Hartlepool Corporations visited the new automatic telephone exchange at West Hartlepool last Friday. Mr. J. R. M. Elliott, superintending engineer for the North-Eastern area, said they intended to make that particular branch of the service popular. In a way they wished to be associated with the municipal undertakings, and become a part of the organisation of the life of the town.

The League of Nations Committee on Electrical Questions which has just finished its first session at Geneva, urges that the Governments should be requested to examine anew the Conventions of 1923 on the transmission of electric power and the utilisation of hydraulic power with a view, if possible, to ratifying them. The Committee also suggests that the League might contribute to the constitution of an international centre of information on electrical subjects.

Members of the Electrical Contractors' Association in Ireland have formed an Irish Sectional Board of the E.C.A.

Blackpool Electricity Committee have decided not to charge consumers for the electricity supplied during the curtailed autumn illuminations.

Organised by Ilkley Electricity Department, an exhibition of domestic electrical apparatus is being held this week in Ilkley Winter Garden.

There were 51 new consumers of electricity at Burnley during October, when 158 radiators were disposed of on sale, hire purchase, or simple hire.

It is stated that the Hungarian Minister of Commerce is conducting negotiations for the construction of a big inter-urban power station, and that several offers have been received.

Southport Corporation intends to spend nearly £100 000 on relief works this winter. One proposal is for the erection of a new bathing lake to cost £60 000, and for which certain electrical pumping plant will be required. The plans have been drawn up by the borough engineer. Another proposal is reported to be the laying of an electric cable from the central station to Ainsdale.

Birmingham Chamber of Commerce has passed a resolution disapproving of the action of Government stores departments in using as patterns of goods for which tenders are invited, samples of foreign manufacture and foreign type, when they might be British. It is urged that every standardised sample of foreign origin should be examined to ascertain whether a similar article of English manufacture could not be substituted.

In connection with the Volta centenary celebrations, an exhibition will be held at Como, Italy, from May to October, 1927. The exhibition will include the following sections :— International exhibition of electric telegraphs and telephones; international exhibition of radio communications; Italian hydro-electric industries. Further particulars may be obtained from the Volta Exhibition offices, Villa Olmo, Como, Italy.

The number of hydro-electric stations of over 300 H.P. in Italy on December 31st, 1925, included 588 with over 2 000 000 H.P. capacity and 95 stations aggregating about 1 000 000 H.P. were under construction. The reservoirs used for the production of power were 86, with a capacity of 800 000 000 cubic metres, equal to a reserve of 1 300 000 000 kWh per annum, while 27 reservoirs were under construction which will have a capacity of about 770 000 000 cubic metres.

A communication by M. Georges Claude and M. Boucherot on a system of obtaining electrical energy from the sea was read before the Académie des Sciences recently. The proposal is to utilise the difference in temperature between the tepid surface water and the cold submarine water. It is stated that steam has been produced by this means, and that it can be used to drive turbines when it is drawn by the very high vacuum maintained in the condenser by the cold submarine water.

Mr. W. G. Heath, in a paper at the Merchant Venturers' Technical College, Bristol, spoke of the need of a more adequate supply of trained men in the electrical industry. He expressed the view that the electrical contracting industry had insufficient skilled labour at its disposal, and said he would like to see the system of apprenticeship and technical training improved. There should be some scheme for assisting parents and schoolmasters when they desired to place boys in the electrical industry.

It is reported that Mr. F. G. W. Tree, a Glasgow engineer, has invented and submitted to the Admiralty a safety device for submarines by means of which, it is claimed, a sunk submarine can be located and salvaged by any vessel of average size which may arrive on the scene. The device incorporates a self-contained wireless signalling apparatus which remains on the surface when the submarine sinks. By its means the crew are able to signal the circumstances of the accident and their location in the sea. Should the crew be rendered unconscious the apparatus emits distress signals automatically. The invention also provides for a means of getting a hawser connected from the rescue ship to the submerged vessel, without the assistance of a diver.

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W.O.B. PROGRESS.

Big Attendances at Demonstration Electric Homes—Birmingham's Bid for Supremacy—A Rural Circle's Fine Effort.

ONE of the most gratifying features of the W.O.B. Campaign in the Midlands (writes an ELECTRICIAN correspondent) is the splendid support given by the Birmingham Corporation Electricity Supply Department. In numerous ways members of the Department are helping forward the campaign, and not the least pleasing features have been the special window displays at the showrooms in Paradise Street and the poster display at the Dale End premises. At the latter, nearly 4 000 competition booklets have been distributed. The Department's initiative in acquainting its domestic consumers by letter of the opening of the demonstration houses has also borne good fruit.

More Demonstration Houses.

Birmingham is determined to maintain its ascendancy in this matter of demonstration houses. Four more will be opened after Christmas. Meanwhile, Walsall, Birmingham's close neighbour, will have two demonstration houses open next week and extensive press advertising will be done in this area.

Leicester's two houses will be opened early next month, and a third will be opened in February. At the Leicester Corporation showrooms the distribution of booklets is proceeding apace, an average of 50 per day being asked for.

Two demonstration houses were opened at Nottingham on Wednesday. They are like those at Birmingham, typical middle-class dwelling houses, attractively fitted and furnished for everything electrical by the local contractors.

The keen support which the Shropshire, Worcestershire, and Staffordshire Electric Power Co. is giving to the campaign has already been mentioned. The company now proposes to hold a series of small exhibitions demonstrating the value of electricity in the home, as part of its endeavour to boost the campaign in the rural areas. The first of these was held last week at West Hagley, in North Worcestershire, and attracted gratifying interest. Similar events are to take place in the near future at Tewkesbury, Dudley, Evesham, Droitwich and Halesowen.

In addition to these exhibitions, the company is advertising the " All-electric House Competition " in a dozen local papers.

Attendances at the demonstration houses in most areas are very good ; Edinburgh had 17 145 visitors in 16 days. Incidentally, the builder of the Edinburgh house has sold the property as the result of the exhibition, and the furnishing firm which supplied the furniture has sold all the furnishings of the house and more besides.

New Electrical Circles were formed last week in Ashford, Chesterfield, Dumfries, Exeter, Felixstowe, Great Yarmouth, Loughborough, Stourbridge, and Wednesbury.

As an instance of what can be done by an Electrical Circle in a small country residential district, reference may be made to an excellent little one-day exhibition held at West Horsley last week.

The exhibition was held in the village hall, West Horsley. Lighting, heating, cooking and labour saving exhibits were staged by Buchanan and Curwen, Ltd., contractors, of Leatherhead, the Mid-Surrey Engineering Co., Ltd., contractors, of Leatherhead, and the Leatherhead and District Electric Lighting Co.,

Two lectures with demonstrations were given on electric cooking and labour-saving devices by Mrs. Frith, late of the E.D.A., and a lecture with demonstrations on " Home Lighting " was given by Mr. L. E. Buckell, of the G.E.C., and a great W.O.B. enthusiast.

Some Immediate Results.

The attendance was as good as could be expected from such a sparsely populated neighbourhood, some thirty people attending in the afternoon and fifty in the evening. All concerned were kept busy giving information and answering questions, and it was the general opinion that a lasting stimulation to an increased use of electricity in the district would result. The Electrical Association for Women, which is associated with the Circle, had a stand, and its staff was very helpful in answering queries and spreading the electrical idea. Several people notified their intention of having a supply of electricity put in for lighting, and sales took place of electric fires and other similar devices.

It is intended to have further similar exhibitions and demonstrations of a more substantial nature in other parts of the district. The Circle arranged for joint advertisements in the local papers on the preceding Saturday, and intend to issue from time to time further joint advertisements. Very satisfactory editorial references to the importance of electricity in the home were given in the " Dorking and Leatherhead Advertiser " of Saturday, November 20th.

Our Manchester correspondent reports that the demonstration house at 40, Balmoral Drive, Denton, Manchester, will be opened on December 18th, and every effort is being made through advertising to secure a large attendance of the general public.

An interesting but rather unfortunate point in connection with the campaign was put to THE ELECTRICIAN correspondent by a leading Manchester contractor this week. He said that the applicants for the competition booklet were almost without exception of the working class, who at the present time have little money to spend. He had not yet succeeded in attracting the more likely purchasers through the campaign publicity.

An extensive advertising scheme has been carried out in Clitheroe, Lancs, where the local paper appeared on November 26th with almost two pages of advertisements by local contractors, and a really useful article pushing the campaign.

The Liverpool Circle is actively pursuing the campaign policy to which reference has been made on previous occasions.

Manufacturers' Co-operation.

The British Thomson-Houston Co., Ltd , has just published a useful leaflet (L. 393) which has been designed to assist the public to choose appropriate fittings for every room in the competition home. This leaflet gives photographic reproductions of actual fittings corresponding to the outline sketches in the competition booklet, and thus enables competitors to visualise clearly the different types of fittings recommended, and to judge of their respective merits. Space is provided on the front cover for the overprinting of a dealer's name and address, and every dealer who has ordered a supply of the E.D.A. booklets from the B.T.-H. Co. will be sent an equivalent number of the B.T.-H. leaflet, so that the two publications may be simultaneously distributed to competitors.

Points from district reports to campaign headquarters include the following :—

Dumfries proposes to hold an electrical exhibition early in the New Year.

Exeter is reported to be getting extremely busy on local supplementary work.

The Mayor of Harrogate is opening a demonstration house in that town on December 6th.

Paisley reports that over 5 000 people visited the electric house and that they propose to run another demonstration house in the New Year.

A shop window of one of the largest stores of Liverpool has been presented free of cost to the Circle for a campaign display. It is said that a fee of £100 per week is often charged for the use of this window.

Work in Prospect.

Trade Possibilities for Electrical Installation Contractors.

ALDERSHOT.—Police buildings, White Hill. Particulars, the Clerk, The Castle, Winchester.

COVE.—School, Tower Hill (£7 500). Particulars, the Director of Education, The Castle, Winchester.

FARNBOROUGH.—Extensions for Higher Education (£10 500). Particulars, the Director of Education, The Castle, Winchester.

GREAT AMWELL (WARE).—Houses (10), Lower Road, for W. H. Lee and Co.

NEWPORT (SALOP).—Housing scheme, Longford Road. Particulars, the Surveyor.

STIRLING.—Housing scheme (41). Particulars, the Burgh Surveyor.

THORNBURY.—Housing scheme, Cromhall. Particulars, the Surveyor, Mr. F. W. Davies, High Street.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

MR. R. B. Maccall, secretary and treasurer of the Glasgow Corporation Electricity Department, has been appointed a Justice of the Peace for Glasgow.

At a dinner given by Hackney Electricity Committee members to celebrate the 25th anniversary of the undertaking, Mr. L. L. Robinson, borough electrical engineer, was presented by the Mayor on behalf of the Committee with a suitably inscribed silver cigarette box.

Mr. G. Marconi had a private interview last week with the Pope, who, it is stated, was greatly interested in Mr. Marconi's description of his recent invention in wireless telegraphy, and presented him with a gold medal similar to that given to General Nobile (of the airship Norge) a few months ago.

Following the report of the resignation of Mr. James Dalrymple from the general managership of Glasgow Corporation Tramways, the Corporation rejected, by 59 votes to 51, the Tramway Committee's recommendation that 316 tramwaymen who were discharged for participation in the general strike last May should be reinstated. Mr. Dalrymple, however, reaffirmed his offer to resign and the Tramways Committtе on Monday accepted it.

It is reported that the resignation of Sir Herbert E. Blain (formerly assistant managing director of the London Underground Railways) from the position of chief agent of the Unionist Party will take effect at the end of the year, and that Sir Herbert contemplates returning to commercial life. It has been rumoured that Sir Herbert is to be appointed as chairman of the Central Electricity Board which it is proposed to set up under the new Electricity Supply Bill, but he denies all knowledge of this.

The Swedish Academy of Sciences has decided to divide the 1925 Nobel Prize for physics between Prof. J. Franck of Göttingen and Prof. G. Hertz of Halle. Prof. Hertz, who is a nephew of the discoverer of the so-called Hertzian waves, has been, since 1921, undertaking research work at the physical laboratory of the Philips' Lamp Works. His work produced valuable information regarding the possibilities of light produced by electrical discharge in gases, and also did valuable work in the field of dull emitter radio valves. A year ago he was appointed director of the Philips' physical laboratory.

Obituary.

The following deaths are reported :—

MR. C. A. HUNT, at Hampstead, on November 17th, a director of the Manx Electric Railway Co., with which he had been identified almost from its inception.

MR. JAMES GILBERT, of Northwich, on November 21st, aged 55 years. He was assistant manager of the Mid-Cheshire Electricity Supply Co., was a member of the Urban Council, the Board of Guardians, and organist of the Semper Fidelis Lodge of Freemasons.

MR. E. C. WALLIS, electrical contractor of Wallis and Watson, Ltd., Leeds, aged 76 years. In 1908 he was President of the Electrical Contractors' Association, of which he was an original member. For many years a member of the Council, he was the " father " of the West Yorks Branch, and was its first secretary. He had also been chairman of the Northern Section, and was one of the small band of Fellows of the Association. He became a full member of the Institution of Electrical Engineers in 1904. Mr. Wallis is survived by his widow and one son. The funeral was at Larnwood Cemetery, Leeds, on November 27th.

Mr. LEONID KRASSIN, Soviet Chargé d'Affaires, in London, on November 24th. Mr. Krassin, who was born in Siberia in 1870, and who had had an eventful life since he first took a share in the Russian revolutionary movement in 1890, found time to do useful work in the field of electrical engineering. He entered the service of Siemens-Schuckert, of Berlin, as an electrical engineer about 1908, and returned to Russia to take over the management of the technical department of the Moscow branch of the Russian Siemens-Schuckert Co., remaining in that position until the outbreak of the war in 1914. The Russian board, which took over the sole management of the Russian company at the outbreak of the war, then transferred Mr. Krassin to St. Petersburg, where he became a vice-director and later the chief technical director of the company. He remained in this position until the 1917 revolution.

BUSINESS ITEMS.

Changes of Address, Representatives, and other Developments.

FERRANTI, Ltd., Hollinwood, Lancs., have taken extensive works in Tame Street, Stalybridge, for the manufacture of wireless transformers and other radio products.

Lieut.-Col. A. F. Watt has commenced a protracted world tour to investigate business conditions overseas on behalf of the Pyrene Co., Ltd., of which he is a director. He expects to be away until June, 1927.

An early advertiser of electrical Christmas presents in the lay Press is Mr. W. Hampton, electrical contractor, 1, Bridge Street, Stafford, who had a full column illustrated announcement in the " Staffordshire Advertiser " of November 20th.

The accompanying illustration shows the new London showroom and service depot opened by Batteries, Ltd., of Redditch, at 220, Shaftesbury Avenue, London, W.C.2. Facilities are available for recharging the firm's "Nife" nickel steel alkaline accumulators and for refilling them, when necessary, with renewal solution.

The new London showrooms opened by Batteries, Ltd., of Redditch.

The policy of standardising types of electric lamps is being followed by Neron Lamps, Ltd., 1–3, Brixton Road, London, S.W.9, who have placed on the market a standard line of lamps which they claim to be suitable for all ordinary lighting purposes. This standard line, containing only five types, replaces forty-two previously existing types.

James Neill and Co. (Sheffield), Ltd., Napier Street, Sheffield, specialists in magnet steels, are now offering a cast magnet with a coercive force of approximately 270 to 280. Advice on the construction and design of permanent magnet systems is given to interested inquirers.

" Hart " batteries are installed at each of the four automatic telephone exchanges in Edinburgh.

Reductions in the prices of the " Athol " coil mounts and the " Tiger " valve holder are announced by the Athol Engineering Co., of Crumpsall, Manchester.

Marconi's Wireless Telegraph Co. announces that, owing to an adjustment of terminal rates by the Governments concerned, the charge for telegrams (via Marconi) between Great Britain and Spain has, in common with all other routes, been increased to 3d. per word for ordinary telegrams, and 9d. per word for urgent telegrams.

The Stella Lamp Co., Ltd., Winchelsea Road, Harlesden, London, N.W., announce that by arrangement with the Electric Lamp Manufacturers' Association " Stella " lamps of all types are now to be supplied under the same conditions as those applying to all members of that Association's new price lists. Showcards and other publicity matter will be available at an early date. Mr. A. H. Jeans will continue to act as sales manager.

Books Received.

" The Transmission Factor of Commercial Window Glasses." By A. K. Taylor and C. J. W. Grieveson. Technical Paper No. 2. Issued by the Department of Scientific and Industrial Research. (London : H.M. Stationery Office.) Pp. 10. 6d. net.

" Rotary and Motor Converters," A Handbook for Operators and Attendants. By E. F. Smith. (London : Crosby Lockwood and Son.) Pp. xii+233. 7s. 6d. net.

" Practical Physics." By T. G. Bedford. (London : Longmans, Green and Co.) Pp. x+425. 10s. 6d. net.

" Polyphase Induction Motors." By R. D. Archibald. (London : Chapman and Hall.) Pp. vii+88. 5s. net.

" First Course in Wireless." By Robert W. Hutchinson. (London : University Tutorial Press.) Pp. 262. 3s. 6d. net.

" Television." By A. Dinsdale. (London : Sir Isaac Pitman and Sons.) Pp. 62. 2s. net.

" Pitman's Electrical Educator," Part 31. Edited by J. A. Fleming, F.R.S. (London : Sir Isaac Pitman and Sons.) 1s. 3d. net.

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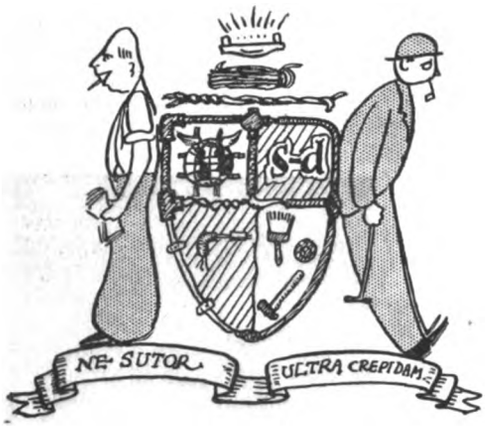
IN LIGHTER VEIN.

A Coat of Arms Designed for the "Odd-Job" Contractors.

AFTER designing the coat of arms for the "registricians," our two tireless workers, the heraldic expert and the famous electrician, refuse to cease. They have now gone to the other extreme, and have produced a magnificent coat of arms for the "odd-job" contractors, the men who will do anything from wall-papering to electric lighting, men who carry out the whole scheme fully, even down to painting the ceiling to obtain a better reflection, and cleaning the windows both inside and outside to increase the efficiency of the general lighting.



The technical description of the design is as follows :—

A SHIELD in conduit-cum-leadcovered-cum-cleats, improper, quartered. *1st Quarter.*—Azure, bolts and bars, sable, in front of which is the earth—free and easy, winged. *2nd Quarter.*—Symbolic mark for shillings and pence. *3rd Quarter.*—The bend (very) sinister, sable, with air-gap. *4th Quarter.*—Silver, a whitewash brush, condenser dial, hammer, inverted, all proper.

CREST.—A wreath of crinkled cable, stranded (having been run to earth), surmounted by a coil of kinked cable, and a fuse, rampant.

SUPPORTERS.—*Dexter.*—Man with hammer, pipe in mouth, inverted, semi-conscious. *Sinister.*—Bright young man in bags (Oxford) carrying book.

To put this explanation into non-technical language, we should explain that the shield, in addition to being quartered, should really be hung and drawn. The first quarter showing the earth free, is symbolic of its unhappy knack of popping up at odd moments alongside the wiring. The second quarter is beyond words, whilst the third is an open confession. The fourth indicates the many duties the bearers are prepared to undertake. The supporters are familiar birds of passage. The dexter or right hand supporter being of the old school who "stops at nothing," and the sinister or left hand supporter is a young blood who regards the world as his oyster—wide open. He carries in his hand the source of his surprising and extensive knowledge (surely the "Encyc. Brit." 1 vol. edition, printed on extra thin paper, on both sides and edges).

The crest indicates patience and resource; for without these how could the cable be untangled, or the fuses refused?

It is very much regretted that the members are so scattered, so elusive, and are so busy in so many different places on so many different jobs, that a mass meeting cannot be arranged. The coat of arms must, therefore, remain in cold storage for an indefinite period.

Points of View.

Interesting Pronouncements on a Variety of Electrical and Allied Subjects.

WITHIN the last twelve months over 16 000 miles of deep sea cable have been constructed and laid, or are about to be laid.—*Sir John Denison-Pender.*

* * *

It is the business of all cable companies to come together in order that this service, which has been so important to the progress of the world, shall not be rendered unremunerative in any direction.—*The Earl of Midleton.*

* * *

The standardisation movement, although it has Government approval and was officially acknowledged during the war as one of the most potent causes of accurate production of munitions of war, has received but scant aid from the Government.—*Col. R. E. B. Crompton.*

LEGAL INTELLIGENCE.

Obtaining Appliances from Contractors by False Pretences.

CHARGED at Rawtenstall, on November 24th, with obtaining electrical appliances from Mr. E. B. Lord, electrical contractor, Bacup Road, Waterfoot, and an electric bowl fire from Messrs. Leicester and Holt, electrical contractors, Blackburn Road, Haslingden, by false pretences, Irving Fell, mill engineer, Cloughfold, was committed for six months, the sentences in each case to run concurrently.

Accused called on Mr. Lord and asked him to tender for the installation of electrical appliances at a house he was building in Rawtenstall. Seeing electrical apparatus on the counter, he said he liked it and was allowed to take it away. Subsequently, he took an electric iron, switches, etc., to fix in the house temporarily. His story was then found to be false. The police found articles installed at licensed premises and accused had received £7 16s. from the licensee.

In the second charge, accused obtained the fire by representing that he was an electrical contractor, of Rawtenstall, and was working at a house in Grane Road. He sold the fire for 26s.

Death Caused by Electrified Fence.

The Bridgend (Glamorganshire) magistrates recently commenced the hearing of charges against Cory Bros., coal exporters, and three of their officials, Mr. Robert Illingworth, chief electrical engineer; Mr. Temple Davies, and Mr. Thomas Hardee, electricians, at the instance of Mr. George Thomas John that they did set, or cause to be placed, a spring-gun, man-trap, or other engine calculated to destroy human life or inflict grievous bodily harm upon the trespasser or any person coming in contact at Ogmore Vale, on August 24th, 1926. They were further charged with the manslaughter of Brynmor Edward John, of Ogmore Vale.

The cases were a sequel to a fatality at the company's power station, when Brynmor John died from the effects of an electric shock sustained by coming in contact with an electrified fence surrounding the power station. A coroner's jury returned a verdict of manslaughter against some person or persons responsible for the erection of the fence.

The cases were adjourned for a month and it was stated that counsel would be engaged at Glamorgan Assizes.

Wireless Valve and Lamp Litigation.

Mr. Trevor Watson moved before Mr. Justice Eve in the Chancery Division on November 24th, for judgment in default of appearance and defence in the action the British Thomson-Houston Co., Ltd., against Louis. Counsel said there were two patents involved in the case and both had been held valid. The plaintiffs were joint registered legal owners of one of the patents with the Marconi Co. The particular invention in question was useful both for wireless valves and electric lamps, and the Marconi Co. and the B.T.H. Co. had joint interests, the former having interests so far as wireless valves were concerned and the B.T.H. being interested so far as regarded the lamps. There had been a partition of interests.

His lordship gave judgment as asked.

Appointments Vacant.

Particulars of the Latest Opportunities for Electrical Engineers.

TORQUAY Corporation requires a district mains assistant in its Electricity Department.

Manchester Corporation requires a mains engineer. Salary £900, rising to £1 000 per annum.

An assistant divisional telegraph engineer is required for the Posts and Telegraphs Department of the Government of India.

Applications are invited for the post of head of the electrical engineering department of St. Helens Municipal Technical School.

A resident engineer is required for an electricity supply station in India. Applications to Martin and Co., 6 and 7, Clive Street, Calcutta.

An electrical engineer-in-chief is required by the Government of Nigeria. Particulars from the Crown Agents for the Colonies, 4, Millbank, London, S.W.1 (reference M/14912).

An assistant transportation superintendent, with telegraph training, is required for Indian State Railways. Applications to Rendel, Palmer and Tritton, 12-14, Dartmouth Street, London, S.W.1., by January 10th.

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THE NATIONAL REGISTER.

Continuation of the Latest List of Registered Contractors.

A FURTHER instalment is given below of the latest list of registered electrical installation contractors :—

Manchester (Continued).—Ross Electrical Engineering Co.; George H. Scholes and Co., Ltd.; Reginald James Scott; R. Seddon and Sons; John H. Sharp; Silcock and Rose; Smith, Major and Stevens, Ltd.; J. A. Somerset and Co.; John Stott; A. E. Sudlow and Co.; Sword and Co.; Tattersalls; W. E. Tetlow; H. Townson; Turner and Booth; Leonard Tweedy; G. Waite and Co.; E. O. Walker and Co.; Ward and Richardson; Robert Alfred Williams, L. E. Wilson and Co.

Margate.—A. F. Dunkley.

Melton Mowbray.—Melton Mowbray Elec. Light Co., Ltd.

Middlesbrough.—Baker Brothers; Graham Bros.; Harrison Brothers (Electrical Engineers), Ltd.; H. G. Sproates and Co.; T. B. Watson and Son, Ltd.

Mirfield.—Herbert Senior.

Morecambe.—E. and W. Shepherdson; W. H. Wilkinson.

Morpeth.—A. R. Hudson; R. J. Woodhouse.

Nelson.—Carter and Co. (Nelson), Ltd.; Allan E. Dent; Nelson Engineering Co., Ltd.

New Brighton (Cheshire).—Chesters.

Newbury.—Urban Electric Supply Co., Ltd.

Newcastle (Staffs).—J. Bagguley and Son.

Newcastle-on-Tyne.—Thomas Atkinson; Robert W. Cairns; G. B. Carnegie and Co.; Devereux, Moodie and Co.; G. S. Douthwaite and Co.; J. R. Douthwaite and Co.; Falconer, Cross and Co., Ltd.; Fletcher Bros.; Gray Bros. (Newcastle), Ltd.; A. S. Hobson; W. W. Jackson; Jesmond Electrical Engineering Co., Ltd.; A. J. Knight; J. Mayo and Co.; C. H. Mauger; J. G. Parker and Co.; R. H. Patterson; Arthur Patton; F. Ferens Reid and Co.; Robson and Coleman; Simm and Richardson; Sleigh and Wood; T. G. Usher and Co.; Wilson and Ridley.

Newport (Mon).—R. Alger and Sons, Ltd.; A. G. Arnold and Son; John Henry Groome; W. B. Howard and Sons; Marler and Co., Ltd.; Newport Electrical Co., Ltd.; E. Parkin and Son; Sewell and Co.

Newquay.—T. Tremain.

Newton Abbott.—A. J. Thomas.

Northampton.—E. Goldston, Ltd.; Lowke and Sons, Ltd.; Smith, Major and Stevens, Ltd.

North Shields.—Electrical Equipments, Ltd.; J. Mayo and Co.; Northern Electrical Engineering and Plating Co.; W. W. Ward and Son, Ltd.

Northwich (Cheshire).—Mid Cheshire Electricity Supply Co., Ltd.

Norwich.—Mann, Egerton and Co., Ltd.

Nottingham.—Attenborough and Turpin, Ltd.; Henry Barker, Ltd.; Blackburn, Starling and Co., Ltd.; W. J. Furse and Co., Ltd.; Good, Marriott and Co.; E. A. Harvey; H. T. Hazzledine, Ltd.; Pearson Bros.; W. H. Tew and Co.; Owen A. Whittaker; Herbert Worton.

Nuneaton.—Parsons, Sherwin and Co., Ltd.

Oldham.—William Caton and Sons; S. Charlesworth and Co.; John Jackson; James Engineering Co.; Henry Lowe and Sons, Ltd.; Paramount Elec. Eng. Co.; Starkie and Sparkes, Ltd.; Wade and Mills; Frank Wall and Co.

Oxford.—F. G. Alden; Hill, Upton and Co.; G. W. Watson and Son.

Paignton.—E. M. Fawcett.

Peterborough.—George Andrews and Co.; Peterborough General Engineering Co.

Pinner.—G. A. Davenport (General Electrical Maintenance Co.).

Plymouth.—W. J. Corse and Co.; W. G. Heath and Co.

Pontardawe.—R. J. Hapgood.

Port Talbot.—Port Talbot Electrical Engineering Co.

Preston.—Ashton Electrical Co. (Preston), Ltd.; Carwin Electric Co.; Thomas Cross; E. Dewhurst, Ltd.; Norman Harrison and Co.; C. H. Haycraft and Son; Lee and Calvin; Mayor and Crozier; Alfred Williams and Son.

Ramsgate.—Edmund Dunn; E. Arthur Pinto; Ramsgate and District Elec. Supply Co.

Reading.—Baughan and Co., Ltd.; Callas, Sons and May, Ltd.; Whitchurch and Pangbourne Elec. Supply Co., Ltd.

Reigate.—J. E. J. Goundry; Tamplin and Makovski, Ltd.

(To be continued)

BIRMINGHAM DINNER.

Speakers Stress National Point of View in Electricity Supply.

THE annual dinner of the South Midland Centre of the Institution of Electrical Engineers was held at the Grand Hotel, Birmingham, last Friday, Col. J. F. Lister being in the chair. About 350 members and guests were present.

The toast of "The Institution of Electrical Engineers" was proposed by Sir Philip Dawson, who said that only one-third of Great Britain was fairly well supplied with electricity, while two-thirds had an inefficient supply, or none at all.

Four General Conditions.

This state of things could only be overcome by complying with four general conditions: The centralisation, as far as possible, of production in well located and efficient stations, and the gradual shutting down of all inefficient ones, the interlinking of the efficient stations so that each would have a larger output and a better load factor, thus requiring less reserve plant, and giving a higher thermal efficiency, the connecting-up to a general supply system of all auxiliary sources of power, such as waste heat and water power and the separation of generation and transmission, which should be carried out on a national basis from distribution, which must be regional and required special local knowledge. To enable this centralisation and interconnection to be effectively carried out, standardisation of frequency was essential, but unless this was done in the near future its cost would be prohibitive. It had been argued that the financial gain which would be obtainable from centralisation and interconnection was exaggerated, and that it would cost more than had been estimated to standardise the frequency; but the figures criticised were arrived at by engineers of high standing, and were based on their own practical experience. The Electricity Bill was the first measure which dealt with the question of electricity supply from the national point of view.

Dr. W. H. Eccles, in replying, described Birmingham as the Mecca of all engineers. Here Boulton and Watt had launched the steam engine, which had changed the whole course of human life and begun the industrial revolution. As regards electricity supply, Birmingham stood in the first rank in all the world. Its plant was being modernised rapidly, and in the use of pulverised fuel it led the way. The establishment of laboratories for coal treatment in the city was evidence of the modern spirit with which problems were faced. He felt that the Institution of Electrical Engineers ought to become the adviser of the nation on matters electrical, and should attempt to influence the public in a broader way than it had done hitherto.

Unjustified Criticisms.

Mr. R. A. Chattock, in proposing "The Electrical Industry," remarked that the supply industry in this country was developing at a satisfactory rate. Ten years ago the annual increase in the number of consumers in Birmingham was 1 000; at present it was 10 000. He did not think that the criticisms which had been levelled against British supply undertakings were justified. It might be that they had not progressed so fast as some other countries, but the conditions under which they had had to work were different. Very few electrical engineers liked the new Bill, but now it was through they were going to make the best of it, and at the same time look after the interests of their consumers. He did not think that the estimates of the cost of standardisation were correct, but the proof of the pudding would be in the eating. Rural electrification would do a great deal to assist the electrical industry, but safe wiring was essential. The interest in lighting developments which was being stimulated by the "Wiring of the Homes of Britain" campaign should be extended to cooking and heating. Progress in these directions was badly wanted to improve the load factor. This would do more to cheapen supply than anything else.

Mr. H. C. Levis, chairman of the British Thomson-Houston Co., in reply, reviewed the progress which had been made in the last twenty-five years, and indicated that for the future there was every reason for optimism. For the time being this country was behind others, but that would be altered when the electrical industry was allowed to expand freely without restriction. A grave hindrance to the prosperity of the electrical industry in this country was that it had no protection against the importer. This kept the output low and the cost high.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest available particulars of contracts for which tenders are invited, with the closing date, if such is given.

HAWTHORNDEN CASTLE, LASSWADE.—Electric lighting plant and heating installation, for Sir James Williams-Drummond. Particulars from Mr. Stewart Kaye, architect, 14, Hill Street, Edinburgh.

PORTSMOUTH CORPORATION.—Two water-tube boilers, each of 50 000 lb. per hour evaporative capacity, with economisers, steel bunkers, etc. Specifications from Mr. B. Handley, Electricity Department, High Street, Portsmouth; deposit £1.

SOUTH INDIAN RAILWAY CO., LTD., December 3rd.—Steam turbine driven generating plant. Specifications (10s.) from the company's offices, 91, Petty France, Westminster, S.W.1.

LICHFIELD CITY COUNCIL, December 4th.—Electric light installation at City Institute and Market Hall. Particulars from the Electrical Engineer.

GREAT SOUTHERN RAILWAYS CO., December 6th.—Six or 12 months' supply of electric cables (under form 129), electric lamps (form 137), etc. Forms (6d. each) from the Stores Superintendent, Great Southern Railways, Inchicore, Dublin.

PRESTATYN URBAN DISTRICT COUNCIL, December 6th.—Underground cables, overhead lines, transformers, e.h.t. and l.t. switchgear and sub-station equipment. Specifications, etc., from Mr. J. Lloyd Hughes, Clerk of the Council; deposit £2 2s.

METROPOLITAN WATER BOARD, December 6th.—Two steam driven electric generators (one 100 kW and one 50 kW), switchboard, piping, etc., for Kempton Park Pumping Station. Specification, etc., will be supplied on deposit of £1 1s. with the Accountant, 173, Rosebery Avenue, London, E.C.1.

AYR CORPORATION, December 7th.—Twelve months' supply of stores to the Tramways Department, including trolley wire, guard wire, span wire, insulated wires, circuit breakers, etc. Forms of tender, etc., from the General Manager (Mr. W. Grant), Town Buildings, Ayr.

DUBLIN PORT AND DOCKS BOARD, December 7th.—Twelve months' electrical supplies. Tender form (No. 10) from the Secretary, Westmoreland Street, Dublin.

LAMBETH (LONDON) GUARDIANS, December 7th.—Twelve months' supply of incandescent lamps. Forms of tender from Mr. J. L. Goldspink, Clerk to the Guardians, Brook Street, Kennington Road, London, S.E.11.

MADRAS AND SOUTHERN MAHRATTA RAILWAY CO., LTD., December 7th.—Sixteen 35 B.H.P. and two 10 H.P. rotor motors, with pulleys, slide rails and star-delta starting switches. Forms of tender (£1 1s., not returnable) from the company's offices, 25, Buckingham Palace Road, Westminster, S.W.1.

OXFORD ELECTRIC CO., LTD., December 8th.—Supply and erection of 7 500 kW (M.C.R.) turbo-alternator, with condensing plant and auxiliaries. Specifications from Mr. F. H. Francis, chief engineer, Russell Street, Oxford; deposit £3 3s.

PORTSMOUTH GUARDIANS, December 8th.—Supply of electrical stores and lamps for three months. Particulars from the Clerk, Mr. H. C. Morrell, St. Mary's Road, Portsmouth.

ROCHDALE CORPORATION, December 8th.—Electric lighting and power installations for 238 houses on the Dicker Green housing estate. Particulars from the Borough Surveyor.

STOKE-ON-TRENT CORPORATION, December 8th.—Erection of overhead lines and connections to 120 new houses on the Abbey Hulton housing site, Hanley. Tender form, etc., from the Electrical Engineer, St. George's Chambers, Stoke-on-Trent.

MANCHESTER EDUCATION COMMITTEE, December 9th.—Electric light installation at Gorton Mount Muncipal School, Mount Road, Gorton. Specification from the Education Offices, Deansgate, Manchester; deposit £1 1s.

INDIA STORE DEPARTMENT, December 10th.—Two 5-ton electric overhead travelling cranes (62 ft. span). Specification (5s.), from the Director-General, Branch No. 11, Belvedere Road, London, S.E.1.

KERRY COUNTY COUNCIL, December 10th.—Supply and erection of two 6 kW, 200 V, d.c. generators, coupled to heavy oil engines; supply and erection of one storage battery of 126 cells and about 110 Ah capacity; supply and erection (or supply only) of one four-panel switchboard; and complete wiring installation for new County Hall, Tralee. Specifications from McEntee and O'Kelly, 23, Upper O'Connell Street, Dublin; deposit £2 2s. for each section.

BELFAST CORPORATION, December 11th.—Penstocks for circulating water channels and ducts at the Harbour power station. Specification (W. 54) from Mr. Johnstone Wright, city electrical engineer and manager, East Bridge Street, Belfast; deposit £2 2s.

CLEETHORPES URBAN DISTRICT COUNCIL, December 11th.—Supply and laying of e.h.t. feeder and l.t. distributor cables, with section pillars and disconnecting boxes; supply and erection of transformers and switchgear equipment; and house services, including meters. Specifications, etc., from Mr. A. S. Baxter, Council House, Cleethorpes; deposit £2 2s.

DUBLIN CITY COMMISSIONERS, December 11th.—Supply of capping and casing and wire. Specifications from the City Electrical Engineer, Fleet Street, Dublin; deposit £1 1s.

EAST LOTHIAN EDUCATION AUTHORITY, December 11th.—Electrical installation work in connection with the erection of a new Infant School at Tranent. Forms of tender, etc., from R. and A. K. Smith, 44, Queen Street, Edinburgh; deposit £1 1s.

COMMISSIONER OF PUBLIC WORKS, DUBLIN, December 14th.—Electric light installation at new military barracks, Limerick. Specification from the Office of Public Works, Dublin, or the District Office of Works, Limerick; deposit £1.

MANCHESTER CORPORATION, December 14th.—Supply of steel girder tramway rails. Specifications from Mr. Hy. Mattinson, Corporation Tramways, 55, Piccadilly, Manchester.

SUTTON COLDFIELD CORPORATION December 14th.—Supply and erection of 1 000 kW steam turbine and gear driven d.c. generator, with condensing plant, auxiliaries and piping. Specification from Mr. T. Bloore, Electricity Works, Sutton Coldfield; deposit £2 2s.

MELTHAM PARISH CHURCH, HUDDERSFIELD, December 31st.—Electric light installation. Particulars from Mr. W. R. Carter, secretary of the Church Council, Birchfield.

NOTTINGHAM CORPORATION, December 31st.—Two 30-inch electrically driven centrifugal pumps (section F.F.); one motor-driven twin booster; each for an output of 10 kW (section K.K.); and one storage battery of 256 cells, capacity 275 Ah at one-hour discharge rate (section M.3), for North Wilford power station. Specifications, etc., from Preece, Cardew and Rider, 8, Queen Anne's Gate, Westminster, S.W.1: deposit £2 for each section.

MANCHESTER CORPORATION, January 3rd.—Supply and erection at Barton power station, of 33 000 V, 420 V, and 240 V switchgear. Specification (B.52), from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

INDIA STORE DEPARTMENT, January 4th.—Supply of about 264 650 copper bonds for track rails. Specifications (5s.) from the Director-General, Branch No. 36, Belvedere Road, London, S.E.1.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

GHENT MUNICIPALITY, December 4th.—Six electric cranes. Cahier des Charges (No. 1 580) can be obtained at the Hotel de Ville.

EGYPTIAN MINISTRY OF THE INTERIOR, December 5th.—Electric motors and accessories. (Reference B.X. 2 996.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, December 6th.—Key switches. (Reference B.X. 2 962.)

STATE ELECTRICITY WORKS, MONTEVIDEO, December 6th.—Diesel-electric generating sets.

MADRAS AND SOUTHERN MAHRATTA RAILWAY CO., LTD., December 7th.—Supply of 16 35 B.H.P. and two 10 B.H.P. short circuited rotor motors, with pulleys, slide nails, starting switches, etc. Particulars from the Secretary, 25, Buckingham Palace Road, London, S.W.1.

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NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 7th.—Three-phase induction regulator for Waikato electric power scheme (section 206). (Reference B.X. 2 935.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 10th.—Electric motors. (Reference B.X. 2 861.)

JOHANNESBURG MUNICIPALITY, December 11th.—High tension cable (contract 714). (Reference B.X. 3 017.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 14th.—Sub-station cables and cable boxes for Arapuni (section 188). (Reference B.X. 3 010.)

CAPE TOWN MUNICIPALITY, December 15th.—Oil-cooled transformers. (Reference B.X. 3 028.)

KEETMANSHOOP (SOUTH AFRICA) MUNICIPALITY, December 15th.—Supply and delivery of material for an electric lighting scheme for the town. (Reference B.X. 3 007.)

NEW ZEALAND GOVERNMENT RAILWAYS, December 15th.—Switchgear, cable, motor-generator sets, junction boxes, etc., for Hutt Valley Locomotive Workshops. (Reference B.X. 2 949.)

SIAMESE POST AND TELEGRAPH DEPARTMENT, December 15th.—Telephone and submarine cable. (Reference B.X. 3 026.)

VICTORIAN ELECTRICITY COMMISSION, December 15th.—Water tube boiler with superheater, economiser, etc., for Yallourn power scheme. Specification (No. 28/82) from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.2; deposit £3 3s.

EGYPTIAN MINISTRY OF EDUCATION, December 16th.—Five a.c. motors and switchboard for Assiut model workshops. (Reference B.X. 3 016.)

INDIA STORE DEPARTMENT, December 21st.—Supply and erection of overhead transmission line, 110 000 V, about 280 miles in length. Specification (5s.) from the Director-General, Branch, 14, Belvedere Road, London, S.E.1.

VICTORIAN RAILWAY COMMISSIONERS, December 22nd.—Supply of a wheel lathe, with electrical and other equipment. (Reference A.X. 3 735.)

VICTORIAN GOVERNMENT RAILWAYS, December 29th.—Electric rivet heaters. (Reference B.X. 3 014.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 30th.—Switchgear, cables and transformers. (Reference B.X. 3 040.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 1st.—Supply and erection at site of Seru pumping and power station, of four Diesel engine alternator groups, three pumps and accessories. Specification (10s. 6d.) from Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1.

INDIA STORE DEPARTMENT, January 4th.—Supply and erection of overhead equipment (1 500 V) and steel structures for about 140 miles of railway route, in connection with the Great Indian Peninsula Railway electrification. Specification (£2) from the Director-General, Branch No. 10, Belvedere Road, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 4th.—Supply of switchgear and transformers for Waikaremoana electric power scheme. (Reference B.X. 2 872.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 4th.—Bells and buzzers (schedule C.147). (Reference B.X. 2 984.)

SYDNEY CITY COUNCIL, January 10th (extended date).—High and low tension cables (contract 1 057). (Reference B.X. 2 959.)

CHINA, January 15th.—Turbo-generators, condensers, boilers, switchgear, transformers, etc. Tenders are invited by a Chinese company holding a concession for water and electricity supply. (Reference B.X. 2 998.)

NEW ZEALAND GOVERNMENT RAILWAYS, January 17th.—Switchgear, cables, motor-generators, lamps, etc. (Specification E.14.) (Reference B.X. 3 020.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 18th.—Transmission line steel towers for Waikaremoana electric power scheme (section 31). (Reference A.X. 3 732.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 18th.—Switchboard cable (schedule C.151). (Reference B.X. 3 013.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, January 19th.—Electric bells and tumbler switches. (Reference B.X. 3 011.)

STATE ELECTRICITY WORKS, MONTEVIDEO, January 19th.—Supply of 100 500 metres of 250 V wires and cables. (Reference B.X. 3 042.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, January 20th.—Electric railway car equipments, including motors, control equipment, air compressors, etc. Specification (No. 1 065) from the Chief Mechanical Engineer, Wilson Street, Redfern, N.S.W.

STATE ELECTRICITY WORKS, MONTEVIDEO, January 24th.—Supply of 220 V cables, telephone cables (20-pair) and branch and terminal boxes.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 25th.—Telephone transmitters and parts. (Reference B.X. 3 012.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, January 25th.—Telephone receivers and associated parts (schedule No. C. 153). (Reference B.X. 3 041.)

STATE ELECTRICITY WORKS, MONTEVIDEO, January 28th.—Supply of 923 000 metres of special wires and cables for outdoor use.

NEW ZEALAND GOVERNMENT RAILWAYS, January 31st.—Electrical equipment for Otahuhu car and wagon workshops. (Reference B.X. 3 038.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 1st.—Storage battery and booster for Waikaremoana Electric Power Board (section 28). (Reference B.X. 2 937.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 15th.—Transformers, for Waikato (section 207). (Reference B.X. 2 985.)

IN PARLIAMENT.

Committee Stage of Electricity (Supply) Bill in House of Lords

OPENING the debate in the Committee stage of the Electricity (Supply) Bill in the House of Lords on Tuesday, Lord Montagu of Beaulieu moved an amendment to provide that the Central Electricity Board should be appointed by the Electricity Commissioners instead of the Ministry of Transport. The amendment was rejected.

An amendment, moved by Lord Montagu of Beaulieu, to include agriculture amongst the interests which might be consulted by the Minister of Transport before appointing the Board was agreed to.

On Clause 2, dealing with the general powers and duties of the Board, Lord Askwith moved an amendment empowering the Central Electricity Board to accept proposals, if made, for the delegation to an association of owners of selected stations within an area of any of the Board's powers or duties within that area which they considered could be delegated without prejudice to the efficient discharge of the general duties of the Board or to the efficient execution of the scheme within the area. The amendment was agreed to.

On Clause 11, which deals with the tariff for electricity supplied directly by the Board, the House agreed to an amendment, moved by Lord Forres and accepted by the Government, providing that the fixed kilowatt charges component and the running charges component shall be ascertained in accordance with such principles as may be approved by the Electricity Commissioners.

The Duke of Montrose moved an amendment to Clause 43, which deals with the sale of fittings by authorities authorised to supply electricity. The amendment provided that the authorities should not for sale by direct labour execute any wiring of private property or undertake the supply direct to the consumer of the fittings or materials for such wiring except between the main and the authority and the consumer's meter. The Earl of Donoughmore said the amendment would upset an agreement which had been come to by all the important parties south of the Tweed. The amendment was rejected.

The Committee stage was completed.

Replies to Questions.

The following are points from answers to questions in the House of Commons this week :—

There are seven broadcasting stations in Europe using power of 10 kW or more (excluding the Daventry station).

The beam wireless stations for communication with South Africa are practically completed, and preliminary tests have been carried out by the contractors.

When arranging with the Canadian Marconi Co. for the opening of the beam wireless telegraph service to Canada the Post Office proposed that the rates should be lower than the existing cable rates, but the company represented that they could not secure the co-operation of the companies which conduct the inland telegraph service in Canada and the proposal had to be abandoned.

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ELECTRICITY SUPPLY.

Curious Reasons for Opposing Overhead Lines—Assisted Wiring Progress at Tynemouth—Shoreditch Contractors and Rental Wiring.

A SUPPLY of electricity for the Lowerhouse and Cheapside districts of Burnley will be available this month.

Richmond (Yorks) T.C. has decided to take up a loan of £11 500 for electricity purposes, at 5¼ per cent. interest.

Grimsby T.C. has decided to ask for the permission of the Electricity Commissioners to supply electricity to the Louth area.

The Wirral Guardians have entered into contracts for the supply of electricity generating plant for the Clatterbridge Institution.

From April to the end of October, 1 030 new electricity consumers were connected at Blackpool. The total output since April is 11 500 000 kWh, an increase of 1 155 000 kWh on last year.

The Sittingbourne Joint Hospital Board has received permission to wire the hospital at Keycol Hill, and to lay distribution cables in connection with the installation of two 15kW generating sets.

Objection to Amesbury Order.

Amesbury R.D.C. has decided to lodge an objection to the application of the Amesbury Electricity and General Supply Co. for an Order to supply electricity in the district, on the ground that the Order would give a monopoly to the company.

The Electricity Commissioners have informed Ashby-de-la-Zouch R.D.C. that they propose to hold an inquiry on January 4th, at Tamworth, into two applications by companies who are seeking powers to supply electricity in the rural area.—The Leicestershire and Warwickshire Electric Power Co. has given the Council notice of intention to lay underground mains at Measham.

Stirling T.C. has received from the Electricity Commissioners a communication stating that any scheme contemplated by the Electricity Bill must take some time to bring into operation, they are of the opinion that the question of meeting the growing demand upon the Stirling undertaking should engage the early attention of the Corporation. The electrical engineer, (Mr. W. A. Murray) has been instructed to report on the matter.

Sir William F. Marwood, on behalf of the Ministry of Transport, recently held an inquiry on the proposal of Carlisle Corporation to erect overhead lines for the supply of electricity to the Gotham Co.'s Cocklakes Works. There was opposition by a landowner and a tenant farmer on the ground that cows would be disturbed and their milk yield affected, and that there would be danger in stormy weather. The inspector said there was no electrical danger.

Cockermouth R.D.C. has decided to ask the Workington Electric Power Co. to submit terms for the supply of 100 000, 300 000 and 500 000 kWh per annum, with a peak load of 500 kW, to Seaton, Great and Little Broughton, Great and Little Clifton, Stainburn, Camerton, Brigham, Greysouthen and Papcastle, mining and agricultural villages in the Derwent Valley. It is hoped to induce Cockermouth U.D.C. to join the scheme, and in that case Cockermouth R.D.C. would apply for a Provisional Order to enable it to carry out the undertaking.

Preston Progress.

At Preston T.C. meeting last week, Coun. E. A. Heaney, Chairman of the Electricity Committee, said the price of electricity would not be raised. In the light of the present consumption of 13 000 000 kWh per annum against 3 000 000 in the last year of the old company, the public could hope for an early reduction in charges. Fifty miles of new cable had been laid in 2½ years. The question of linking up the Blackburn and Preston systems would be discussed by the two Corporations. The Preston load was 11 800 kW, compared with 3 400 when the Corporation bought the station.

At the meeting of Tynemouth T.C. last week Coun. R. Irvin drew attention to the fact that application had been received from the Tyne Improvement Commissioners for a supply of electricity to the Albert Edward Dock area, and stated that the Electricity Committee would do all in their power to meet the wishes of the Commissioners. Further demands in considerable numbers had been received for assisted wiring, and the Committee had resolved to set aside a further sum of £5 000 out of the profits of the undertaking for the purpose. The Council approved the Committee's action.

Mr. A. Nichols Moore, borough electrical engineer, Newport (Mon.), has submitted a report showing that the expenditure of the Electricity Department for the current quarter will be increased by over £5 000 as a result of the increased cost of fuel, and it is estimated that during the ensuing quarter the increased price and the greater tonnage occasioned by the inferior quality of the fuel may result in a further increase of £24 000. Increases of prices to produce over £10 000 per annum are suggested. The Electricity and Tramways Committee, however, is of opinion that any loss should be borne by the whole of the ratepayers.

Col. T. C. Ekin, on behalf of the Electricity Commissioners, has held an inquiry into the application of Mexborough T.C. for permission to borrow £20 000, and for sanction to an extension of the Corporation's electricity works. Mr. K. J. Sutcliffe, for the T.C., said they applied to the Commissioners in 1921 to extend the plant. The application was never refused, but the Commissioners pressed the T.C. to go to the Yorkshire Electric Power Co. for its supply. An agreement was made with the Power Co., and was still in force, but the Council found the charges were higher than the cost at which they themselves could generate electricity. Mr. J. B. Feltham (borough electrical engineer) and Mr. R. Blackmore (Stalybridge) gave evidence in support of the application, and Mr. W. P. Donald, for the Power Co., said the company was not opposing the application, but was of opinion that it would be to the interest of the town to take a bulk supply.

Shoreditch (London) Borough Council Lighting Committee has appointed four local contractors to canvass districts assigned to them, and to wire approved premises, under the rental system of wiring, at an agreed charge per point. In September last the Council approved the Housing Committee's action in connection with the installation of electric cooking apparatus in 29 tenements in Provost Dwellings. Further applications for the installation of such apparatus have since been received from tenants of the Britannia, Provost, Citizen and Council Dwellings, and the Lighting Committee has offered to deal with these applications on the same terms as were agreed upon in the case of the 29 tenements in Provost Dwellings, 1½d. per kWh, including hire and maintenance of electric cookers and kettles, provided the Housing Committee bears the cost of the wiring, estimated at £2 15s. per flat, plus cost of removing existing ranges from the sculleries, etc., at £1 per flat. There are 71 tenements where electric cooking apparatus can be installed if desired, and the cost of wiring would be £195 5s. The cost of carrying out the necessary alterations in the sculleries, including those in respect of which applications have already been received, would be £100. The Housing Committee has under consideration the question of installing electric heaters in certain bedrooms in St. Leonard's Dwellings, which are not provided with any other means of heating. Applications have been received from several of the tenants for electric heaters to be installed, and the Lighting Committee has offered to provide that service, on condition that the Housing Committee bears the cost of wiring, estimated at £2 per plug point. The total estimated cost would be £80. The Finance Committee recommends that the estimate of the total expenditure (£375) be approved.

Proposed Chiswick Power Station.

London Authority's Scheme Held Up by Minister of Health.

THE Minister of Health has refused to sanction the application of Chiswick Urban District Council for permission to amend its existing town-planning scheme to enable the Joint Electricity Authority to erect a power station on 45 acres of Duke's Meadows, Chiswick, which are reserved under the town-planning scheme for playing fields and open spaces.

The Bill which the London and Home Counties Joint Electricity Authority is promoting in the next session of Parliament, however, seeks power to acquire land in Chiswick, compulsorily, as a site for the proposed station, and to vary for the purposes of the Bill the Chiswick Riverside Lands Town Planning Scheme, 1924. The project for a Chiswick power station is, therefore, not yet finally vetoed.

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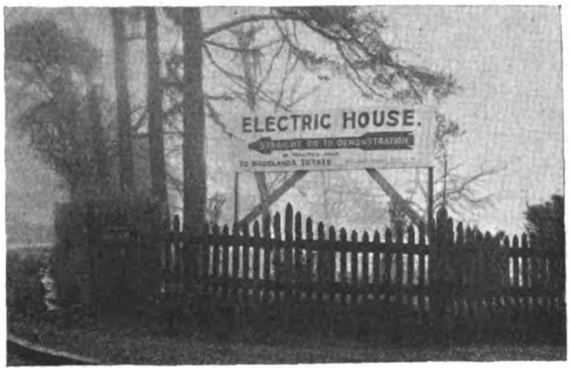
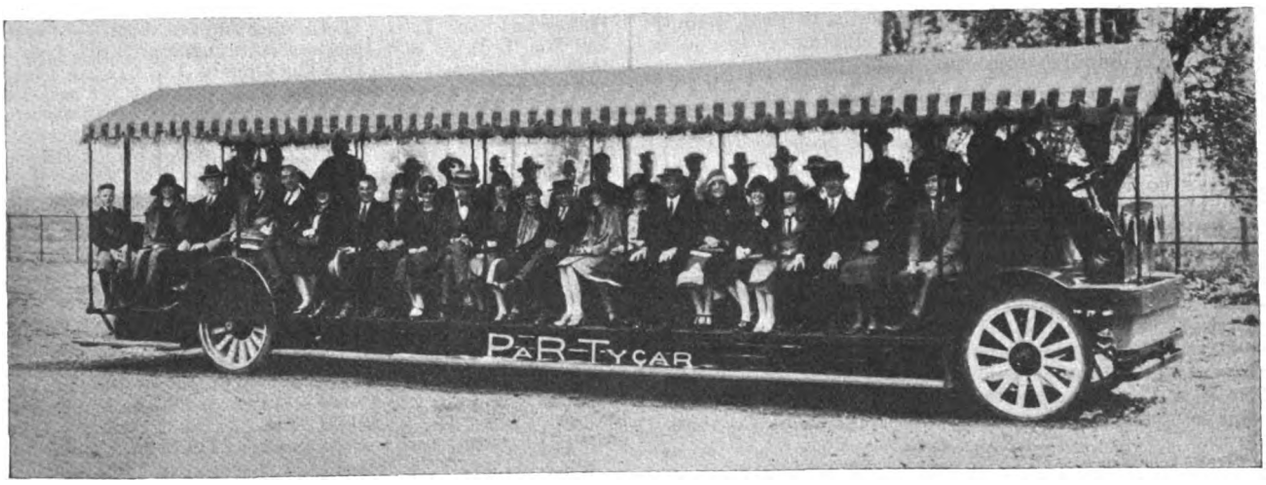
NEWS IN PICTURES

An impression of the fine new offices which the Spanish National Telephone Co. is erecting in Madrid. It will house an automatic exchange which will have a capacity of 40 000 lines, plus toll lines.



One of the striking notice boards used in the Birmingham district to direct the public to W.O.B. demonstration electric houses. Every effort is being made in Birmingham to extract the maximum value from the campaign. Details of campaign activities throughout the country are given on page 648.

Mr. Albert Illing, well known in electrical and radio circles in the Midlands and North of England, is now manager of the new Midlands branch opened in Birmingham by Burndept Wireless, Ltd.



A novel form of electric vehicle used at an American exhibition for passenger transport. The car, which seats forty persons on two longitudinal seats, is 34 ft. long and is capable of a speed of 8 miles per hour. To collect the fares the conductor passes down a centre aisle between the seats.

TRADE PUBLICATIONS.

Details of Catalogues and Dealer-Helps Issued by Manufacturers.

THE D.P. Battery Co., Ltd., Bakewell, Derbyshire, has issued two leaflets dealing with the D.P. Kathanode Battery and the D.P. High-tension Wireless Battery respectively. Prices, illustrations and details of construction are given in both publications.

The "Ediswan Nurse," a neat cut-out standing show-card, in the form of a female nurse holding an Ediswan wireless valve, with the caption "Nurse your set; fit Ediswan valves," is being issued to retailers by the Edison Swan Electric Co., Ltd., 123-5, Queen Victoria Street, London, E.C.4.

Adam Hilger, Ltd., 24, Rochester Place, Camden Road, London, N.W.1, has issued publications (D.1) on wavelength spectrometers, monochromators, and specialised spectroscopes, and (E.1) on quartz, uviol glass, infra-red, concave grating, X-ray, two prism glass, and ultra-violet stellar spectrographs. Some of the spectrographs are new types.

The catalogue (No. 364G.) of Marconiphone and Sterling radio receivers, accessories, and components, issued by the Marconiphone Co., Ltd., 210-212, Tottenham Court Road, London, W.1, contains particulars and illustrations of a comprehensive range of wireless goods. Other useful publications from the same source are "Marconiphone and Sterling Components" (publication 446), containing instructions for building various radio receivers, leaflets on Marconi h.t. supply units (No. 450); Sterling condensers (No. 440A); Marconi and Sterling Radio Apparatus by Deferred Payments" (No. 451); a window pelmet, 6 ft. by 3 ft., for shop window use and illustrating a Marconi valve and receiving set; the Marconi log book; "The Story of the Marconi Valve"; two posters relating to the Marconi valve and one depicting a delighted listener wearing Sterling headphones; and a folder illustrating various Marconiphone and Sterling window display material.

Cardiff Engineering Exhibition.

AN Exhibition of Engineering Plant and Accessories, organised by the South Wales Institute of Engineers, was opened at Cardiff on November 24th, and will remain open until to-morrow, December 4th. Amongst the exhibitors are the General Electric Co., Ltd. (who show switchgear, motors, electric hoists, a Fraser and Chalmers turbine and turbo-compressor wheels); W. H. Allen, Sons and Co., Ltd. (turbine wheels); Hopkinsons, Ltd. (water gauges, fitted with electric water-level illuminators); Ed. Bennis and Co., Ltd. (chain-grate stokers, bucket elevators, etc.); and International Combustion, Ltd. (Hummer electric coal screens, etc.).

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WIRELESS NEWS.

New Radio Manufacturers' Association to Deal with Price-Cutting Evil.

IN order to deal effectively with price-cutting, the new Radio Manufacturers' Association has (we learn) taken steps to secure certification as a trade union. With this provision and a fully representative membership—already its members are more in number than those originally on the roll of the old N.A.R.M.—it is hoped that the stabilisation of the radio industry will be hastened.

Pending the election of a representative Executive Council at the forthcoming first annual general meeting on December 8th, the organisation is being carried on by an Interim Committee.

Among the matters to which the R.M.A. will give early attention are :—(*a*) The determining of a policy on the holding of radio exhibitions in provincial centres ; (*b*) the dealing with existing difficulties and restrictions affecting the British radio industry ; (*c*) the promotion of close co-operation with : (i) the British Broadcasting Commission, with a view to safeguarding the interests of manufacturers of British radio apparatus ; (ii) the national Press and radio periodicals ; (iii) radio distributors' organisations ; (iv) radio listeners' associations ; (*d*) standardisation ; (*e*) the taking of the necessary steps to extend British radio export trade, and, in this connection, to facilitate the showing of members' manufactures at foreign wireless exhibitions.

In regard to standardisation, representatives of the Association have been appointed to the B.E.S.A. Committee for the standardisation of valve holders, and the committee set up by the Institution of Electrical Engineers to deal with the issue of wiring regulations for battery eliminators in connection with h.t. supply from the mains for radio receiving apparatus.

Wireless News in Brief.

The Union of Radio-Electric Industries proposes to erect a 60 kW broadcasting station near Paris.

Wireless equipment has been installed at the Woodstock Poor Law infirmary, at a cost of £136 10s.

Marconi's Wireless Telegraph Co., Ltd., has opened an agency, and will establish a transmitting station, at Prague.

It is claimed that the problem of broadcasting pictures has been solved in practice by the Norwegian Government's chief telegraph engineer, Mr. H. Petersen.

It is stated that the broadcasting station in course of erection at Motal, Sweden, will be the largest and most powerful in Europe. The power used will be 120 kW. The equipment is being supplied by Marconi's Wireless Telegraph Co., Ltd.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

TWO of the double-deck cars for the Oswaldtwistle section of the Accrington tramways have been delivered.

Manchester Tramways Department is about to experiment with a tramcar with transverse seats on the lower deck.

Burnley T.C. has decided to construct a tramway along Gunsmith Lane to Yorkshire Street, at an estimated cost of £2 900.

Bolton Tramways Committee has decided to double the tramway track on the Wigan Road as far as Beaumont Road in time for the Royal Lancashire Show next year.

A Ministry of Health inquiry has been held into the proposal of East Ham Corporation to borrow £33 128 for establishing a railless trolley vehicle undertaking, etc.

Cardiff Corporation is applying for a Provisional Order for the construction of certain new tramways. Plans can be seen at the Town Hall and at the offices of the Clerk of the Peace for Glamorgan, Cathays Park, Cardiff.

London County Council Highways Committee recommends that the Council agree to a suggestion that the one shilling all-day tramcar ticket system be extended to the through routes between the L.C.C. system and the West Ham, East Ham and Walthamstow tramways.

A decision on the subject of the Anglo-Argentine Tramway Co.'s provisional subway concession will probably be further postponed owing to the advent of a new proposal by an Anglo-Argentine syndicate, which asks for a concession for 90 years, and offers to provide for direct journeys on a 10-cent fare basis.

E.T.B.I. SUBSCRIBERS.

Further List of Contributions to Funds by Electrical Firms.

PUBLICATION is continued of the list of subscribers in connection with the annual festival dinner of the Electrical Trades Benevolent Institution :—

Gibbons & Sons, Ltd., £2 2s. ; General Engineering Co. (Radcliffe), Ltd., £1 1s. ; W. Gammons, Ltd., £2 2s. ; Mrs. Gilberthorpe, 3s. ; H. C. Goodman, £1 1s. ; J. P. Green, £1 1s. ; D. Gilson and Co., £2 2s. ; Gittings and Hills, Ltd., £1 1s. ; Gaskell and Grocott, £2 2s. ; J. Gilman and Son, £5 5s. ; Gummers, Ltd., £1 1s. ; A. Graham and Co., £5 5s. ; General Investors and Trustees, Ltd., £52 10s. ; Fred Garside, 10s. 6d. ; Gillespie and Beales, £2 2s. ; Guest's Brass Stamping Co., £1 1s. ; C. F. Gaywood, £5 ; L. D. Gunnell, 10s. 6d. ; A. S. Gosling, £1 1s. ; J. J. Gracie, £1 1s. ; — Greening, £1 1s. ; Gilkes and Sons, 10s. ; E. Garcke, £5 5s. ; G.E.C. Leeds Staff, £1 ; G.E.C. Witton Works Staff, £16 19s. ; C. C. Garrard, £2 2s. ; G.E.C. Cardiff Branch Staff, £2 10s.

Hudson and Son, £2 2s. ; Hugh, Stevenson and Sons, £5 5s. ; Houlder, Son and Co., £1 1s. ; Hudson and Wright, £3 3s. ; F. J. Hemming, £1 1s. ; F. Hiller, £2 2s. ; Hick, Hargreaves and Co., Ltd., £1 1s. ; W. E. Hobbs, £2 2s. ; Hall and Pickles, Ltd., £5 5s. ; D. M. Henderson and Co., Ltd., £1 1s. ; W. W. Hill, Son, and Wallace, Ltd., £2 2s. ; W. Hazelby and Co., £1 1s. ; G. Hawkes and Sons, £1 1s. ; C. H. Higgins, £1 ; H. H. Howe, 10s. 6d. ; G. N. Haden and Sons, Ltd., £1 1s. ; Ainsworth Harrison, £1 1s. ; Hawkins and Co., Ltd., £2 2s. ; Hamilton, Woods and Co., 10s. 6d. ; Walter Hill and Co., £3 3s. ; Holder, Harriden, Ltd., £1 1s. ; Heart, Heaton, and Sons, Ltd., £5 5s. ; Heckt, Levis and Kahn, Ltd., £1 1s. ; B. and C. R. Horrax, £3 3s. ; Haes and Sons, £10 10s. ; Henry Horne, £50 ; D. H. and G. Haggie, Ltd., £1 1s. ; Horn (England), Ltd., £5 5s. ; G. W. Hillman, 5s. ; W. T. Hilder, 10s. ; W. G. Hodgson and Co., £1 1s. ; Francis and Mrs. Holt, £3 3s. ; J. T. Halsey and Sons, £1 1s. ; J. Holding and Co., Ltd., £5 ; J. B. Hall and Son, Ltd., £1 1s. ; Harrison (Birmingham), Ltd., £10 ; Higgs Motors, Ltd., £3 3s. ; Heaton and Dugard, Ltd., £2 2s. ; J. Harper and Co., Ltd., £2 2s. ; Henry Cox Screw Co., Ltd., £2 2s. ; Thos. P. Headland, £1 1s. ; H. Hicks, £1 1s. ; Hawkins and Co., £2 2s. ; Houlder Bros. and Co., £5 5s. ; F. Harrison, 10s. ; Highton and Sons, Ltd., £2 2s. ; L. Horn, £3 ; E. E. Hoadley, £1 1s. ; Higgins and Griffiths, Ltd., £1 1s. ; Handley and Robinson, Ltd., £1 1s. ; Haddock, Parker and Co., £1 1s. ; Heywood and Son, Ltd., £1 1s. ; Culmer C. Hodges, £1 ; Haydn Harrison, £1 1s. ; Hall and Stinson, Ltd., £2 2s. ; W. H. Heaton, £2 2s. ; R. A. Hopkinson, £10 10s. ; Harris Plating Works, Ltd., £1 1s. ; M. Hunt, £1 1s. ; T. F. B. Hall, £1 1s. ; M. J. Healey, £1 1s. ; Harrington Brothers, Ltd., £1 1s. ; E. M. Hollingsworth, 10s. 6d. ; Holophane Co., £10 10s. ; W. T. Holland, £3 3s. ; F. H. Hale, £1 ; E. H. Hunter, £2 2s. ; Heinke and Co., Ltd., £5 ; C. and L. Hill, Ltd., £1 1s. ; J. Halden and Co., Ltd., £2 2s. ; W. Horsfall, £10 10s. ; Haslam and Stretton, £1 1s. ; S. Haslam, Esq., £3 3s. ; Huntley, Boorne and Stevens, Ltd., £5 5s. ; Hardman, Ingrain and Dawson, Ltd., £2 ; Hill, Upton and Co., £3 5s. ; Henry Head and Co., Ltd., £5 5s. ; Henley's Telegraph Works Co., Ltd., £100 ; Holman Bros., Ltd., £1 1s. ; W. L. Harrison, Ltd., £1 1s. ; Heenan and Froude, Ltd., £10 10s. ; A. G. Hawkins, £1 1s. ; — Horne, Esq., £1 1s. ; R. E. Hunt, £1 1s. ; Ed. Hirst, £1 1s. ; J. Snow Huddleston, £2 2s.

Illingworth, Ingham and Co., 10s. ; Ioco Rubber and Waterproofing Co., Ltd., £2 2s. ; R. Ingham, Clark and Co., Ltd., £1 1s. ; G. H. Ide, £5 5s. ; A. E. Ide, £1 1s. ; Industries, £1 1s. ; Igranic Electrical Co., £5 5s. ; Ingram, Perkins and Co., Ltd., £1 1s.

Jenson and Nicholson's employees, 10s. ; Johnson, Matthey and Co., £5 5s. ; Joplin and Sons, Ltd., £5 5s. ; A. E. Jepson, £2 2s. ; L. Jordan, 5s. ; Wm. Jacks and Co., £1 1s. ; James Bros., £1 1s. ; S. G. Jones, Ltd., £1 1s. ; Jonas and Colver, Ltd., £10 ; J. Johnson and Co., Ltd., £2 2s. ; J. W. C. Jones, 10s. 6d. ; J. D. Jones and Co. (London), Ltd., £5 5s. ; H. Jenkins and Sons, Ltd., £1 1s. ; Richard Johnson, Clapham, and Morris, Ltd., £1 1s. ; Walter Richard Judd, £10 10s. ; Jones (Aberdare), 10s. 6d. ; J. F. Jessop, £1 1s. ; T. Jones, 10s. 6d. ; H. and J. Jones, £2 2s. ; Jagenberg, Ltd., £2 2s. ; E. A. Joyce, £2 2s. ; F. J. Jeffs, £1 1s.

Kingscott Studio, £5 ; W. M. Kermode, £1 1s. ; R. Klinger, Ltd., Ltd., £5 3s. ; King, Taudevin and Gregson, Ltd., £10 10s. ; Kennish and Co., Ltd., 10s. 6d. ; King Brothers (Stourbridge), Ltd., £1 1s. ; Knowles, Barker and Co., Ltd., £5 5s. ; H. P. King and Co., £1 1s. ; Kent Bros. Electric Co. and E. H. Phillips, Ltd., £1 1s. ; C. Y. Knight, £1 1s. ; Kayser, Ellison and Co., Ltd., £10 10s. ; H. Kahn, £3 3s. ; Kensington Stamping Co., Ltd., £2 2s. ; H. Kemp, 10s. 6d. ; W. E. King, 10s.

Loxit Loose Leaf Co., £2 2s. ; Lewis and Randall, £1 1s. ; Lawler, Ayers and Co., Ltd., £1 1s. ; J. Lilley and Sons, £1 1s. ; G. V. Lacock, Ltd., £1 1s. ; Lea Recorder Co., £2 10s. ; H. M. Leaf, £1 1s ; E. F. Leichti, £1 1s. ; Lankester and Sons, Ltd., £1 1s. ; Lisc. Munday and Co., 10s. 6d. ; F. W. Lewis, £1 1s. ; C. W. Leng, 10s 6d ; London Electric Firm, £2 2s. ; S. G. Leach, £10 10s. ; L. P. S. Electrical Co., £2 2s. ; F. Liversedge, 5s. ; Laurie and Bishop, Ltd., £1 1s. Litholite Insulators, Ltd., £1 1s. ; W. and J. Lawley, Ltd., £1 1s. ; Liverpool Supplies Co., £1 1s. ; H. Lilley and Sons, £1 1s. ; John Lysaght, Ltd., £10 10s. ; F. G. Lunt, £2 2s. ; Le Carbone, £1 1s. ; London Electric Firm, £2 2s. ; Lightalloys, Ltd., £1 1s.

(*To be continued.*)

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COMPANY NEWS.

Share Market Quiet—Manufacturing Improvements—Lancashire Power Co.'s Issue—London Power Companies' Capitalisation of Reserves.

THE electrical share market remains quiet, alike as regards supply, transportation and equipment descriptions. The only real feature is a rise of 2s. on the week, from 29s. 6d. to 31s. 6d., in the ordinary shares of the General Electric Co. English Electric ordinary are 6d. better at 15s. British Insulated Cables ordinary are 7½d. down, to below 67s. London United Tramway 1st debenture stock is a couple of points higher at 42½. Metropolitan District Railway ordinary stock has fallen 10s., to 56½. Eastern Telegraph 3½ per cent. preference stock, at 65½, is a point down. Several electricity supply shares are now quoted in their new subdivided form, and with the share bonus deducted, which emphasises the extent to which such bonus had been discounted by the market.

Last Annl. Divd %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
	Electricity Supply.				
10	Brompton & Kensington Ord. ..	30/-	30/-	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	89*	90	100	67
15	Charing Cross Elec. Ord. (£1) ..	46/3	46/3	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	25/-†	40/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	50/7½	50/7½	52/6	20/3
6	,, ,, 6% C.P. ..	23/-	23/-	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	62/6	62/6	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£1)	24/6†	68/-	13½	3½
10	Lon. Elec. Sup. Ord. (£1) ..	36/-	35/6	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	40/7½	40/7½	41/6	8/-
4½	,, ,, 4½% C.P. ..	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	22/6	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord. (£1) ..	24/6†	74/-	15½	5½
15	W'minster Elec. Sup. Ord. (£1)	25/6†	41/3	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
6	,, ,, 6% C.P. ..	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	142½*	144½	123	24
6	,, ,, 6%‡Pf. Stk. ..	109*	110	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69	69	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	77½	77½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	57½	57½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	76½	76½	89	65
4	Lon. Un. Trams. 1st Deb. ..	42½	40½	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	65½	65½	101½	49
5	,, ,, 5% Deb. ..	66½	66½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	62	62	84½	19
3½	,, 3½ Pf. Stk.	63½	64	88½	40½
3½	,, 3½% Deb.	69½	69½	92½	51
3½	Met. Dis. Rly. Ord. Stk. ..	56½	57	58	12½
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb. ..	68	68	73½	48½
5	Yorks. (W.R.) Trams. Ord. ..	12/6	12/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	66/10½	67/6	62/-	26/6
6	,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	22/9	22/9	23/4	19/7
7	,, ,, 7% Deb.	104½	104½	107½	92
10	Brush Electrical Ord.	26/3	26/3	29/-	10/-
‡15	Callender's Cable Ord.	65/-	65/-	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref.	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)	12/9	12/9	28/9½	1/1
7½	,, ,, 1st Pref. ..	22/6	22/6	26/-	5/-
10	Elec. Construction Ord. ..	31/3*	31/10½	30/4	6/7
7	,, ,, 7% C.P. ..	22/6*	23/1½	25/3½	16/-
—	English Elec. Ord.	15/-	14/6	29/3	7/3
6	,, ,, 6% C.P. ..	17/6	17/6	21/3	10/6
—	Ericsson Telephones 7% Pref.	21/10½	21/10½	21/-	12/7
6	Ferranti 6% Pref.	19/3	19/3	18/6	16/9
7	,, 7% 2nd Pref. ..	18/9	18/9	19/-	13/9
7½	General Elec. Ord.	31/6	29/6	59/-	13/6
20	W. T. Henley's Ord.	80/-*	80/-	86/6	23/3
17½	Johnson & Phillips Ord. ..	56/3	56/3*	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	23/9	23/9	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	46/3	46/3	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	29/4½*	29/4½	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	29½	29½	56/2/6	19
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	74½	74½	87½	60
10	Eastern Ord. Stk.	180½	180½	213½	113/2/6
3½	,, 3½% Pref. Stk. ..	65½	66½	84/17/6	49
4	,, 4% Deb.	77½	77½	103½	60
10	Eastern Extension Ord. (£10) ..	18½	18½	21½	10/12/6
4	,, ,, 4% Deb. ..	77½	77½	97½	60
22	Gt. Northern Telegraph (£10) ..	27	27	42/12/6	19
‖10	Indo-European (£25)	47½	47½	59½	25
—	Marconi's Wireless T. Ord. ..	16/3	16/3	9/16/3	20/9
7½	,, Int. Mar.	22/6	22/6	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	17½	17½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	77½	77½	10	60/2/6

* Ex-dividend. ‡ Plus share bonus. † Ex share bonus. ‖ Including bonus.

GLOBE TELEGRAPH AND TRUST CO., LTD.—Int-div. proposed of 2½ per cent., tax free.

AMERICAN TELEPHONE AND TELEGRAPH CO.—Quarterly div. of 2¼ p.c. on cap. stk., payable January 15.

WESTERN TELEGRAPH CO., LTD.—First quarterly intm. div. of 5s. p. sh., tax free, for year ending June 30, 1927, payable December 16.

DUBLIN UNITED TRAMWAYS CO., LTD.—Shareholders have approved company's Bill for the acquisition of Dublin and Lucan electric railways.

ELECTRICAL DISTRIBUTION OF YORKSHIRE, LTD.—At an extraordinary meeting last week resolutions to increase the capital to £1 000 000 by the creation of 500 000 £1 shares were confirmed.

LANCASHIRE ELECTRIC LIGHT AND POWER CO.—Particulars have been sent to shareholders of the offer for subscription of 250 000 7 p.c. cum. participating pref. shs. of £1 each, at 24s. p. sh.

MINAS GERAES ELECTRIC LIGHT AND TRAMWAYS CO.—It is reported that coy's electrical services have been since July 26th last, and will be, directed by Government of the State of Minas Geraes.

SOUTHERN ELECTRIC TRAMWAYS CO. (BUENOS AYRES).—Partics. are published, for information only, of an issue at 93 p.c. of £130 000 6½ p.c. first mtge. debs. The whole issue has been placed privately.

VERA CRUZ ELECTRIC LIGHT, POWER AND TRACTION, LTD.—Est. net earnings (after deducting London office exes.) for October, 1926, $19 000, decr. $31 200 compared with October, 1925. Aggregate from January 1, $135 100, decr., $46 100.

HALL TELEPHONE ACCESSORIES, LTD.—Net pft. for year ended August 31st, £8 866; fin. div. 5 p.c., making 10 p.c. less tax, for year; fwd. £8 138, against £1 622. During year coy. secured contract to supply British Post Office.

SOUTH METROPOLITAN ELECTRIC LIGHT AND POWER CO., LTD.—Resolutions were passed at extraordinary mtg. last week to increase cap. to £1 100 000 by creation of 600 000 £1 shares; to authorise alterations of articles of association in connection with capitalisation of reserves.

BURMA ELECTRIC SUPPLY CO., LTD.—Pft. for year ended July last, £24 094, and, including pft. on exchange and int. on investments, and blce. fwd., amt. available was £31 781. To res. depreciation, £10 000; fin. div. 4 p.c., making 8 p.c. for year; fwd. £6 581. Directors propose to capitalise £20 000 from res. and issue 20 p.c. sh. bonus.

SOUTH LONDON ELECTRIC SUPPLY CORPORATION, LTD.—At extraordinary mtg. last week shareholders approved proposed increase of cap. from £310 000 to £750 000 by creation of additional 440 000 £1 shs., increase of borrowing powers to £500 000 and certain alterations of articles of association in connection with capitalisation of reserves.

LONDON ELECTRIC SUPPLY CORPORATION, LTD.—At a meeting last week resolutions were passed authorising the directors to capitalise any profits of the company not required for the payment of dividend or any preference shares, and to distribute them in the form of ordinary shares among the members holding ordinary shares, and to subdivide each of the 50 000 £5 shares of the company created in 1925 into five shares of £1 each.

VENEZUELA TELEPHONE AND ELECTRICAL APPLIANCES CO., LTD.—Pft. for year ended June 30th, £36 516, int. on debs. and loans, £10 335; income tax £2 064; blce. £24 116. Div. proposed on old ord. shs., 8 p.c.; to first deb. sinking fund, £1 500, written off increase of cap. £1 407, to res. for renewals and depreciation, £10 000, to undivided pfts. acc., £2 249. Directors have ordered for Caracas 1 000 automatic sets. Agreement for sale of undertaking in Venezuela must now be regarded as having lapsed.

OFFICIAL QUOTATIONS.—The Stock Exchange Committee has granted official quotations to $1 288 200 cap. stock of the American Telephone and Telegraph Co., 134 189 £1 fully paid 7 per cent. pref. (cum.) shares of the Argentine Light and Power Co.; 294 000 £1 fully paid ordinary shares of the Kensington and Knightsbridge Electric Lighting Co., Ltd.; £250 000 6 per cent. 1st mortgage debenture stock of the Lancashire United Transport and Power Co.; and 4 868 878 £1 fully paid ordinary shares of the Underground Electric Railways Co. of London.

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North Wales Power Co., Ltd.—Pft. for 1925, £46 479, plus £2 686 brought in. Deducting debenture interest left £24 101. Directors have obtained consent of Trades Facilities Act Advisory Committee to recommend H.M. Treasury to grant an additional guarantee in respect of a further £300 000, which will make the total of the company's guaranteed loan £2 000 000. An arrangement has been made with the preference shareholders to postpone payment of pref. div. until the construction work at present in progress has been completed. Sales of electrical energy during 1925 show increase of 30 per cent.

India Rubber, Gutta Percha and Telegraph Works Co., Ltd.—At the meeting last week the chairman (Mr. C. H. Gray) said practically all departments had shown improvement during the first half of the financial year ended August last, but the report contained a note of warning as to the possible effect on the full year's trading of the general strike and the coal strike. The gross trading profit for the year was 3 per cent. lower than that of the previous year, and the net profit fell short of that of 1925 by a narrow margin. Out of the balance of profit and loss account the directors had transferred £35 000 to reserve, against £60 000 last year, leaving a balance of £59 678, against £57 957. During the coal strike they had to buy Westphalian coal at a high price in order to carry on, and finally, owing to a deterioration in the quality of this German coal, they were forced to fit their boilers for oil fuel, with which they were at present working. There had been a slight falling off in the amount of cable made, laid and repaired during the year, but, generally speaking, there were indications of improvement in the business of this department. The trading of the foreign branches had not been quite so satisfactory as in the previous year, and the directors were taking steps to remedy the individual inequality profits. A dividend of 5 per cent., tax free, was approved.

New Companies.

John Hunter and Co. (Heating), Ltd.—Cap., £1 000. Heating and ventilating engineers, etc. Reg. office: 25, Roscoe Street, Liverpool.

Willesden and Brondesbury Garage, Ltd.—Cap., £3 000. Electrical engineers, etc. Reg. office: 77, St. Paul's Avenue, Cricklewood, London, N.W.

Friary Motors, Ltd.—Cap., £2 000. Mechanical and electrical engineers, etc. Solicitor: J. E. M. Crowther, 23, Abingdon Street, Westminster, London, S.W.

Radiant Panel Warming Co., Ltd.—Cap., £1 000. Electrical engineers, etc. A permanent director: F. A. Norris, Beechgrove, Sydenham Hill, London, S.E.26.

Lampshades, Ltd.—Cap., £100. Manufacturers, importers and exporters of and dealers in lamp shades, and electrical goods, etc. Reg. office: 9–11, Copthall Avenue, London, E.C.2.

Price and Reef, Ltd.—Cap., £100. Electrical engineers, dealers in wireless detectors and valves, electrical instruments and apparatus, etc. Reg. office: 71, Lincoln's Inn Fields, London, W.C.2.

Stuart Laird, Ltd.—Cap., £1 000. Dealers in and manufacturers of electric equipment, plant, machinery and motors, etc. Reg. office: 8A and 9, Great Chapel Street, Oxford Street, London, W.

Metropolitan Electrical Contractors, Ltd.—Cap., £200. Electrical and general contractors, traders in electrical goods and machinery, etc. Reg. office: 53, Tottenham Court Road, London, W.1.

H. P. Eyers and Co., Ltd.—Cap., £1 000. Manufacturing, wholesale and retail electricians, manufacturers of wireless apparatus and materials, etc. Reg. office: 325, Ashley Road, Parkstone, Dorset.

Ernest Graham, Ltd.—Cap., £500. Manufacturers of lamp shades, stands, holders, brackets, etc. A first director: J. G. Graham, 18, Hart Street, Bloomsbury, London, W.C., lamp shade manufacturer.

Hertfordshire Motors, Ltd.—Cap., £100. Electrical, wireless and mechanical engineers, electrical plant factors and agents, etc. Reg. office: Hertfordshire Motors Showrooms, Great North Road, Knebworth, Herts.

WESTERN TELEGRAPH CO.

Satisfactory Results in Spite of Trade Depression—The World's Cables Continually Increasing Notwithstanding Wireless Competition.

Sir John Denison-Pender, chairman of the company, presiding at the 93rd annual general meeting of the Western Telegraph Co., Ltd., at Electra House, Moorgate, London, on November 25th, said since he had the pleasure of addressing the shareholders a year ago no material change had taken place in the general administration, the policy, or the actual working arrangements of the company. There was nothing in the accounts which called for any special notice, beyond an explanation of one or two alterations in the way certain figures were now put before them.

Throughout the year their cable service between South America and the rest of the world had been well maintained, no interruption of cables having caused delay in the flow of traffic, and the results of the year's working must, he thought, be considered more than satisfactory considering the widespread trade depression and social upheaval which were affecting the South American States.

The chairman next dealt with the figures in the directors' report (abstracted in our last issue) and explained the means which had been adopted for doing away with a long list of detailed investments which had appeared in former reports.

He then said they maintained two cable-ships on the East Coast of South America for repairing their extensive network of cables. During the year, these ships were some 250 days at sea occupied in repairs. The number of interruptions which occurred over this vast area amounted in all to thirty-six, the majority of them of short duration.

The town of Miami in Florida had been in the newspapers a good deal lately and the shareholders would remember that their jointly-owned route between North and South America passed through that point via the British island of Barbados. This route had now been working satisfactorily for more than four years, and the service was a splendid one, placing New York within a few minutes' communication with the important cities of South America. This happy result was due in no small measure to the cordial relationship and co-operation existing between the Western Union Telegraph Co., the owners of the New York-Barbados section and themselves.

At their last meeting he mentioned the opening of the Italian Cable Co. on October 12th, 1925. This company had now extended its connections on the coast up to the cities of Rosario de Santa Fé in the Argentine and Sao Paulo in Brazil, and their accounts showed the effect of 9½ months' competition. The Italian Co. received a large yearly subsidy from the Italian Government; it was therefore in the interests of that State that all cable traffic should be handed to this cable. Therefore, to no small extent they could control the South American traffic from Italy, but the homeward Italian traffic was a more open market and the Western Co.'s directors were not dissatisfied with the share they carried. Then their oldest and strongest competitors, the Central and South American Telegraph Co., now named "All America Cables, Incorporated," following the universal road of improvement, had increased its cable capacity between North America and the West Coast of South America. He was glad to say that the competition between that company and their own had latterly been carried on in the manner in which he considered all competition should be worked; that was, each doing its best to give the public a speedy and efficient service, and thereby promoting cable traffic in general, and not indulging in any cut-throat policy one against the other. The Companhia Radiotelegrafica Argentina Transradio Internacional, a wireless company, had made some headway during the year, no doubt largely due to its lower tariffs and cheaper class of telegrams. Yet another wireless competitor opened in Brazil on May 9th last, known as the Companhia Radiotelegraphica Brazilera, with a transmitting station close to Rio de Janeiro, also worked at lower rates than their own.

There was a great movement taking place in telegraphy as a whole, which no one could have failed to notice. While radio telegraphy in its most recent application was offering the public an additional means of communication, still the vast web of cables which covered the world was continually increasing. Within the last 12 months, over sixty thousand miles of deep sea cable had been constructed, and laid, or were about to be laid by various British and foreign cable companies.

The report and accounts were adopted, and the dividend of 10 per cent., tax free, was approved.

The Rt. Hon. the Earl of Bessborough, C.M.G., and Mr. J. C. Denison-Pender, were re-elected directors, and the appointment of Vice-Admiral Henry William Grant, C.B., was approved and confirmed.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BOWDEN, M. L., and BOWDEN, L. E. (trading as M. L. BOWDEN AND SON, 33, High Street, Harrow-on-the-Hill, electricians. £33 11s. 2d. October 27th.

COLLEN, SON AND HARDING, Seal Wyarf, Stratford, general electrical engineers. £15 17s. 7d. October 22nd.

GILFILLAN BROS., LTD., 63, High Holborn, W.C. radio manufacturers. £20 8s. 6d. October 8th.

HOLBECK AND DISTRICT WIRELESS SUPPLY CO., 97, Domestic Street, Holbeck, wireless dealers. £15 3s. September 29th.

LEE AND BUFTON, 39A, Carver Street, Sheffield, electric engineers. £12 15s. October 20th.

QUAIN, Mr. J. R., 17, Victoria Street, S.W., electrical engineer. £112 1s. 3d. October 11th.

REVELL, E., AND SON, 87/91, Gray Street, Blackfriars, wireless dealers. £32 17s. 6d. October 15th.

RUKIN, E. and P., 18 Mumford Street, Bradford, electrical engineers. £10 15s. 4d. October 27th.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

MILLER AND SONS, LTD., New Burlington Street, London, W., electrical engineers, etc. The voluntary liquidation of this company was confirmed at the statutory meeting of creditors last week. Mr. C. J. Dixey, the liquidator, submitted a statement of affairs which showed liabilities of £967, of which £708 is due to the trade and £259 in respect of directors' fees, gas and electricity, etc. The assets were estimated to realise £1 444, less £348 for preferential claims, and £866 due on debentures, leaving net assets of £230 or a deficiency of £737. The liquidator said that the book debts might produce £900, when the assets would accordingly be increased by about £200. The business of Miller and Sons is an old-established one, and the limited company was formed in 1900, the issued capital being £11 553. The business was originally carried on in Piccadilly, and later removed to Conduit Street, and then to New Burlington Street. For a great number of years the business was recognised as being that of the leading candle and lamp manufacturers. With the introduction of electric light the business suffered considerably, and it was decided to take up that branch. The electric department, however, was not opened soon enough. The business was located in large premises in Piccadilly, and smaller offices were taken in Conduit Street. Messrs. H. and A. Miller, who were the gentlemen who had really made the business, retired. Whilst at Conduit Street the concern was not very successful, and several ventures which were made did not turn out well. For instance, there was an investment of £500 in another company, which made fittings, and that amount was entirely lost. There was also an investment in a concern which produced artistic fittings for lamps, and up to the moment there had been a loss of £2 000, although some small amount might be recovered. There was a third investment in a company which was formed to refill electric light bulbs, and in that direction about £300 was lost. The business continued with varying fortunes until 1914, when some heavy losses were sustained in connection with contracts, and there was a debit on the profit and loss account of £2 500. The expenses were then cut down in an effort to retrieve the position. In 1919 there was a profit on the trading of £200, which increased in the following year to £557, whilst in 1921 there was a profit of £177. Since that date there had been continuous losses ranging from £76 to £493 per annum. Those losses would have been increased had further depreciation been written off the assets. The only chance of realising a substantial amount for the stock was by tender. Some portion of the stock was not modern, as the tendency of the directors in recent times had been to refrain from buying. Some of the stock was very good, but a quantity was old. The debentures were issued to the bank as long ago as 1913. The debentures were for £2 500, but less than £900 was now due to the bank.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Bankruptcy Information.

ANDERSON, Frank, 109, Warwick Street, Greenheys, Manchester, electrical engineer. First meeting, December 7th, 2.30 p.m., Official Receiver's offices, Byrom Street, Manchester. Public examination, December 17th, 10 a.m., Court House, Quay Street, Manchester.

REEVES, Reginald Percy, trading as the LUXRAY SPOTLIGHT PROJECTOR CO., 5, Say's Corner, North Quay, Great Yarmouth, electrician. First meeting, December 11th, 12.30 p.m., Official Receiver's office, 9, Queen Street Chambers, Norwich. Public examination, December 20th, 10.15 a.m., Town Hall, Great Yarmouth.

WATSON, Charles William, 33, Rainhall Road, Barnoldswick, Yorkshire, electrical and wireless engineer. Receiving order November 24th. Debtor's petition. First meeting December 8th, 10.30 a.m., Official Receiver's office, 12, Duke Street, Bradford. Public examination, December 20th, 10 a.m., County Court, Manor Row, Bradford.

WOODGATE, Ernest Frederick, 7, St. John's Terrace, Weymouth, Dorset, electrical engineer. First meeting, December 7th, 1 p.m., Official Receiver's office, City Chambers, Catherine Street, Salisbury. Public examination, January 28th, 1927, 10.30 a.m., County Hall, Dorchester.

Notice of Dividend.

DE FRECE, Violet (separate estate), lately trading in partnership with Josephine Raie Hereford-Lavey, under the style of the RADIO CASH STORES, at 371, Upper Street, Islington, London, N.1, and 5, New Station Street, Leeds, and Parliament Street, Nottingham, electrician. First and final dividend, 20s. per £, payable, December 9th, 78, New Oxford Street, London, W.C.1.

Bankruptcy Proceedings.

BROCK, Reginald Lewis, trading as R. L. BROCK AND CO., 5. Bedford Row, Tavistock Road, Plymouth, electrical engineer. Creditors met last week at the office of the Official Receiver. Debtor estimated his liabilities as £5 100, of which £1 722 is expected to rank, and his assets were estimated to produce £355, leaving a deficiency of £1 307. Debtor said that bad trade, heavy expenses and losses in partnership were the causes of his failure. Mr. J. S. Bradley Hole, of Monument House, Monument Street, London, was appointed trustee.

SELLERS, Reginald Victor Greening, wireless engineer, trading as THE WIRELESS SUPPLIES AND INSTALLATIONS, Town Hall Buildings, Banbury. The causes of failure alleged by this debtor are: bad summer season, pressure by creditors, and poor business owing to the strike. The receiving order was made on debtor's own petition. He commenced to trade in September, 1924, with a capital of £70, of which £20 was in cash, and a Ford car. The unsecured indebtedness is almost entirely for trade goods supplied in the course of this year. The secured indebtedness is the amount of hire purchase owing on a motor-car. The car had been returned to the owners, who made a claim for repairs to it. The immediate cause of failure was pressure by creditors. No cash book had been kept, but a small book with entries of book debts and creditors' accounts had been kept. The debtor did not admit knowledge of insolvency prior to a recent judgment.

Metal and Chemical Prices.

TUESDAY, November 30th.

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£63 7 6	—	—
Electro Wirebars	,,	£65 5 0	—	10s. 0d.
H.C. Wire, basis	per lb.	9 7/16d.	—	1/16d.
Sheet	,,	9¼d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 0 7/16d.	—	1/16d.
Brass 60/40—				
Rod, basis	per lb.	7¼d.	—	—
Sheet, basis	,,	10¼d.	—	—
Wire, basis	,,	10½d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£6 5 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 0 0	—	—
Lead Pig—				
English	,,	£30 15 0	5s. 0d.	—
Foreign or Colonial	,,	£29 7 6	7s. 6d.	—
Tin—				
Ingot	,,	£320 5 0	£8 2 6	—
Wire, basis	per lb.	48. 0d.	1d.	—
Aluminium Ingots	per ton	£112 0 0	—	—
Spelter	,,	£33 15 0	8s. 9d.	—
Mercury	per bottle	£17 15 0	15s. 0d.	—

Sulphur (Flowers)—Ton £11 15 0 ***Sodium Chlorate***—Per lb. 2½d.
,, (Roll-Brimstone)—,, £10 10 0 ***Sulphuric Acid*** (Pyrites, 168°)
Copper Sulphate— ,, £25 to £25 10s. per ton, £6 15 0
Boric Acid (Crystals) ,, £37 ***Sodium Bichromate***—Per lb. 3½d.
Rubber—Para fine, 1s. 5½d.; plantation 1st latex, 1s. 6⅛d. to 1s. 6⅜d.

The metal prices are supplied by British Insulated Cables Ltd.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Application for Patents.

November 1st.

27 363 Automatic Telephone Mfg. Co., Ltd., A. E. Fienley and W. O. Passmore. Telephone systems.
27 323 British Thomson-Houston Co., Ltd., S. M. Lejeune and H. S. Petch. Electric protective apparatus.
27 344 A. E. Chapman. Radio aerial systems.
27 315 English Electric Co., Ltd., and F. A. Youngmark. Dynamo-electric machines.
27 351 Felten und Guilleaume Carlswerk Akt. Ges. Insulating paper. (29/4/26, Germany.)
27 258 T. Gillow and G. E. Rowson. Direct current supply systems.
27 322 International General Electric Co., Inc. Railway signalling systems. (31/10/25, Germany.)
27 366 G. F. Judd and E. A. Millington. Connections for electric circuits.
27 274 C. E. Methven. Bell-push.
27 312 Siemens-Schuckertwerke Ges. Signalling cables. (2/11/25. Germany.)
27 320, 27 321 H. Yagi. Variable direction electric wave generation. (29/12/25, Japan.)

November 2nd.

27 492 British Thomson-Houston Co., Ltd. Electric braking systems. (3/11/25, U.S.)
27 493 British Thomson-Houston Co., Ltd., A. G. Salisbury and T. H. Woodfield. Electric fuse holders.
27 465 R. L. Broadwood and A. D. Lacy. Variable electric condensers.
27 474 C. Conradty. Carbon slip pieces for current bow collectors. (23/11/25, Germany.)
27 400 J. A. Dixon. Wireless signalling apparatus.
27 485 Felton und Guilleaume Carlswerk Akt. Ges. Armouring for a.c. cables. (21/4/26, Germany.)
27 482 Ferranti, Ltd., and S. Z. de Ferranti. Electrical connecting devices.
27 388 H. T. Harrison. Joining electric wire installations, etc.
27 411 J. R. Hoult. Thermionic valve holder.
27 466 S. C. Miller. Thermionic valve.
27 496 Standard Telephones and Cables, Ltd. (Western Electric Co., Inc.). Piezo-electric devices.
27 491 E. G. Turner. Automatic control of arc lamps.

November 3rd.

27 616 F. A. Andrews. Inductance coils.
27 619 J. L. Baird and Television, Ltd. Variable electric resistances.
27 573 F. Baker and Siemens Bros. and Co., Ltd. Plunger type electrical keys.
27 574 F. Baker and Siemens Bros. and Co., Ltd. Mounting devices, etc., for electrostatic condensers.
27 579 A. W. Barker and L. G. Woodward. Scales for galvanometers, etc.
27 623 A. J. Bouchayer. Making tubes by electrolysis. (21/1/26, France.)
27 613, 27 614 J. Brettmon. Emitting electrodes for luminous tubes. (3/11/25, France.)
27 583 British Thomson-Houston Co., Ltd. Protective systems for electrical circuits. (3/11/25, U.S.)
27 624, 27 626 W. J. Brown, Metropolitan-Vickers Electrical Co., and A. B. Field. Electrical protective arrangements for a.c. systems.
27 627 C. R. Burch, N. R. Davis, and Metropolitan-Vickers Electrical Co., Ltd. Fluid-cooled conductors for alternating currents.
27 620 H. E. Clarke and Oldham and Sons, Ltd. Galvanic batteries.
27 596 Cline Electric Mfg. Co. Variable braking devices. (20/3/26, U.S.)
27 562 J. C. Corsam. Electric signs.
27 625 D. R. Davies and Metropolitan-Vickers Electrical Co., Ltd. Metal clad switchgear.
27 575 E. R. Garrod and Siemens Bros. and Co., Ltd. Number dials for telephone systems.
27 584 International General Electric Co., Inc. Electric testing of insulation layers. (3/11/25, Germany.)
27 576 W. G. Patterson and Siemens Bros. and Co., Ltd. Automatic telephone selectors.
27 528 C. E. Thomason. Wireless aerial.

November 4th.

27 647 J. F. Bennett and J. Hadfield. Insulating electric wires, etc.
27 699 A. Black. Internal electric lamp fitting for automobiles, etc.
24 733 British Thomson-Houston Co., Ltd. Electric relays. (4/11/25, U.S.)
27 688 J. Elzer. Disconnecting overhead conductors.
27 713 Felten und Guilleaume Carlswerk Akt. Ges. Armouring cables. (21/4/26, Germany.)
27 690 J. W. Ferrier. Head telephones.
27 677 General Electric Co., Ltd., and R. J. Kaula. Incandescent lamps.
27 707 E. E. T. Greville. X-ray apparatus.
27 720 M. Hochstadter. High tension cables. (6/1/26, Germany.)
27 722 S. Loewe. Frequency selecting valves. (4/11/25, Germany.)
27 725 M. E. Macgregor. Electrolytic current rectifiers.
27 651 J. Meiklejohn. Trolley poles.
27 636 J. T. Murphy. Electric cooker timing appliance.
27 659 R. T. Norton. Electric lamp locks.
27 745 W. A. Stevens. Safety device for electric vehicles.
27 731 Therma Fabrik fur Elektrische Heizung Akt. Ges. (vorm. S. Blumer). Rotary switches. (30/3/26, Switzerland.)
27 732 Therma Fabrik fur Elektrische Heizung Akt. Ges. (vorm. S. Blumer). Barrel switches. (31/3/26, Switzerland.)

November 5th.

27 803 British Thomson-Houston Co., Ltd. Flexible conductors. (9/11/25 France.)
27 804 British Thomson-Houston Co., Ltd. Elastic fluid turbines. (5/11/25, U.S.)
27 805 British Thomson-Houston Co., Ltd. Multiple filament electric lamps. (5/11/25, U.S.)
27 828 W. H. Broughton. Lamp-holders, etc.
27 755 W. Crocker. Electric protective device, etc.
27 871 R. S. Elvin. Thermionic valve.
27 771 N. W. Gilbert, A. E. Jabet and H. C. E. Jacoby. Oscillating fans. (22/3/26.)
27 829 I. G. Farbenindustrie Akt. Ges. Mounting for furnace electrodes. (28/12/25, Germany.)
27 785 W. Joice. Method of securing heating resistances.
27 844 Marconi's Wireless Telegraph Co., Ltd. Modulation, etc., systems. (28/11/25, U.S.)
27 869 Messgerate Boykow Ges. Regulation of current intensity. (7/11/25. Germany.)
27 811 Siemens und Halske Akt. Ges. Synchronising device for television apparatus. (6/11/25, Germany.)

November 6th.

27 965 H. G. Bartholomew and R. R. Pecorini. Phototelegraphy, etc.
27 929 G. Bloch. Automatic regulating transformer.
27 925 British Thomson-Houston Co., Ltd. Speed control systems. (6/11/25, U.S.)
27 926 British Thomson-Houston Co., Ltd., and T. H. Kinman. Circuit arrangement employing thermionic valves.
27 903 J. W. Dungey. Telephone receivers.
27 291 Electrical Improvements, Ltd. Wired wireless systems.
27 933 H. J. Garnett, J. A. Holden and W. S. Smith. Magnetic alloys.
27 921 L. C. Grant. Wired wireless systems.
27 877 J. E. Keith. Protection of switch arrangements of an electrometer.
27 878 J. E. Keith. Electric lifts, etc.
27 892 A. Lang and Veritys, Ltd. Totally-enclosed motors, etc.
27 922 A. Reyrolle and Co., Ltd., and T. R. Warren. Electric protective systems.

Coming Events

A Diary of the Chief Electrical Arrangements for the Week.

Friday, December 3rd (To-day).

Institution of Mechanical Engineers.—Institution, Storey's Gate, St. James's Park, London. Informal meeting. Discussion on "Industrial Ventilation," introduced by Mr. A. E. Harris. *7 p.m.*

Institute of Transport (Yorkshire Local Section).—Town Hall, Leeds. Paper by Mr. R. Bell on "State Control of Transport." *7 p.m.*

Electrical Power Engineers' Association (Southern Division).—Institution of Electrical Engineers, Victoria Embankment, London. Lecture by Mr. C. H. Naylor on "Choice of Turbine Plant." *7 p.m.*

Junior Institution of Engineers.—Royal Society of Arts, John Street, Adelphi, London. Presentation of medals and awards by Mr. J. S. Highfield; induction and address of Engineer Vice-Admiral Sir Robert B. Dixon entitled "The Progress of Marine Engineering." 7.30 *p.m.*

Electrical Trades Commercial Travellers' Association.—Victory House, Leicester Square, London. Carnival dance. 7.30 *p.m.*

Institution of Fuel Economy Engineers.—Royal Society of Arts, John Street, Adelphi, London. Paper by Dr. T. Barratt on "The Loss of Heat from a Surface by Radiation and Convection." 6 *p.m.*

Nottingham Society of Engineers.—Victoria Station Hotel. Annual dinner.

Saturday, December 4th.

Electrical Power Engineers' Association (West Yorks Section).—Hotel Metropole, Leeds. Annual dinner.

Association of Mining Electrical Engineers.—South Wales Institute of Engineers, Park Place, Cardiff. Paper by Mr. W. G. Hardie on "General Colliery Engineering." 6 *p.m.*

Royal Institution of Great Britain.—21, Albemarle Street, London. Lecture by Dr. G. C. Simpson on "Atmospheric Electricity." 3 *p.m.*

Monday, December 6th.

Electrical Contractors' Association (Derby Branch).—Ordinary meeting.

Electric Lamp Manufacturers' Association.—Lighting Service Bureau, 15, Savoy Street, Strand, London. Fifth Lecture of the 12th Illumination Design Course by Mr. P. J. Spencer on "Light as a Decorative Medium." 7.30 *p.m.*

Royal Institution of Great Britain.—21, Albemarle Street, London. General meeting. 5 *p.m.*

Institution of Electrical Engineers (Western Centre).—Chamber of Commerce, Cambrian Place, Swansea. Paper by Prof. S. P. Smith on "The All-Electric House." 6 *p.m.*

Institution of Electrical Engineers.—Savoy Place, Victoria Embankment, London. Informal meeting. Discussion on "Notes on the Trend of Electrical Development in America and Canada." (Opened by Mr. Ll. B. Atkinson). 7 *p.m.*

Institution of Electrical Engineers (South Midland Centre, Wireless Sub-Section).—282, Broad Street, Birmingham. Lecture and demonstration by Messrs. J. A. Cooper and A. C. Chatwin on "Distortion in Receiving Sets." 7 *p.m.*

Tuesday, December 7th.

Institution of Electrical Engineers (East Midland Sub-Centre).—College Loughborough. Address by Colonel J. F. Lister. 6.45 *p.m.*

Institution of Electrical Engineers (Scottish Centre).—Royal Technical College, Glasgow. Informal meeting. Paper by Mr. R. B. Mitchell on "Home Lighting." 7.30 *p.m.*

Institution of Electrical Engineers (Western Centre).—South Wales Institute of Engineers, Park Place, Cardiff. Lecture by Prof. S. P. Smith on "The All-Electric House." 7 *p.m.*

National Association of Supervising Electricians.—Junior Institution of Engineers, 39, Victoria Street, London. Lecture by Mr. A. I. Tracey on "Cables." 7.15 *p.m.*

Paisley Association of Electrical Engineers.—Visit to Messrs. Walter M'Gee and Sons, Paisley. 7.30 *p.m.*

Wednesday, December 8th.

Electrical Contractors' Association (Sheffield Branch).—Angel Hotel. Ordinary meeting. 5.30 p.m.

Institution of Civil Engineers.—Institution, Great George Street, Westminster. Informal meeting. Discussion on Mr. A. H. Dykes's paper "The Circumstances in which Small Private Electric Generating Stations may have Advantages over Public Stations." 6 *p.m.*

Institute of Wireless Technology.—Engineers' Club, Coventry Street, London. Paper by Mr. W. A. Chambers on "A New Rectifier-Amplifier for Broadcast Reception of High Quality." 7 *p.m.*

Thursday, December 9th.

Electrical Contractors' Association (East Yorks Branch).—Metropole Hall, Hull. Ordinary meeting. 3.30 *p.m.*

Electrical Contractors' Association (Newcastle Branch).—Tilley's Restaurant, Newcastle. Annual dinner. 7 *p.m.*

Electrical Contractors' Association (Nottingham Branch).—Ordinary meeting.

Institution of Electrical Engineers (Dundee Sub-Centre).—University College, Dundee. Paper by Prof. A. R. Fulton on "Tidal Power from the Tay." 7.30 *p.m.*

Friday, December 10th.

Electrical Trades Benevolent Institution (North-East Coast Section).—Old Assembly Rooms, Newcastle. 8th Annual Ball.

Liverpool Engineering Society.—9, The Temple, Dale Street. Joint meeting with the Institution of Mechanical Engineers. The Fifth Report of the Marine Oil-Engine Trials.

Physical Society of London.—Imperial College of Science and Technology, South Kensington, London. Papers by Mr. F. Wenner on "The Principle Governing the Distribution of Current in a System of Linear Conductors," and Mr. A. Campbell on "A Capacitance Bridge of Wide Range and a New Inductometer." 5 *p.m.*

Institute of Transport (Western Local Section).—Bristol University. Paper by Major F. Bustard on "The Internationalising of European Communications." 5.30 *p.m.*

Institution of Mechanical Engineers.—Storey's Gate, St. James's Park, Westminster. Fifth Report of the Marine Oil-Engine Trials Committee. 6 *p.m.*

Institution of Electrical Engineers (London Students' Section).—Automatic Training School, King Edward Buildings, General Post Office. Paper by Mr. F. I. Ray on "Automatic Telephony." 6.30 *p.m.*

Junior Institution of Engineers.—Institution, 39, Victoria Street, Westminster. Lecturette on "The Determination of Temperature in Cylinders of Internal Combustion Engines," by Mr. C. E. Foster. 7.30 *p.m.*

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THE ELECTRICIAN

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The Electrician.

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DISTRIBUTION ECONOMIES.

THE Papers Committee of the Institution of Electrical Engineers often come under a great deal of criticism. They are accused of being out of touch with the needs of the industry and of selecting communications for presentation to the meetings which are only of interest to specialists. It is significant, therefore, that all the Papers which are to be read this session before Christmas deal with various aspects of one great problem: distribution. Dr. ECCLES, speaking at the annual dinner of the South Midland Centre, drew a lurid picture of the effect on our existence of the complete failure of electricity supply. Not only would our homes cease to be lighted, but factories, railways, motor cars and aeroplanes would come to a standstill and long distance communication would be impossible. And if we examine exactly how electricity operates we find not only is it being increasingly employed for the distribution of energy in a conveniently utilisable form for all sort of purposes, but that it permits the transmission of intelligence speedily and accurately and immensely facilitates the growth of human intercommunication. It is obvious, therefore, that the problem before electrical engineers is not only how to generate electricity more efficiently, but how to distribute it in the best possible way so that the consumer will have as much as he requires for his needs at the most economic price, and so that the amount of plant employed for fulfilling this purpose is reduced to a minimum.

This is the principle underlying the Paper on "The Design of City Distribution Systems and the Problem of Standardisation," by Messrs. J. R. BEARD and T. G. N. HALDANE, which the Institution dealt with about a month ago, and the Paper on "An Outline of the Trunking Aspect of Automatic Telephones," by Mr. G. F. O'DELL, an abstract of which we give elsewhere in this issue. In the former Paper the authors suggested an arrangement of the distribution system of an electricity supply undertaking which would take into account the probable increase in consumption and at the same time be flexible enough to allow of easy extension when occasion demanded it. In the idea itself the authors would be the first to admit there is nothing new. A well-known telephone engineer informed us with some scorn that it was what administrations connected with that form of electrical communication had been doing for years. In the course of the discussion Mr. CHATTOCK pointed out that the lines of development indicated were very similar to those adopted in Birmingham, and the same is probably true of every other enterprising industry in the country. At the same time, it is general knowledge that in many places a thorough revision, as distinct from an extension, of the distribution system has been necessary to meet the increasing demands of consumers, and that black spots where no mains are laid are to be found equally within the areas of most undertakings as in the country considered as a whole. It is not too much to say that in future generation and transmission will become the business of the few. On the other hand, more and more will be concerned with the distribution, or, in other words, the selling of electricity, and if this is to be carried out successfully certain preliminary work will have to be done. Of this, perhaps the most obvious, and certainly the most important, is to ensure that mains are laid in every street and that the layout is such that it can take care of all demands that the future may impose upon it. We have no doubt that the majority of supply engineers are well aware of this, but no harm will be done in stating the case.

The policy of the Post Office Telephone Department, as those who have studied the appropriate literature know, is constantly to examine the future traffic requirements of the district and to lay their mains accordingly. The nature of telephone communication has made this forward planning more important than it is at first sight in the distribution of electricity for heavy current purposes. Every telephone subscriber must have the exclusive use of at least one pair of wires from his premises to the exchange. A heavy current consumer requires the use of a pair of wires from his premises to the nearest distributor, but this pair is not only generally much shorter but can be put in when it is required, while, owing to the diversity, an additional consumer in the majority of cases does not mean a strengthening of the distributor. While, therefore, supply engineers can learn a great deal from telephone engineers, when they come to consider the layout of their distribution network, telephone engineers can in their turn learn something from the supply engineer in considering a problem which the increasing use of automatic telephones makes of current interest.

In manual telephony not only is an exclusive pair of wires necessary between the subscriber's premises and the exchange, but certain apparatus in the latter place must be provided for each incoming line. Though this is to a certain extent also true with automatic telephony, as Mr.

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G. F. O'DELL points out in his paper it would be uneconomical to provide a subscriber with a pre-selector by means of which his line could be connected to any one of, say, 500 selectors, and it is more usual to reduce the number of "first" selectors so as to save their cost. Again, when the size of a group of switches is fixed the maximum possible value of the average traffic per switch is also fixed, and it therefore becomes a question of working out the number of switches that will be required to deal with the ultimate traffic, as extensions lead to wholesale rearrangements of the plant of a kind which are highly undesirable. Mr. O'DELL also emphasises the need for flexibility in trunking schemes, not only on the score of convenience, but for the very important reason that inflexibility in terminal assembly arrangements means an increased cost of switching plant. This is apart altogether from the saving in plant effected by improved methods of trunking, which in their turn are made practicable by increased flexibility. Stated generally the problem is to calculate the amount of switching plant (internal and external) which is required to convey the traffic under all the various conditions occurring in practice and to provide, arrange, and cable this plant in such a way that not only is its traffic capacity a maximum but it can readily be extended or rearranged as the traffic conditions change. These conditions are not dissimilar to those obtaining on power distribution systems, and the two problems might therefore be considered together. Mr. O'DELL concludes his Paper with an excellent bibliography which shows that the subject has been thoroughly investigated on the theoretical side, notably by Mr. W. H. GRINSTED, in a way which should form a sound foundation for the erection of a practical structure in both telephony and power supply work.

Current Topics.

Faraday and Kelvin.

AN interesting ceremony took place at the Institution of Electrical Engineers last week when portraits of FARADAY and KELVIN were hung in the lecture theatre. The former has been presented by Mr. SYDNEY EVERSHED, who took the opportunity to draw some interesting differences and parallels between the characteristics of these two great electrical pioneers. He went on to say that he had for long thought it a becoming thing that individual members should present one or more of these portraits, and had at last concluded that he himself might well make a beginning. He is to be congratulated both on the thought that prompted the action and on the action itself. It is to be hoped that the example he has set will be followed widely and quickly. There are a large number of scientists whom the Institution might fittingly honour in a similar way. Some of these have held the presidency and some have not. In the case of the former, photographs, often of small artistic merit, are hung in the Common Room, but something more is needed. The portraits which have now been provided might well be the beginning of a National Electrical Portrait Gallery.

Assisted Wiring at West Hartlepool

IT is generally recognised that the small consumer must be assisted to install electricity in his home by some form of what is conveniently called hire-purchase. At South Shields this has been done by adding 2d. per kWh to the price charged for electricity, while at Newcastle a monthly rental is charged. Both schemes have been highly successful, but the first has the disadvantages of making the cost of electricity high and, where an undertaking draws its supply in bulk, of forcing up the demand, thus increasing the average price paid per kilowatt hour, while the second sometimes leads to trouble when there is a change of tenant. Mr. J. H. PARKER, the borough electrical engineer of West Hartlepool, therefore hit upon the ingenious idea of collecting a fixed charge of 1s. per week with the rent and charging for all the electricity consumed at 1d. per kWh. This weekly rent being more than sufficient to cover the standing charges, a bowl fire and an iron were supplied to each consumer. The scheme also allowed a pre-payment meter to be saved. The success of the arrangement is shown by the fact that while last November there were only 20 consumers on the housing estates who were paying more than 52s. per annum for their electricity there are now 292 paying a fixed charge of that amount and 1d. per kWh for their electricity in addition. There are a number of other houses in the town where the fixed charge would be less than 1s., and a charge for the installation of 6d. per week for ten years would more than cover the cost, so that a total fixed charge of 1s. 6d. per week plus 1d. per kWh would greatly increase the use of electricity for domestic purposes. We are glad to learn that the Council have adopted Mr. PARKER'S view and are applying for a loan of £5 000, so that from 400 to 500 houses may be wired. As it is, Mr. PARKER informs us that he has persuaded 292 out of 550 consumers on the housing estates of the Corporation to change from slot meters to the domestic rate and that he hopes to get most of the others before the winter ends. Our heartiest congratulations.

Electricians and "The Electrician."

IN a playfully sarcastic note about the names submitted by readers of THE ELECTRICIAN in response to our invitation for suggestions for a distinctive title for registered contractors, the "Electrical Contractor," the official organ of the Electrical Contractors' Association apparently overlooks the fact that the idea of seeking such a title originated at the E.C.A. Conference at Brighton this year. In the absence of any criticism of the suggestion made by one of the leading contractors of the country, it was thought that contractors generally were anxious for a name to be found; hence our offer. Our postbag showed the widespread desire for such a title. It also contained a number of letters suggesting that the title of this journal supplied the long-felt want. Although a certain modesty has prevented us from advocating its adoption, we agree with the "Electrical Contractor" that "a name that is good enough for THE ELECTRICIAN should be good enough for the trade at large." But, unfortunately, the section of the trade most intimately concerned seems to prefer to pass on its proper title to the wireman, and to reserve for itself a name which is unwieldy and equivocal, and which, furthermore, means very little to the general public. We can only hope that the "Electrical Contractor" will endeavour to rehabilitate the word which it admits best describes the man who now calls himself an electrical contractor.

Sir E. Rutherford on Wireless.

IN his Presidential Address to the Royal Society Sir ERNEST RUTHERFORD took radio-communication as his subject and gave an interesting account of its development from the earliest times. The history of this new method of signalling was, he said, of special interest to all scientific men, for it illustrated in a vivid way the value of a close co-operation between pure and applied science for rapid progress. The first chapter was due to MAXWELL, who in 1864 published his paper on "Dynamical Theory of the Electromagnetic Field." He was followed by HERTZ, LODGE and MARCONI, while in the later stages progress had been largely influenced by FLEMING'S use of an electron tube as a detector of electrical waves. Sir ERNEST, in giving a description of the Rugby station, said its success was a tribute to the breadth of the scientific knowledge and the boldness of the initiative displayed by the Imperial Wireless Commission and the engineering staff of the Post Office. It would soon, he hoped, be practicable to employ it for public telephonic communication between Western Europe and North America. Reference was naturally made to the beam system, and it was also remarked that it would be interesting to see how far a con-

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tinuous service was feasible by these new methods in spite of atmospheric disturbances which sometimes so seriously affected ordinary short wave transmission. The study of the propagation of electrical waves through the atmosphere gave us a new and powerful method of attack on the problem of its electrical state, particularly at heights where direct observations were impossible.

Marine Engineering.

In his presidential address to the Junior Institution of Engineers last Friday, Engineer Vice-Admiral Sir Robert Dixon naturally dealt with the progress of marine engineering, and in the course of his address made some significant comments on the part which electricity plays and could potentially play on board ship. He remarked that electrical propulsion was not favourably regarded in this country, and had only been used in isolated cases. On the other hand, it has been employed on all battleships in the U.S. Navy completed since the closing years of the war, and has given satisfactory service under peace conditions. In war, in Sir Robert Dixon's opinion, it may prove less economical in fuel and be more liable to breakdown. We do not know what justification there is for these statements, but it forms a good argument for our own naval authorities, not only not to adopt electrical propulsion but not even to try it, except for auxiliary propulsion on H.M.S. "Adventure." Research is, however, as necessary in marine engineering as elsewhere. Something more should, therefore be done in this direction. As regards auxiliary machinery Sir Robert considers that the ideal arrangement would be to provide for all the power auxiliaries being driven by or from power supplied by the economical main engines. This is only possible to a small extent owing to the scattered disposition of the auxiliaries, and the best that can be done is to use the exhaust from the steam-driven auxiliaries to heat the feed water and to drive the remainder electrically by current generated by fairly large and, therefore, economical turbo-generators or oil-electric generators. Sir Robert concludes by calling for co-operation. Electrical engineers are willing to do their part in this respect, if marine engineers will do the same.

The Whitworth Book.

The name of Joseph Whitworth will always be honoured by engineers. He did more than anyone to establish engineering as an exact science and, with a foresight which was not his least outstanding characteristic, established the scholarships which bear his name. These scholarships, owing to the skill with which their founder worked out the conditions under which they should be held, have done much to advance engineering education by insisting on the need for combined theoretical and practical training, while the eager competition for them has, in its turn, played a part in maintaining the standard of the instruction given in our technical schools. Over 1 400 men have, in fact, benefited directly by Sir Joseph Whitworth's foundation, and very many more must have improved their knowledge by the stimulus of the competition. It was, therefore, a happy thought, not only to establish a Whitworth Society, but to prepare a Whitworth book which would give some account of the careers both of the "pious founder" and of those who have benefited by his munificence. This has been admirably done in the "Whitworth Book," which is published by Longmans, Green and Co. It contains a memoir of Sir Joseph Whitworth by Mr. H. H. Johnson, an historical account of the foundation of the scholarships and the present regulations relating to them, some details of the Whitworth Society, and the names of 1 401 "Whitworth men," who obtained scholarships, exhibitions or prizes between 1868 and 1925. Of these 156 are deceased and 185 are at present unlocated. Of the remainder biographical notes are given which are both interesting and stimulating. This is a veritable history of modern engineering, and Professor D. A. Low, its honorary editor, is to be heartily congratulated on his work.

Restraints on Trade.

The Federation of British Industries does well not to relax its efforts to obtain a reduction in public expenditure. As pointed out in its latest memorandum to the Prime Minister the competitive powers of the British industry are being impaired by such expenditure as £87 500 000 on national insurance, a large proportion of which has to be found by industry. The Factory Bill will impose further serious burdens on trade, while other measures by increasing the number of departmental regulations tend to have the same result by forcing the manufacturer to incur expense, at the bidding of officialdom, to an extent that was never contemplated by Parliament when the legislation concerned was under consideration. The Federation, therefore, feel, quite rightly, that the time has come to call a halt. This is the more necessary as the coal dispute has meant increased local debt, which must be reflected in increased rates, and thus form an added burden at a time when industry is least able to bear it. More is, in fact, needed than mere assertion. Something must be *done* to bring about a reduction. Otherwise unemployment must remain a serious problem which may tend to grow worse instead of better. The Federation, therefore, urged the postponement of the Factories Bill and the slowing up of measures of social reform which, however legitimate in theory, should only be undertaken when economic conditions warrant. There is the more reason for this owing to the pressure of foreign competition, the successful meeting of which is necessary in order that we may maintain our present position.

The Electricity Bill.

The Electricity Bill passed the report stage in the House of Lords on Tuesday evening. The point to which most attention seems to have been given was the effect on the antiquarian or artistic value of villages, buildings, forests, woods, trees and lakes of overhead lines, and an amendment was passed providing that the Minister of Transport should take into consideration any recommendation made to him by the Commissioner of Works before erecting an overhead line to the prejudice of an ancient monument. As recent events show that the latter department is not always as solicitous as it might be in these matters as this does not seem to be much of a safeguard. In any case the interference of overhead lines with scenery is more theoretical than actual and the Central Board are not likely to be less careful of their duties in this respect than many of those who preach one thing and do the other. An amendment which was moved with a view to limiting the field of choice of the Board in the matter of the ownership of new stations, was added, perhaps only temporarily, to clause 6, but others providing that a power company should be allowed to make a claim where its position was prejudiced by a diversion of its stations into selected and non-selected, and dealing with the compulsory acquisition of land were negatived.

Sir George Sutton's Munificence.

"What has made Henley's," said Sir George Sutton, in thanking the employees of that famous firm for illustrating in tangible form the love and respect in which they hold him, "has been the quality of work performed and the energy with which the products have been sold." A business can only be successfully built up, he went on to say, by the exercise of patience, while money and time were both required for its permanent establishment. Sir George, with justifiable pride called attention to the pension funds that have been organised for the staff of the firm and regretted that it was possible to do so little in this way for the workpeople. He, however, proposes to contribute £5 000 to their Benevolent Fund and hoped that this would be administered not as a charity, but as a right. Henley's are indeed fortunate in their chairman.

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PARIS SUBURBAN ELECTRIFICATION.

Power Supply on the Western State Railway—Details of Generating and Sub-station Plant.

By THEODORE RICH.

As previously mentioned there are two power stations belonging to the French State Railway administration, one in the north-west of Paris at Bezons, and the other at Les Moulineaux near the Versailles Railway; these stations supply not merely the electrified sections with power for traction, but also many passenger stations with lighting and power, together

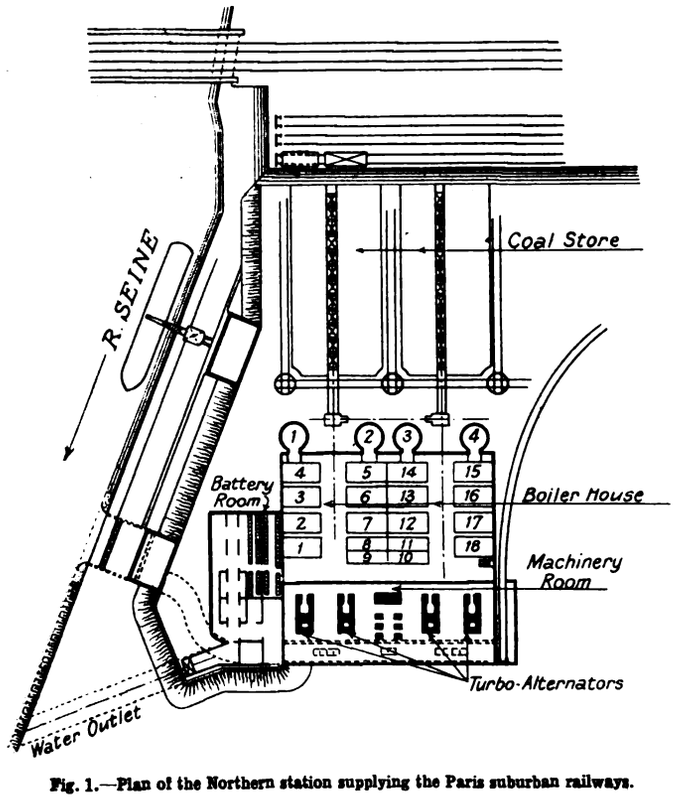

Fig. 1.—Plan of the Northern station supplying the Paris suburban railways.

with various railway workshops, running sheds, and goods yards. Figs. 1 and 3 show outlines of the Northern station. Each station has a gross capacity of 20 000 kW, space being left and other facilities provided so that in each case the capacity can be increased by another 20 000 kW.

The current is generated at 25 periods; both stations are situated on the River Seine, so that besides having ample supplies of condensing water, coal can be received by barge as well as in trucks. Although Paris is so many miles from the sea, yet the catchment area of the Seine Valley, together with that of the Marne, above Paris, is so large, and the volume of water held up by the locks is so great, that there are ample condensing facilities not merely for smaller stations such as those of the Western Railway, but also for the power stations at Gennevilliers and Saint Ouen, each of which stations has a capacity approximating to 350 000 kW.

In both stations modern coal handling and extensive storage accommodation have been arranged for. Coal breaking arrangements are provided so that large coal can be treated for use with mechanical stokers; in the case of the Southern station the coal is carried to the boiler hoppers by means of a telpher system on an endless overhead rail.

Each power station has four chimneys built with up sectional pre-cast concrete blocks arranged with external ribs, the vertical armouring bars running up the middle of these. In view of the very high cost of bricks and bricklaying at home it is astonishing that the use of concrete for the building of chimneys has not been taken up more with us for general factory work; large numbers are to be found on the Continent often with high level armoured concrete water tanks built into them; although for power station work in France, as with us, induced draught and individual short steel chimneys built on to the boiler structures are very fashionable.

In each station eighteen boilers are installed, fourteen with an output of about 20 000 lb. per hr., and four for 10 000 lb. each. The larger boilers have each a heating surface of 286 sq. m. or about 3 077 sq. ft., with about 129 sq. ft. grate area, the smaller boilers having heated surface and grate areas of half of the above. In the Northern Station the boilers are of the Niclausse type working at 17 kg. per sq. cm., or about 241 lb. per sq. in.; half of these are fitted with Hotchkiss chain grate stokers and the rest with Niclausse moving bar stokers, in both cases with Green's economisers.

In the Southern station the boilers are of the Belleville type working at about 255 lb. pressure, they are fitted with Hotchkiss chain grate stokers and with economisers of the Belleville type. The coal usually used comes from the Bruay Coalfield, having a volatile content of about 30 per cent. with 10 per cent. ash.

The Northern station contains two Brown-Boveri turbines made by the Cie. Electro-Mecanique of Le Bourget, near Paris, and two units of similar capacity of the Zoelly type made by the Société Alsacienne of Belfort. In order to conform with the 25 periods the units operate at 1 500 revs. per min., they have direct coupled exciters and an auxiliary excitation supply. The machines are wound for 5 250 V; they are connected with the transmission busbars through banks of step up transformers contained in concrete cells closed with roller shutters. A certain amount of power for station lighting is transmitted at 5 000 V. At the Southern station the turbines are of the Brown-Boveri type.

With an output of 5 500 kW at 1 500 revs., a pressure of 12 kg. sq. cm., or about 170 lb. at the inlet, and a temperature of 300 deg. C. (572 F.), with condensing water at 59 deg. F., after allowing for the energy absorbed for excitation and condenser auxiliaries, the consumption of steam of the Brown-Boveri turbines is 6 kg. or about 13·2 lb. per kWh. The Southern power station was set to work in 1921.

At each station there is an auxiliary battery operating at 125 V, consisting of 62 cells of 1 600 Ah capacity, which can be charged either by a motor generator off the three-phase supply or from emergency steam plant.

There are at present fourteen sub-stations equipped with plant. The sub-stations are made of steel and brickwork, they are distinctly pleasing looking structures, though it would be difficult to say that their cost has been very materially increased by their being so constructed. In France and Italy engineers seem to have the knack of putting an artistic touch to utilitarian structures such as power stations, sub-stations, factories and so on, even if they are made of such an uncompromising material as armoured concrete; French brickwork, usually in Flemish bond, is generally neat looking. Fig. 2 shows a sub-station at the Bois de Boulogne station,

Fig. 2.—Sub-station at Bois de Boulogne.

remarkable owing to the fact that the upper part is bracketed out with the aid of an armoured concrete framework. Two signals of the revolving disc type are to be seen in the foreground; it must be said that to English eyes this type of

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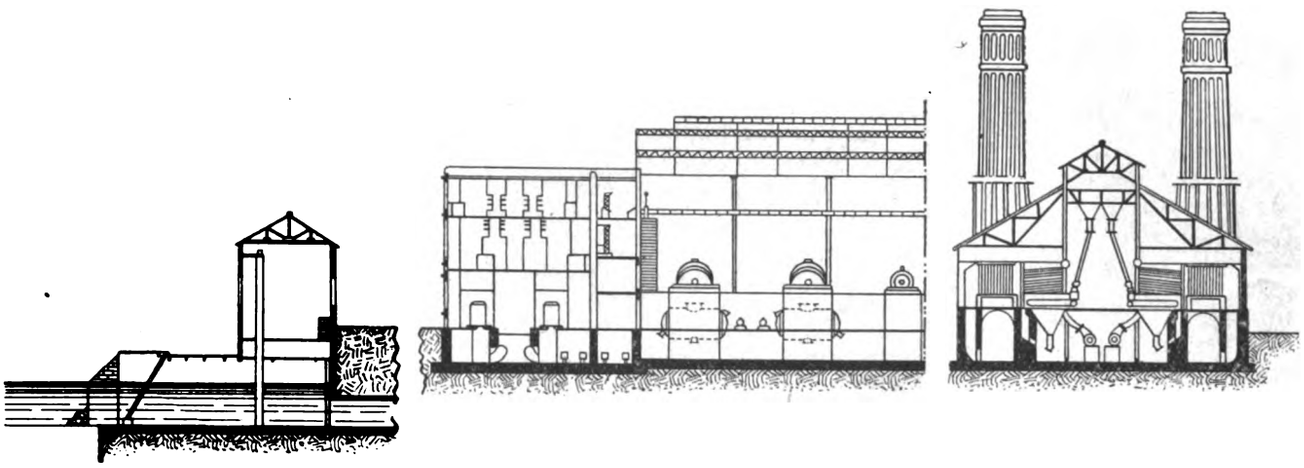

Fig. 3.—Elevation of the Northern station

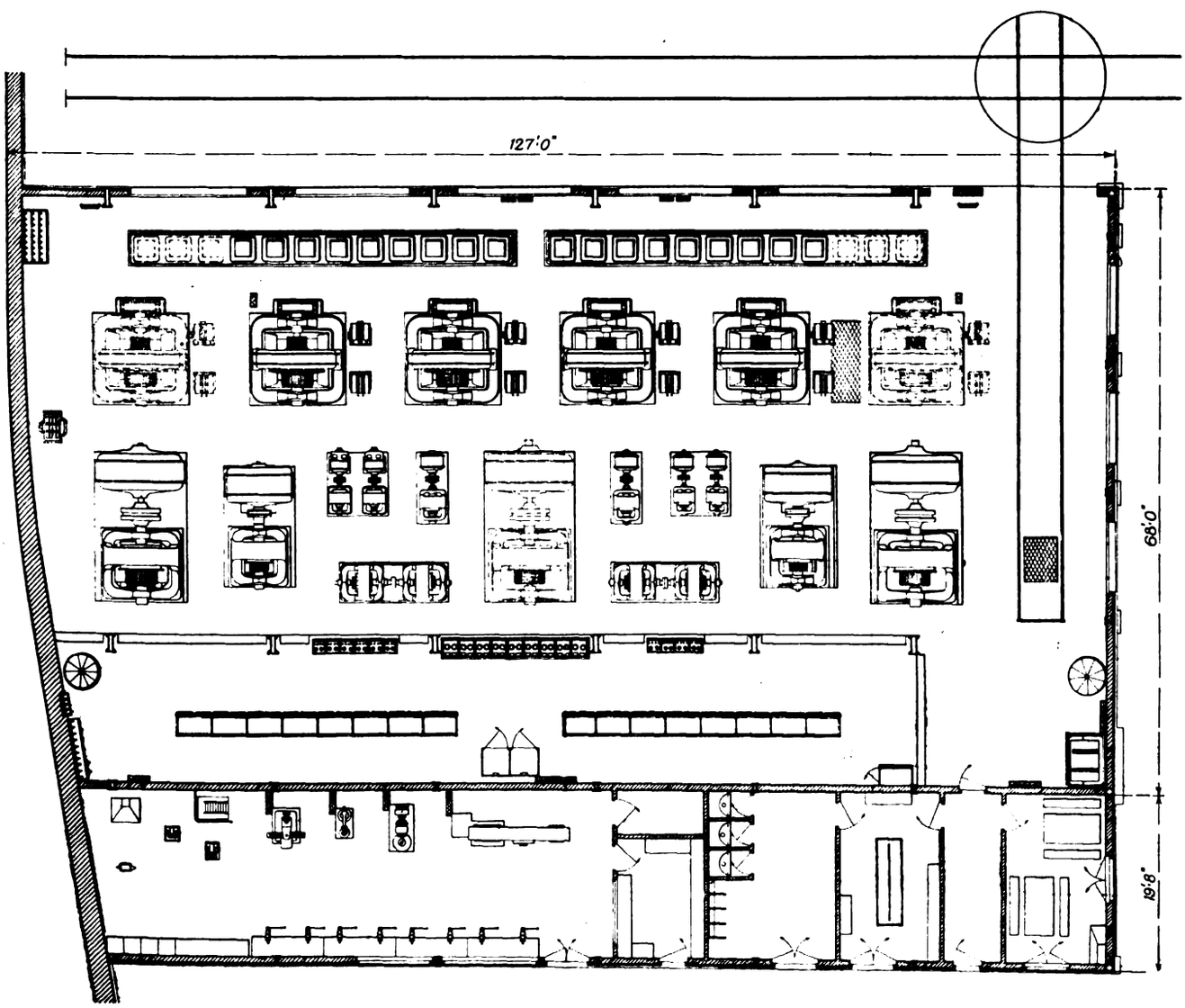

Fig. 4.—Plan of the Pont Cadinet Sub-station supplying the Paris suburban railways.

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signal does not adapt itself so well to route indication as the English semaphore, and in many positions the supporting structures are more expensive than with the latter. Fig. 7 shows a sub-station at La Garenne, with the main repair workshops on the right. In England during the much despised mid-Victorian era, at a time when the Italian style of architecture was so much in vogue, successful efforts were made to take the rough edges off many engineering structures, as witness many water works pumping stations on the Thames and Lea; as a contrast one might compare the sewage pumping station on the west side of Grosvenor Road railway bridge outside Victoria Station with the plain looking, almost "cubist," traction sub-station recently built by the Southern Railway on the east side of the line. It should be remembered, however, that during the Victorian era people did not enjoy such forms of real progress as "doles" or 4s. in the pound income tax, or local rates on a "Social Reform" basis. So they could afford to spend money on making things look nice. The roofs of the sub-stations on the Western Railway are flat, and they are finished with a basaltic cement. In order to act as outlets for low pressure overhead lighting and power circuits a certain number of sub-stations are arranged with outlet towers.

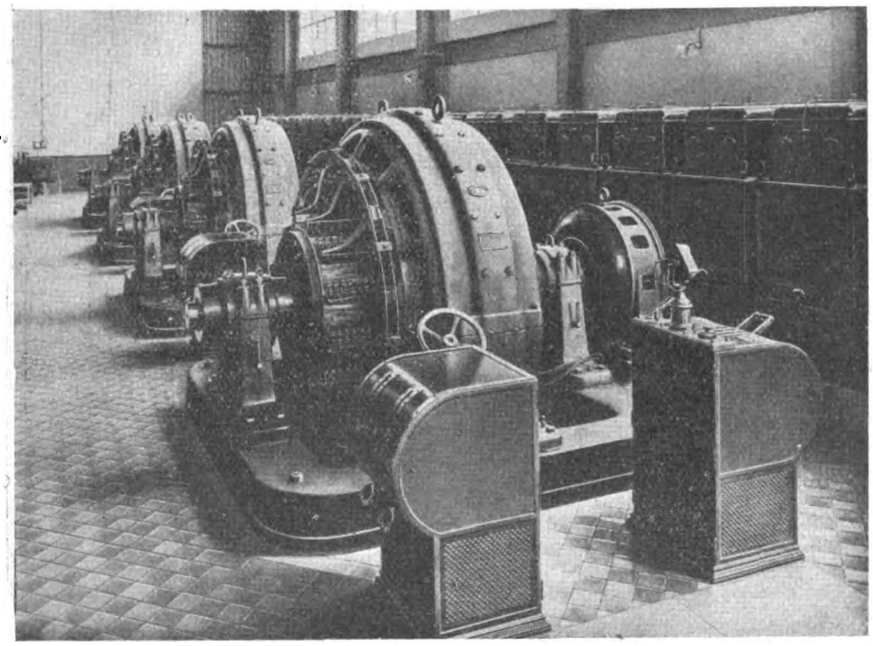

Fig. 5.—1 500 kW Westinghouse rotaries (Pont Cadinet sub-station).

With the exception of a mercury vapour rectifier which is installed at the sub-station at the foot of the long Meudon tunnel on the Versailles line, all the sub-stations are equipped for the traction supply with six-phase rotary converters. At each of the sub-stations converting plant, generally motor generators are installed, with a battery of accumulators to supply light, and in some cases power to railway stations and other railway buildings, and also for the operation of trip gears, etc.

The most important sub-station is that at Pont Cadinet, Figs. 4 and 8. This supplies power for traction to the terminal section at St. Lazare, and also light and power to neighbouring goods depots, locomotive running sheds, and passenger stations. There are two sets of incoming feeders, one at 15 000 V for traction, and one set at 5 000 V used primarily for local non-traction services, but the busbars belonging to the latter section can be connected to the former by means of interchange transformers. At this sub-station and at the one at Asnières, over the river at an important junction, rotary converters are installed in 1 500 kW units; at the other sub-stations the units are of 1 000 kW capacity Four rotary converters have been installed, as can be seen from the plan, and space has been left for a further two. The converters, Fig. 5, are fitted with 12 laminated poles, compensation coils and with auto-synchronising gear of the Westinghouse-Rosenberg type. Two banks of single phase air cooled transformers are placed behind the converters. These can be seen in Fig. 5; they are of 535 kVA each. They are cooled by a motor driven fan delivering through air trunks; oil-cooled transformers will be used in the case of future sub-stations. For future sub-stations oil cooled transformers will be used. In considering the plant and general lay-out it should be pointed out that many arrangements were decided on well before the war, much of the plant was in progress in 1914, and many of the sub-station arrangements were completed, so that if the system had to be designed *de novo* many modifications would doubtless have been incorporated.

For the local lighting and power supply there are two 600 kW motor generators and two of 300 kW capacity. The larger units are made up of 850 H.P. squirrel cage induction motors with the h.t. side wound for 50 000 V at 25 periods, coupled to a 600 kW d.c. generator running at 290 revs. per min. For starting up from the d.c. side a 30 kW motor generator is provided, it is fed from the three-phase side. This plant can be seen on the plan, the larger motor generators being on the right and left with the smaller auxiliaries in between. An electric traveller with 5 ton and 30 ton lifts is arranged to command a full gauge track. A workshop with hand traveller with useful tools is provided.

The high tension switchboards are of the cellular type made up with pre-cast slabs of armoured concrete 50 mm (about 2 in.) thick, reinforced with 8 mm. iron rods, they were assembled with the aid of hooks formed in the armouring and cemented up solid. The d.c. lighting and power supply is at 500 V across the outers, two 100 kW balancers at 250 revs. per min. are provided, and also two batteries, each of 280 cells, with a one hour capacity of 720 Ah, and a capacity of 1 440 Ah on a 10 hour discharge. At the smaller sub-stations motor generators are installed of a unit capacity from 5 kW upwards to 400 kW, the size depending on the duty, in the smallest size the d.c. current is only

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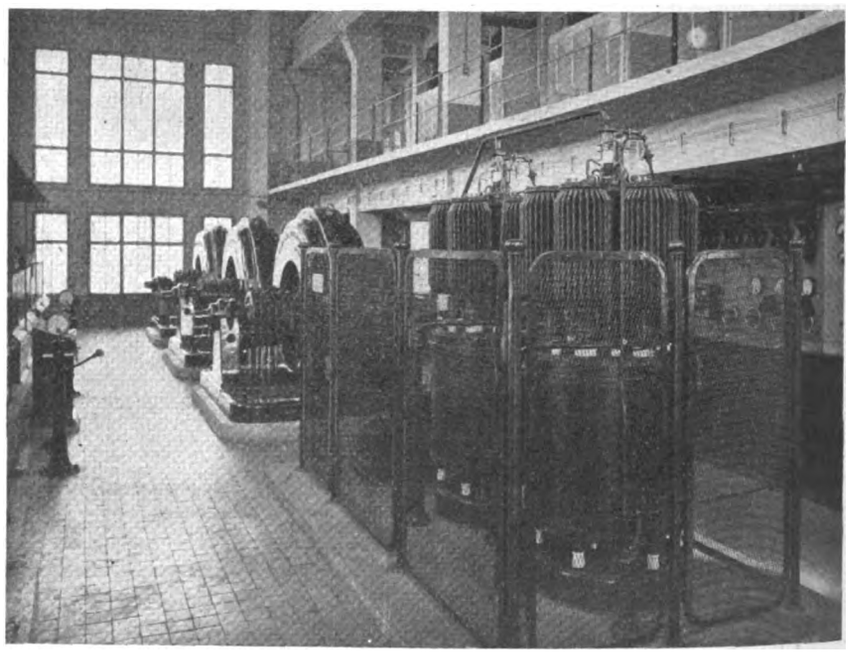

Fig. 6.—Three 1 000 kW Brown-Boveri type rotary converters and mercury vapour converter 1 000 kW (Meudon Val Fleury sub-station).

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Fig. 7.—View of sub-station at La Garenne, showing the main repair workshops on the right.

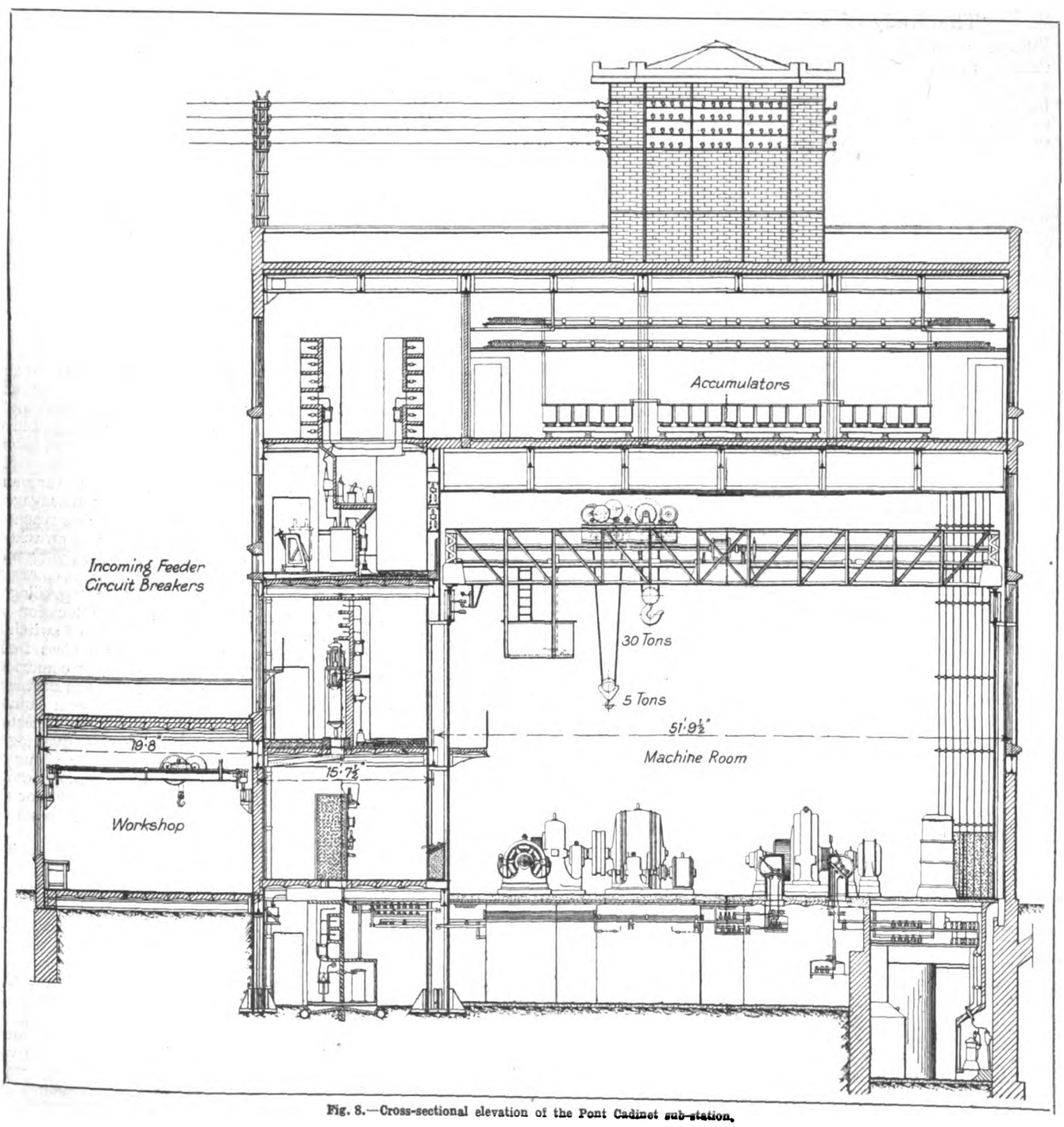

Fig. 8.—Cross-sectional elevation of the Pont Cadinet sub-station.

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THE TRUNKING PROBLEM.*

An Outline of an Important Aspect of Automatic Telephones—The Science and Art of Trunking.

By G. F. O'DELL, B.Sc.

RECENTLY (March 10th, 1926) the fiftieth anniversary of the invention of the telephone has been celebrated in America, and celebrations in this country occurred a few weeks later. In the wonder at the magnitude of the achievement thus recorded there is little recognition of the fact that the telephone would have remained scarcely more than a wonder, and of limited practical use, had it not been for later inventions which made possible, first, the rapid connection of one telephone circuit with any other; and second, the establishment of a large number of simultaneous connections. With the first of these developments—the connection of one subscriber with any other—we are not at the moment concerned directly, though, as will be seen later, we are so indirectly. The second lies at the root of the whole of the problems with which this paper deals, namely, the problems which collectively make up the science and art of trunking.

The Study of Subscribers' Demands.

Soon after the invention of the telephone it became apparent that for the invention to be of real value, arrangements must be made for anyone possessing a telephone (subscriber) to be put in communication, on demand, with any other subscriber. When the telephones are in the same building, or at least close together, this may be done by means of intercommunication systems; but in general exchanges are necessary. In the smallest exchanges sufficient plant is provided to allow all subscribers to be using their telephones at once. But in larger exchanges it is found that, generally speaking, only a small proportion of subscribers wish to use their telephones at any one time. It is probably the recognition of this fact that has rendered telephony on a large scale practicable. Certainly the economics of the industry would have been vastly different if the average subscriber had been other than a small user. In the writer's opinion this phase of telephony has never been sufficiently emphasised. An essential branch of the science is the study of demands made by subscribers on telephone administration.

In the next section of the paper the author briefly indicates some differences in the methods of handling traffic in manual and automatic exchanges. In the latter case there are three places where calls may be "lost," or delayed: (1) between pre-selectors and first selectors, if all the latter are engaged; (2) between first and second selectors; and (3) between second and final selectors. Considered with reference to a comprehensive trunking scheme, the branch of automatic telephony termed trunking may be defined as the method of calculating the amount of switching plant required to carry the traffic under all the various conditions occurring in practice; and to provide, arrange and cable this plant so that not only is the traffic capacity a maximum, but it can be readily extended or arranged as the traffic conditions change.

Telephone Terminology.

In the next section of the paper the author discusses a few main terms used in dealing with this subject. The B.E.S.A. have standardised the "traffic unit." This may be defined as "the amount of traffic which one switch or circuit carries in an hour when it is continuously occupied." The traffic unit is a measure of traffic intensity rather than of total traffic; no standard unit for measuring traffic in bulk has been defined. The other chief term of consequence is "grade of service," defined in terms of the proportion of calls which fail to mature owing to shortage of switching plant. In the Post Office the standard has been fixed at one lost call in 500 at each switching stage; with the proviso that if the traffic increases temporarily by 10 per cent. the service shall not deteriorate below one in 100.

The author next summarises a series of attempts to deal with the problem quantitatively, i.e., in estimating the amount of switching plant necessary to handle a given amount of traffic. Thus in the classic papers of the late W. Lee Campbell, various formulæ are derived. Many of these take the form $N = A + k\sqrt{A}$, where N is the number of switches required to carry A traffic units, and k is a constant. W. H. Grinstead, in 1907 arrived at the result that for a traffic intensity of A traffic units, the probability of exactly x simultaneous calls is $e^{-A}A^x/x'$; this is commonly known as the Poisson formula of distribution. Reference is also made to the work of E. C. Molina, of the American Telephone and Telegraph Co., and others. The theory has been much discussed by Continental engineers. Special interest attaches to the work of Erlang, scientific assistant to the Copenhagen Telephone Co., who has derived an expression for the proportion of lost traffic ("grade of service"). Most of these theories deal with the "full availability" problem, i.e., the problem involved when any call can be put through on any switch or circuit, provided it is free. From the qualitative side the author traces the development of the "link distributing frame" (developed chiefly by Messrs. Siemens Brothers, and largely used in their exchanges, as in the more recent exchanges of the Automatic Telephone Manufacturing Co.). This frame marks the high-water mark of development in trunking facility, and is highly flexible. But this flexibility has to be paid for, and accordingly an improved form of terminal assembly, located at the ends of the selectors boards, has been evolved, which is economical in cable.

The Advantages of Grading.

Erlang's theory, mentioned above, is considered to correspond most closely with conditions in this country. His expression is fairly easy, though somewhat tedious to evaluate. In the original paper the author presents tables and curves showing average capacity per switch for various grades of service. However, those familiar with automatic switching plant, will realise that "full availability" conditions do not occupy a large space in practice. When the availability is limited, the question arises of how best to join the banks of the switches of one rank to the wipers of the next. In most of the early exchanges the switches of one rank were divided into groups, each containing a number equal to, or not greater than, the number of contacts in the banks of the preceding switches. This arrangement, besides being uneconomical, is very inflexible. Flexibility in trunking arrangements is not only a matter of convenience; inflexibility materially increases the cost of the switching plant. An important departure was the "slipped bank." The chief advantages claimed for this device were: (1) that the amount of rotation which a selector has to make to find a disengaged circuit is reduced, and (2) that the wear on switches reached from slipped banks is more or less uniform over all switches. On the strength of American experience, bank-slipping was introduced into nearly all the earlier exchanges in this country. But later the method of trunking known as "grading" was developed. In this the basic idea is the allocation of certain switches as the first choices of one group of switches of the preceding rank, and of others as later choices from several groups. Grading has developed in other countries, notably in Germany; in this country Messrs. Siemens Brothers have been its chief exponents. Grading in any form cannot be used with advantage in exchanges where the selector banks are slipped, and it is now believed that the advantages of slipped banks is not so great as was originally thought. The turning-point was the trial of a scheme of interconnecting at Leeds, which led to the adoption of straight banks for all future equipments; grading then being made the basis of future trunking schemes.

In the next section of the paper the possibilities of grading are discussed in considerable detail and diagrams illustrating traffic capacity under different conditions are presented. Amongst the chief conclusions are that the best effect is only obtained if, first the grading is "smooth," and second, the number of groups is so chosen that the number of outlets does not exceed half the maximum possible number.

The author next describes the method of obtaining the design curves, used by the Post Office for Pure Chance Tariff. Theoretical treatment is difficult owing to lack of uniformity in groups which reach different switches. On the other hand, to make sufficient tests to produce sufficient design curves is impracticable. A combination of these methods was, therefore, used. An approximation to Erlang's somewha

(*Concluded on page* 672).

* Abstract of a paper read before the Institution of Electrical Engineers.

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TELEPHONE TESTING APPARATUS.

Necessity for Checking Speed of Subscribers' Automatic Calling Dial—Description of a New Device.

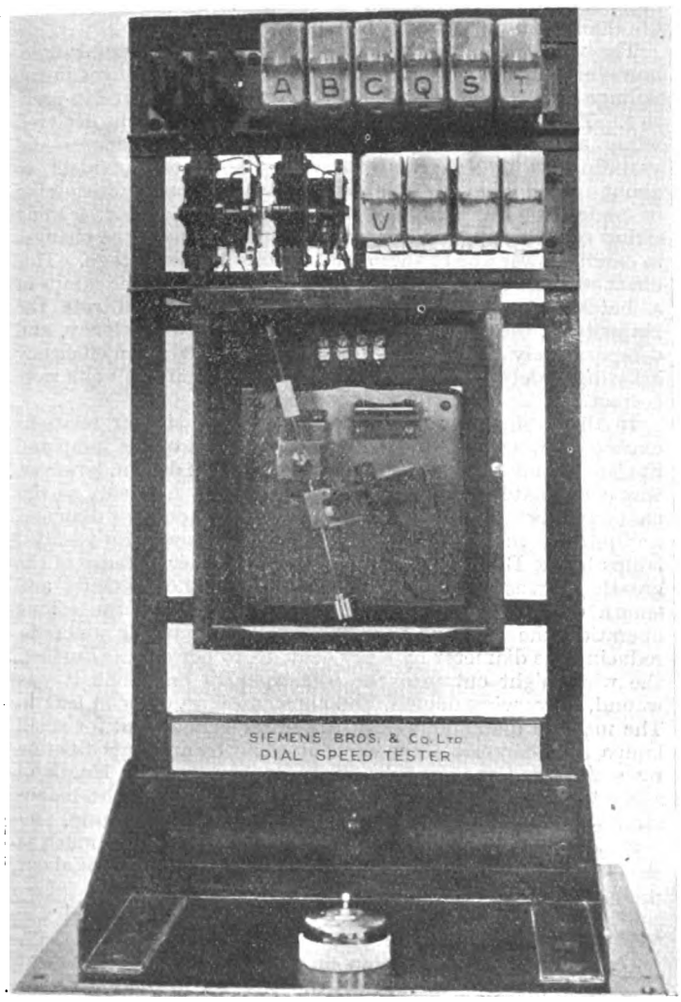

Fig. 1.—View showing one of the speed test equipments of Siemens Bros. and Co.

IN the development of automatic telephone exchange apparatus, the correct functioning of which is largely dependent upon the impulses received from the subscriber's station, it became apparent that some ready method would be desirable for testing the speed of the subscriber's dial. With this object in view, Siemens Brothers and Co. have designed a testing device which is capable of indicating the exact speed of a subscriber's dial. The general principles of the apparatus are described below.

The apparatus consists fundamentally of a pendulum and two preselectors. The principle underlying the operation is that the pendulum measures off a definite time period and the number of impulses received from the dial during that period is a measure of the speed of the dial. The pendulum is normally in a latched position and is released by the first impulse received from the dial. As it is released it receives a slight kick from the armature of the releasing magnet in order to ensure that it returns again to its latched condition.

To obtain a maximum accuracy of timing, advantage is taken of the fact that an impulse consists of two parts—the break of the circuit and the succeeding closure of the circuit. This is done by using two preselectors—one stepping forward at the break, and the other at the make of each impulse.

The two preselectors thus commence stepping forward with the first dial impulse at the same time as the pendulum is unlatched. During the swing of the pendulum the preselectors step alternately via relay contacts controlling the circuit and when the pendulum restores to its latched position, the driving circuit of the preselectors is cut, thus preventing any further impulses from the dial from affecting them. The banks contacts of the preselectors are connected to a group of lamps and the lamp corresponding to the contacts on which the preselector wipers are standing, lights at the termination of the impulses. Each lamp is marked with the dial speed which causes it to light, so that direct reading of the dial speed is given.

To restore the apparatus for further use, a reset key is used which de-energises the relays and allows impulses from either a relay interrupter or a motor interrupter to return the preselectors to their normal positions.

Provision is made for testing the dial on the instrument at the subscriber's premises by connecting the line under test, via the test desk, to the dial speed tester. A circuit can also be taken into use from the bench used for repairing

(*Concluded on page* 672.)

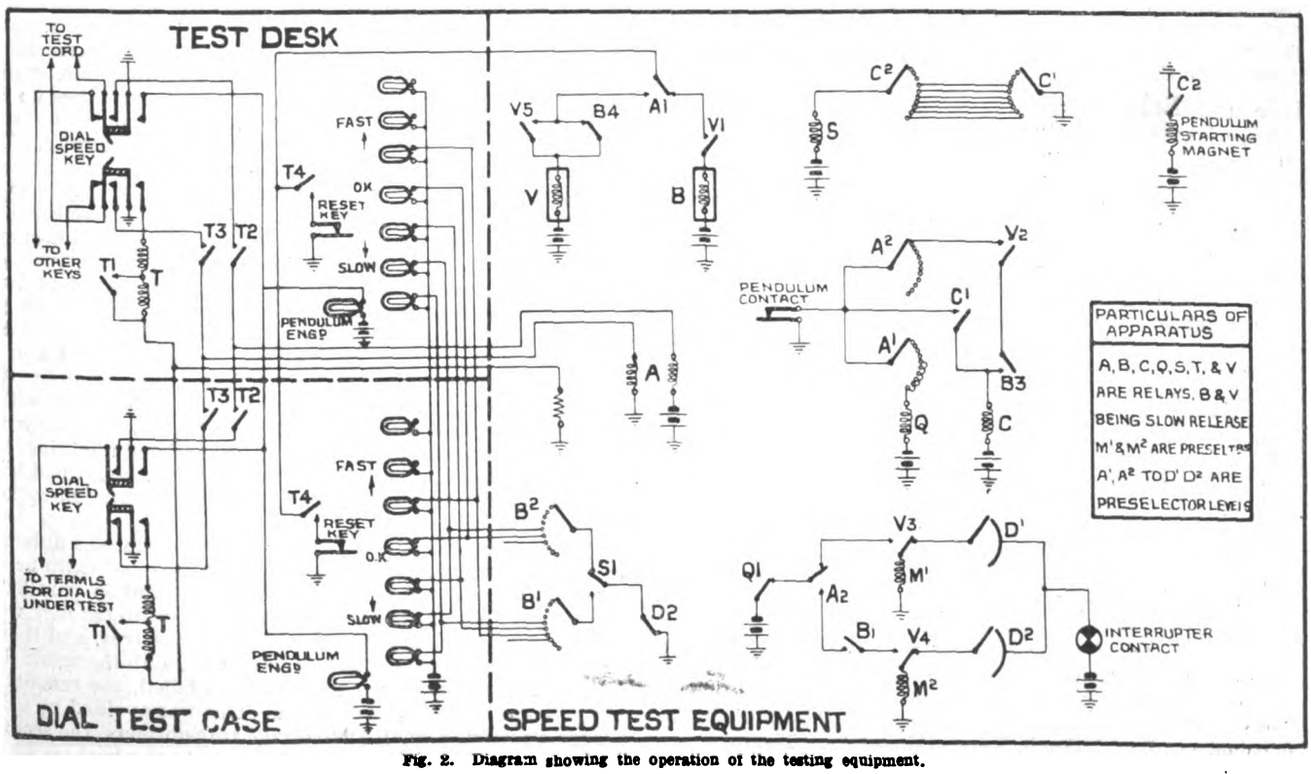

Fig. 2. Diagram showing the operation of the testing equipment.

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ELECTRIC LAMPS.

Their Characteristics and Methods of Testing Them—The Inter-relation of Temperatures and Filament Length and Diameter.

A PAPER on "The Characteristics of Electric Lamps in Relation to their Testing" was read at a recent meeting of the Institution of Engineering Inspection by Mr. B. P. Dudding and Mr. G. T. Winch, of the Research Laboratories of the G.E.C. The paper also considered the causes which resulted in variations in the operating efficiency of lamps of the same nominal rating, so that a more definite idea might be obtained of the magnitude of the physical variations in lamp manufacture which had made necessary the tolerances of the present-day lamp specifications.

Tungsten Filaments.

Discussing the lamp-making characteristics of tungsten filaments, the authors considered first the relations connecting the operating voltage and efficiency, size of filament and life of lamps. The temperature of tungsten filaments could be measured in terms of watts per candle, if the design of the lamps compared were closely similar, and the authors used watts per mean spherical candle instead of temperature. Data connecting temperature, size and life of filaments had been obtained as the result of comprehensive tests on many hundreds of lamps, which showed that the lives of vacuum lamps varied approximately as the seventh to eighth power of the watts per candle, whilst those of gasfilled lamps varied as the sixth to seventh power of the watts per candle. The life of a lamp was proportional to the diameter of the filament; hence, fine filaments could not be run as hot as stouter filaments if the same life were required. When large numbers of lamps were all burnt to failure, the incidence of failure followed consistently definite laws. The presence of comparatively early failures was not due to ordinary defective lamps. The lamp that failed at one-third average life had none of the signs connected with a defect in one or more of the manufacturing processes. Further, if lamps were made having defects purposely introduced, the average life might be reduced very considerably, but yet it was found that the same relation existed between the times of failure of various lamps of this defective batch. It was highly probable that this regularity in the incidence of failure was connected with extremely slight differences in diameter or state of the surface, or nature of the ultimate crystal of which the filament was made which led to local places of high temperature in the filament and consequent failure at this point, the time of failure depending on the intensity of the high temperature spot. With regard to the relations connecting the dimensions of filaments and operating characteristics, the most important point was that if the temperature of operation of the filament were fixed, then fixing the watts and volts determined both the length and diameter of the filament.

Life and Efficiency.

Experience had led, by general consent, to the adoption of an average life to burn out of 1 000 hrs. as a lamp life suitable for all ordinary purposes of illumination. If a lamp were required to give an average life of 1 000 hrs., the operating efficiency depended on the diameter of the filament to be used. Also, the fixing of the volts and watts determined the length and diameter of the filament when the temperature was fixed. Hence these three conditions, volts, watts and life, fixed definitely the diameter and length of the filament. Obviously, it would be uneconomic to attempt to make all lamps of the same nominal rating of exactly the same size of wire, owing to the wear of the diamond die through which the tungsten was drawn. Therefore, sizes differing from the ideal must be utilised. It was impracticable to measure the mean diameter of every filament, and hence some tolerance in the operating watts per candle was necessary.

As to the magnitude of the changes involved, the filament of a high-volt 40 W lamp was about 0·025 mm. diameter. A 1 per cent. variation was therefore equivalent to a change of 0·00025 mm., or about one hundred thousandth of an inch. It was not surprising, therefore, that deviations amounting to possibly 4 per cent. in diameter occurred. The British Engineering Standard Specification for vacuum lamps No. 161, allowed for a tolerance of about ± 6 per cent. in watts per candle, ± 10 per cent. in watts, and ± 12½ per cent. in candles. These tolerances appeared to be large, but they allowed for extremely small variation in filament diameter. The tolerance of 6 per cent. in watts per candle meant that a certain proportion of the lamps would give, on the average, a shorter life than the normal, and others a longer life.

The variation allowed in the operating watts per candle, however, was not so large as variations due to changes in the voltage applied to the lamps that frequently occurred in practice. The variation of voltage by 4 per cent. from the declared value allowed to supply authorities by the Statute—and variations often exceeded these limits—was equivalent to about 10 per cent. in watts per candle. Serious over-running or under-running of lamps might, therefore, occur, leading either to short or long life, with corresponding large changes in candle power due to these fluctuations in line voltage. This effect was the more serious in that it affected all the lamps of a batch, whereas the lamp manufacturer could rate the majority of the lamps closely to the designed efficiency, and comparatively few of the lamps would operate at an efficiency differing widely from the designed efficiency if the volts were correct.

In the design of gasfilled lamps exactly similar relations existed between the electrical characteristics of the lamp and the length and diameter of the filament. The design, however, was complicated by the helical form of the filament, as the characteristics of the lamp also depended on the diameter and pitch of the helix. The rating limits allowed for gasfilled lamps in the B.E.S.A. specification were wider because of the greatly increased difficulty of controlling the diameter and length of wire in the helical filament. During the coiling operation the filament wire stretched by varying amounts reducing the diameter by 6 per cent. to 10 per cent. Further the wire might cut into the iron mandril on which it was wound, to varying depths, and thus cause an error in length. The mandril diameter was of the order of 0·2 mm. for small lamps, and therefore, if the wire cut into it by amounts differing by several ten-thousandths of an inch, errors in length of several per cent. might arise. In this case also the manufactured lamps tended to cluster round the ideal lamp, and comparatively few lamps differed from the ideal by as much as ± 6 per cent. in efficiency, corresponding to an error of about ± 2½ per cent. in voltage.

Life Testing at Wembley.

The life-testing installation at the G.E.C. Laboratories at Wembley was then discussed. In this, the primaries of the transformers which fed the life test racks were supplied from two 50 kVA, 415 V motor generator sets. The fields of these sets were controlled by a Tirril regulator which maintained the life test supply voltage constant to ± ¼ per cent. under all load fluctuations. There were also two 150 V d.c. machines, each of 2½ kW capacity, which supplied a three-wire system to the life test switchboards in order to give facilities for life testing on d.c. The life test racks were arranged in bays, each bay being supplied by one 10 kVA transformer. The secondaries of these transformers were wired to switchboards arranged with suitable taper sockets so that any voltage between 0 and 330 V in steps of 2 V might be connected to any of the strings of 10 lamps by means of taper plugs and flexible leads. If it were required to burn lamps at voltages between the two volt tappings, accommodation had been made for inserting resistance to control the volts across the whole string, and a socket to enable the volts across a string to be measured. This system was adopted for all normal house-lighting types and high wattage lamps, and by this means the voltage on a lamp could be kept constant within ± ¼ per cent. of the required voltage. In order to allow the same accuracy to be attained in the case of train lighting, bus lamps, etc., which operated on 12 to 50 V circuits, it had been found advisable to insert separate resistances and volt sockets in each lamp circuit.

Motor car headlights and similar lamps presented a different problem. These lamps had very low voltages and extra heavy currents, and trouble arose if they were burnt in parallel in the normal way, due to the fact that the leads to the rack were comparable in resistance to the lamps themselves, and therefore, acted as a series regulating resistance, with the result that if one lamp of a set burning in parallel failed, the remainder of the lamps were badly over-run. This was avoided by using a large number of small low-voltage transformers, the secondary windings of which were soldered on to the busbars which

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formed the holders for the lamps. The primary of these transformers was supplied from a large transformer tapped in a manner similar to those used on the racks for normal types of lamps. By this arrangement the volts across the lamps could be adjusted by altering the secondary volts of the small transformer, and if finer adjustment were desired a resistance was provided in the primary circuit. In this way the volts across the lamps were critically controlled to within about 0·02V.

For rating tests, a number of lamps were selected from the bulk of a consignment, and were measured at their marked volts for current consumption and candle power, the results of the tests being plotted on a target diagram, which showed pictorially how the lamps fell about the designed efficiency. For the life tests a small proportion of the consignment were chosen and set up on the life test racks to operate at the designed or specified efficiency. At different periods during the life the lamps were removed from the racks and again measured for candle power and current consumption.

Discussion.

Dr. Paterson pointed out that a lamp was exceedingly exacting upon all the instruments and apparatus used to test it, and he always felt that the lamp was a severe tester of those electrical instruments. Unless the voltage measurements were exceedingly accurate, one was liable to be led astray as to the results of the tests. The life of a lamp would vary 15 per cent. with a 1 per cent. variation in the voltage on the terminals. If a supply authority reduced the volts by. 1 per cent. below the rated value of the lamp, the life was prolonged 15 per cent., and if the voltage were increased by 1 per cent., the life of the lamp was shortened by 15 per cent. The Board of Trade imposed a limit of 4 per cent. on supply authorities, but if there were a variation of 4 per cent. up or down, the lives of the lamps on that circuit would be halved or doubled. There were rumours that certain people were advocating a wider variation than 4 per cent., but he hoped that that would be opposed by anyone who knew anything about electric lamps and their characteristics, because a variation of 6 or 8 per cent. plus or minus in the voltage would make a huge difference in the life of lamps.

Mr. F. P. Sexton said he was one of the pioneers in lamp testing, having been connected with a company formed in 1899 for the purpose of testing lamps put on the market, and supplying the public with lamps which were guaranteed to be within 10 per cent. of their stated candle power. One of the first difficulties was to get supplies from the makers, and he believed that in the first instance the Robertson Lamp Co. had agreed to supply his company with lamps, and to take back those which were not within 10 per cent. Other manufacturers did the same, and he believed that in the early days sometimes as many as 95 per cent. were returned as high voltage lamps. He believed that a great many of the foreign lamps at present did not come anywhere near the specifications, either as regards efficiency or life. Even when the metal filament lamps were first used, the British were very good, but the best of all were the American lamps.

Mr. Foyster agreed with Dr. Paterson that the Board of Trade voltage limit should not be extended. Even with a 4 per cent. variation in voltage, the candle power of a lamp might be reduced by 28 per cent., though both the supply authority and the lamp manufacturers might be within their proper limits. If, for instance, the voltage on one side of a street were 4 per cent. below the declared voltage, and the voltage on the other side were 4 per cent. above, there might be a difference in the candle power of the lamps on either side of the street amounting to 56 per cent., a difference which could quite easily be seen by the naked eye.

Mr. W. B. Clarke said that target diagrams, life tests, and so on, were all necessary to enable a lamp manufacturer to keep the quality of his products within certain limits, but what on earth was the good of them when the supply authority could vary its voltage to the extent of 4 per cent. up or down ?

Mr. R. P. Wilson, referring to the statement that a 1 per cent. variation in voltage reduced the life of a lamp by 12 or 15 per cent., asked what would happen to a tungsten or gasfilled lamp if the variation were 6 or 7 per cent. He gathered that the filament would cease to exist. He remembered one case in which the variation was wider even than 7 per cent., but the lamps on the circuit did not go off instantly. Therefore, he considered that the view expressed by the authors was rather pessimistic. A reduction of voltage by 4 per cent. did not cause very much harm to anybody, though a rise of 4 per cent. did, but the advantage of the variation to the supply authority was very considerable, and the difficulty if the limit were reduced below 4 per cent. would be very serious. The Board of Trade limit was 2½ per cent. at one time, and it was because of the difficulty of keeping within that limit that the Board of Trade had been induced to increase it to 4 per cent.

Mr. Dudding said that one should not be surprised to find large variations in the early carbon lamps, bearing in mind the fact that they were constructed from fibres of various sorts, which had to be carbonised. The accuracy which the early manufacturers did attain was extraordinary, and must have called for tremendous ingenuity on their part. With regard to voltage variation, he disagreed with Mr. Wilson's remark that a decrease in voltage did not matter. If voltage were decreased, candle power was decreased. A drop of 4 V on cooking apparatus designed for fixed voltage might be sufficient to make cooking impossible. The 4 per cent. variation allowed by the Board of Trade represented just about as much as could be allowed, and if smaller limits were not justified owing to the extra capital expenditure involved in keeping within those limits, the information contained in the paper at least justified sticking to the present limit of 4 per cent.

Replying to Mr. Wilson as to the effect of a variation in voltage of 7 per cent., he said that tungsten followed definite laws, and one could actually double the volts on a low voltage lamp. The life, however, would be extremely short. An increase of 15 per cent. in voltage on a 1 000-hour lamp would reduce the life to 200 hours, or thereabouts.

CORRESPONDENCE.

DR. ECCLES AND THE ELECTRICITY BILL.

[To the Editor.]

Sir,—I would ask your permission as a reader of The Electrician to reply to some of the points raised by Mr. Rich in his letter of November 22nd, published in your columns of December 3rd.

First of all, if he will refer to the "Financial Times" of November 23rd, he will find a table giving the output of electricity in fourteen countries with the sources of special information appended. Those statistics are a very substantial confirmation of the figures quoted by Dr. Eccles in his presidential address.

I would also take exception to his statement that 50 per cent. of the total output of electricity in Germany is supplied from brown-coal stations. As far as my information goes, the total capacity of the generating plant installed in brown-coal stations in 1924 represented about 34 per cent. of the total capacity of all the generating plant in Germany. Even assuming that the load factor on brown-coal stations is higher than on hard-coal stations, the highest possible estimate would give about 40 per cent. as due to the former. Mr. Rich would lead us to understand that brown coal, "a wet, low-grade, bulky fuel, is burned under boilers on the spot." He says nothing about the fairly elaborate preparations that have to be made to permit of combustion of brown coal, and these add markedly to the fuel-costs in the power station.

With reference to the German output per head of population (Dr. Eccles in his address adhered consistently to output and not to consumption comparisons), a recent figure published, by the "Zentralverband der deutschen elektrotechnischen Industrie" gives the total output in 1925 at 13 000 million kWh or 208 kWh per head of population, a higher figure than the British.

If Mr. Rich had taken the trouble to analyse the last annual report of the Electrowerke Co., he would have seen that only one station of the three at its disposal, the Lauta station, comes under the heading of an electro-metallurgical supply station, and less than 50 per cent. of its total capacity is devoted to public supply. The Töging station in Bavaria has a total installed capacity of 106 000 kW, and the annual report of the Innwerk Co. gives its output for 1925 at 300,000 000 kWh. Your correspondent gives 465 000 000 kWh.

It is difficult in the matter of statistics to be absolutely infallible, but, judging from the tone of Mr. Rich's letter, Jupiter himself could not be more infallible than your correspondent.—I am, etc.,

Hugh Quigley.

London.
December 3rd.

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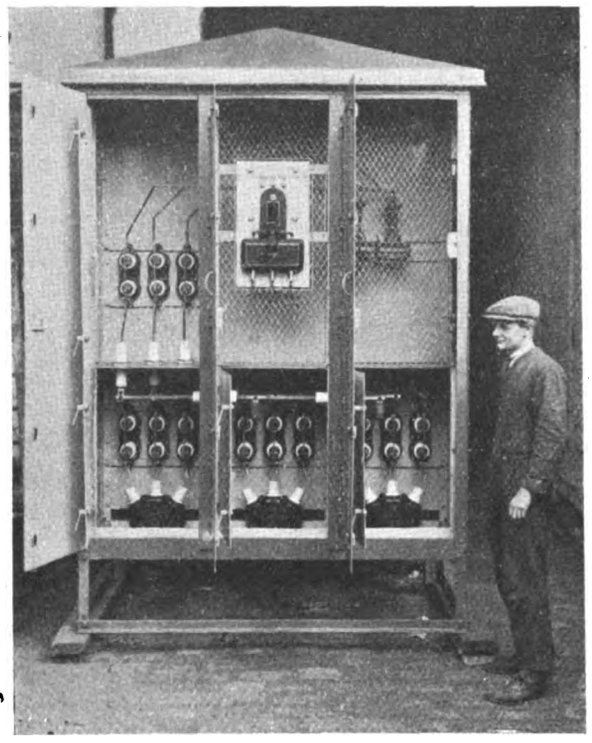
OUTDOOR SUB-STATIONS.

Some Interesting Points in a Recent Installation of Kiosks.

IN view of the increasing use of steel kiosks as static transformer sub-stations, the following description of a recent installation will no doubt be of interest. The illustration shows one of two kiosks designed and made by Long and Crawford, for the Burnley Corporation Electricity Department; one of the objections expressed by some engineers is that some kiosks have the appearance of a "hen house." The present design aims to remove this "stigma" and at the same time not to prejudice other considerations of efficient layout and construction. The kiosks are built of a substantial angle and tee iron framework surrounded by heavy sheet steel plates. The structure is surmounted by a welded steel roof with a beading fixed at the lower extremity of the turned down edge. There is a gap all round the kiosk underneath the eaves to provide ample ventilation and which is suitably baffled to prevent the ingress of rain or



View of new design of kiosk sub-station.

snow. The root or under-framing which is concreted into the ground is detachable. This enables the root to be grouted in on site and the concrete allowed to set before the body of the kiosk is bolted on. The interior of the structure is divided into three main compartments for e.h.t. and l.t. switchgear and power transformer respectively. The e.h.t. switchgear portion is again sub-divided into smaller or sub-compartments. The three lower sub-compartments contain the isolating links and busbars for the ring main and radial or tee feeder to same, and are capable of being locked up to prevent unauthorised access. The other sub-compartments contain the transformer isolating links, oil switch and current transformers respectively. The transformer chamber which is large enough to accommodate a 200 kVA transformer, is in the centre of the kiosk, with a door at each side. The floor of this chamber consists of thick sheet steel strengthened with girders and provided with guide rails for the transformer rollers, same being adjustable for a smaller size. The l.t. switchgear consists of slate panels carrying a triple pole knife switch and an ammeter in each phase for controlling the mains from the power transformer. Four outgoing circuits are also provided, each controlled by a fuse in each phase and a link on the neutral wire. Each of the three main compartments is lighted by a lamp supplied from the l.t. side of the transformer through a switch and fuses. The connections between compartments are made with bare copper passing through porcelain bushes. Ample space is allowed in each compartment for the apparatus to be accommodated.

Telephone Testing Apparatus. Pendulum Mechanism Details.

(*Concluded from page* 669.)

dials, and a group of lamps is provided there in order that the speed of the repaired dial may be tested without assistance from the test clerk. As a means of indicating when the tester is in service, a pendulum engaged lamp glows, but to definitely prevent interference with the set during use, a lock out relay (T) is incorporated in the apparatus at the test desk and at the dial test case. Fig. 2 shows a simplified schematic from which the circuit operation can easily be traced. Fig. 1 shows one of the speed test equipments which includes relays, preselectors and pendulum. Fig. 3 is an enlarged view of the pendulum mechanism showing the details quite clearly.

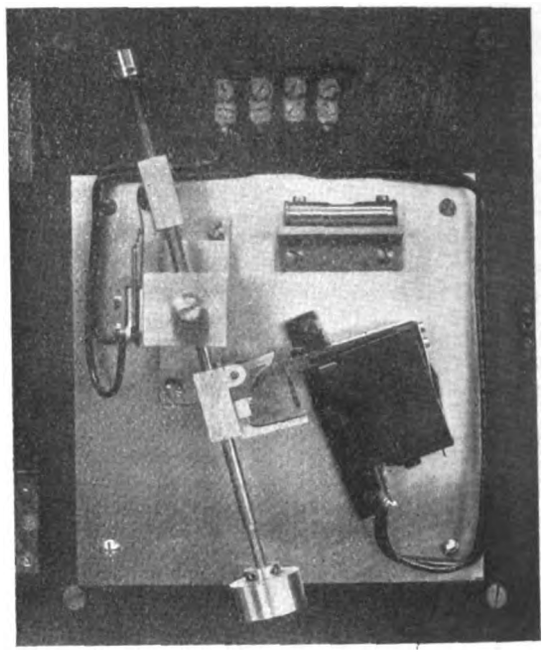


Fig. 3.—Enlarged view of the pendulum mechanism.

We understand that these testers have been in use for some years and have given very satisfactory results. Among other places where they have been installed the testing equipment in exchanges supplied to the British Post Office at Grimsby (1918), Stockport (1919), Southampton (1923), Swansea (1924), Kirkcaldy (1925) and Edinburgh (1926) may be mentioned.

The Trunking Problem.

(*Concluded from page* 668.)

involved formulæ proved to give useful results. Grading does not conform with the conditions laid down in Erlang's theory; but the author thinks it reasonable to expect that a grading curve will have the same general characteristics as an interconnecting curve. It was found that the traffic capacity obtained by grading was considerably less than that obtained theoretically by Erlang's scheme of interconnecting; but a new design curve was evolved which gave satisfactory agreement.

Measurement of Traffic.

In the final section of the paper the author deals with such matters as Variations in Traffic Distribution and the "smoothing effect" between first and second selectors. The measurement of traffic is aided by three classes of records: (*a*) congestion or last-contact meters, (*b*) overflow meters, and (*c*) analysis meters. In the Post Office recording ammeters were regarded in the first place as the most suitable means of traffic recording. However, they proved to have great drawbacks, such as the bulkiness of records and the tediousness of their analysis. Again, recording ammeters do not lend themselves to the study of distribution of traffic on an extensive scale. Nevertheless, recording ammeters appear to be used with good results in Amsterdam, where the study of traffic has been brought to a fine art.

The paper is concluded by a useful bibliography.

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INSTITUTION OF ELECTRICAL ENGINEERS.

Portraits of Faraday and Kelvin Presented—Mr. Sydney Evershed on their Characteristics—Discussion on Telephone Trunking—Importance of Call Duration.

DR. W. H. ECCLES, F.R.S., presided at the meeting of the Institution of Electrical Engineers on Thursday, December 2nd, when Mr. G. F. O'dell read a paper on "An Outline of the Trunking Aspect of Automatic Telephones."

Before calling on the author to read his paper, however, the President referred to portraits of Faraday and Thomson which had been hung in the lecture theatre. Both portraits had been painted by Mr. G. Harcourt, R.A., and whilst the one of Faraday had been presented by Mr. Sydney Evershed, that of Kelvin had been paid for by the Institution.

Mr. Sydney Evershed, in presenting the portrait of Faraday, asked permission to take up a few moments in saying something of both Faraday and Kelvin, not so much from the point of view of what they had done as of what they were. Both were geniuses, but it would be difficult to find two such men who came from such different homes. In Kelvin there was a strain of heredity. His father was a clever man and a notable man in the academic world. Faraday's father was a blacksmith. Whilst Kelvin's genius was disciplined by a long course of academic study, Faraday's genius was left to develop by itself. Kelvin took to mathematics as a duck took to water, but Faraday had no mathematics. Very possibly to a mind like his the rigidity of mathematics would have been a hindrance. Then Kelvin was a great inventor and spent his life translating scientific principles into practice. Faraday, on the other hand, did not seem to have an inventive turn of mind. He was a seer, a discoverer. But in spite of these differences, in certain essentials Faraday and Kelvin were alike. They both had imagination as well as an ardent spirit of enquiry. Both also had a singular openness of mind, although there was no trace of the know-all about either of them. If they did not understand nature's way they said so in all simplicity, and instances were on record which bore this out in a marked degree. Those who were accustomed to experimental research well knew how they had struggled with what seemed like a deliberate perversity in nature. But nothing of that kind ever happened to Faraday. He never seemed to lose his way.

A cordial vote of thanks was passed to Mr. Evershed.

Mr. O'dell then read his paper, an abstract of which will be found on p. 668 of this issue. An account of the discussion is given below.

Discussion.

Mr. W. H. Grinstead said that what had struck him most in the paper was the importance now attaching to the duration of the call. Conditions in automatic exchanges were very different from those in manual exchanges in that respect, because the basis of the whole design was the traffic unit. Whilst this embraced the number of calls and their duration, it was obvious that more had to be done, in preparing statistics to emphasise the importance which the duration of the call now possessed. In view of this importance, the traffic metering arrangements described in the paper were a little disappointing, because the duration was apparently the only thing that was not metered. Grading was an unnecessary refinement. There seemed to be an idea that if only the traffic were mixed up enough, it was possible to eliminate some of the fluctuations. He believed that was a fallacy. Traffic varied according to the day of the week and also according to the season of the year, and it was therefore necessary when starting out to design an exchange to choose the basis figure carefully, as it had some bearing on the provision of the plant.

Dr. Turney said that an important question concerned the determination of loss in grading cable. So far as he knew there were only three methods, the first being to build an exchange and put on traffic meters to see what the loss was; the second was a mathematical one which was very involved, and the third was the use of artificial traffic. Each of these methods had their disadvantages, and the disadvantage of the third one was that a telephone exchange was so complicated that a scheme of artificial traffic must be nearly as complicated as the telephone exchange itself. Therefore, he had been wondering whether anything had been done by purely graphical means by taking a series of observations of the simultaneous calls every day throughout the busy hour. It would then be possible by graphical means to arrive at a determination of the loss in a graded cable.

Mr. A. J. Chanter asked the author to give the methods by which he had arrived at some of the curves in the Paper, particularly those in the section relating to grading, because although it was stated that numerous tests had been made on artificial traffic, it was not stated how this was done. He could not go so far as the previous speaker in saying that artificial traffic experiments were useless, although they necessarily had their limitations.

Maximum Number of Calls the Criterion.

Mr. W. J. Thorowgood said it must be remembered that automatic telephony would be judged not by the results obtained at normal times, but by what it would do when the traffic was a maximum. He therefore deprecated the efforts that designers of the apparatus were making to curtail the number of channels through which a call could be taken from one subscriber to another. Designers must cater not for the average number of calls, but for the maximum number, if automatic telephony was to be made a complete success and useful to the community, especially to railway companies.

Mr. J. Mason, speaking with regard to the statement in the Paper that the percentage of calls lost due to shortage of switching plant was very much smaller than the percentage lost due to the required subscriber being engaged, asked if the author could state the percentage of calls in P.O. automatic exchanges which were lost through the required subscriber being engaged or not answering the call, or to the call being abandoned by the calling subscriber, or to the calling subscriber getting the wrong number. Did these differ greatly from the results with manual exchanges? The author had stated that it had been the experience of the Post Office that individual circuits should be tested first and commons last, but that in Germany this did not seem to be the case. Could the author give any reason for this? Referring to the diagram illustrating the principle of grading, he pointed out that certain switches carried the bulk of the normal traffic, whilst the others only came into use occasionally. It was common knowledge, however, that faults were more likely to occur on switches that are only brought into use occasionally on account of dirty contacts, etc., and it would be interesting to know if the Post Office proposed systematically to change the position of the switches on the shelves in order to overcome these difficulties.

Mr. O'dell, in reply, said that the importance of the duration of the call could not be too much emphasised. He did not agree with Mr. Grinstead that it was impossible to measure duration as the methods of metering described enabled an estimate to be made both of the total traffic that was carried by grading and of the amount which was being lost. Again, there was the automatic method of metering traffic which had been developed by the Post Office. The revenue came from calls, and if one exchange had a large number of short calls and another a small number of long calls, the switching plant required would be the same, but the accounts would be different. The conditions at Waterloo were very different from those in a public exchange. Grading work must be carried out on artificial traffic as in an actual operating exchange subscribers calls had to be relied on.

"Bilux" Lamps.

OUR attention has been called to a new double filament lamp, which is especially intended for use on motor cars. This, it is claimed, fulfils the three necessary conditions of providing a long range illumination, a lateral illumination for the negotiation of curves and passing other vehicles, and absence of glare. One of the filaments is placed at the focus of a mirror and provides the main illumination. The other, which is placed rather farther forward and above the focal axis, is provided with a screen. This screen cuts off the portion of the light from the second filament, which is directed downward, so that only the upper part of the mirror is illuminated, whence light is reflected downwards in front of the car. The main lighting system is intended for use on high speeds and has a range of 200 to 300 yds. The "glareless" device enables the whole width of the roadway to be illuminated. The lamp is supplied by Neron Lamps, Ltd.

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Paris Suburban Electrification

(*Concluded from page* 666.)

required to work trips and other sub-station auxiliaries. In some cases station lighting is handled from the three-phase mains.

Apart from the high overload capacity and the high efficiency of the mercury vapour rectifier there is the advantage that it will work on 25 or 50 periods, as there is a probability that before long 50 periods will be used for the traction supply and not 25. This plant is fitted with the Brown-Boveri

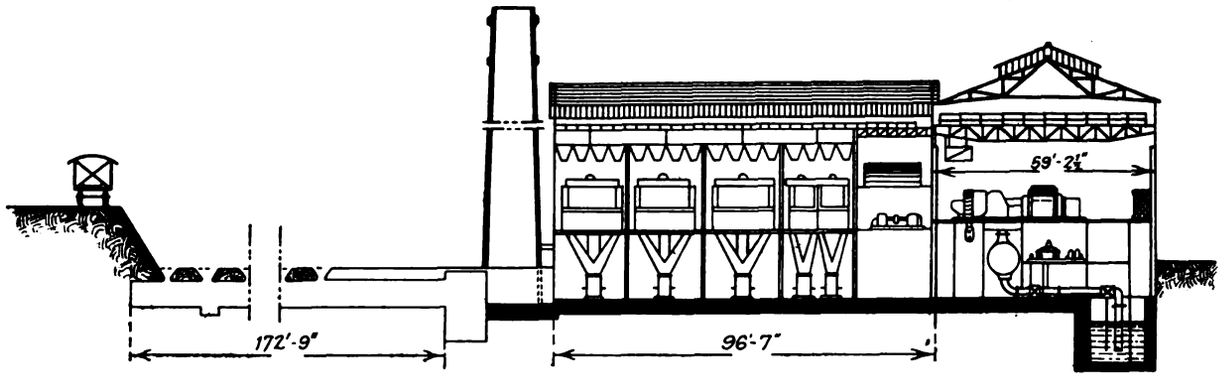


Fig. 9.—Elevation of the Southern Station.

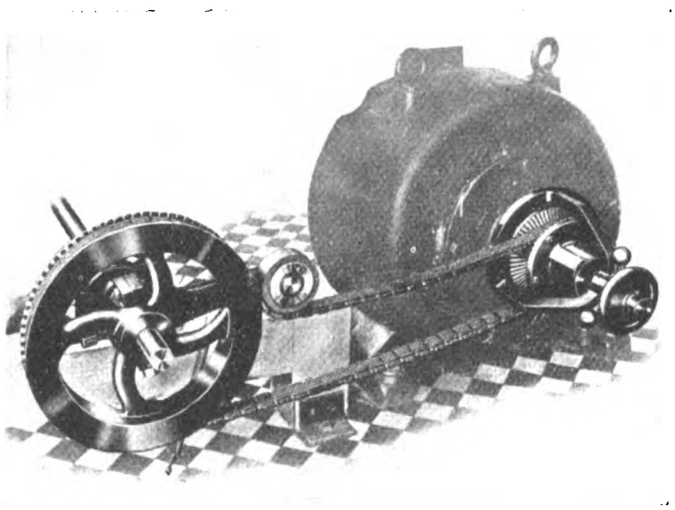
Fig. 6 shows the interior of the sub-station at Meudon which supplies power for the operation of the heavy grade section through the Meudon tunnel. It is fitted with three 1 000 kW Brown-Boveri rotary converters and a Brown-Boveri mercury vapour converter of the same nominal capacity. patent mercury seal and vacuum pump; there are two cylinders, each with six electrodes supplied with six-phase current. The plant can be operated in parallel with the rotary converters; it has proved to be very useful in practice, especially during the rush hours.

POSITIVE DRIVE INFINITELY VARIABLE GEAR.

A New British Invention of Great Value for Use with the Alternating Current Motor.

THERE has now been solved a long outstanding problem in the mechanical transmission of power, that is a positive drive infinitely variable gear. The new invention, which is British throughout and patented in over forty different countries, is known as the "P.I.V." (Positive Infinitely Variable) and has been placed on the market after two years' running and testing by the P.I.V. Gear Syndicate, Ltd.

With this gear it is claimed that it is now possible to alter within the range of the gear supplied the speed ratio to an infinite degree, between a driving and a driven shaft, smoothly and instantly with positive transmission, by the operation of a single handle or lever. The value of this achievement will be evident by comparing it with the ordinary complicated, expensive, and unsatisfactory positive gear box as on a motor car, which only allows a few definite speeds, while, of course, any device depending on a belt and cone pulleys is non-positive, that is the belt slips, just as the step pulleys of a lathe are both non-positive and finitely variable.



View of the P.I.V. Gear

The essential principle of the "P.I.V." gear consists in the use of a driving chain of special construction running between two split pulleys of the opposed conical disc type, one set on each shaft, sloping down at an angle of 30 degrees to the shaft on the inner faces. These latter contain alternate ribs and grooves radiating to the centre, which are broader at the periphery and narrower at the hub, while also the two halves are "staggered" in the sense that a rib is always opposite a groove. The chain is engaged at the edges by these ribs, which act as teeth, so that the drive is positive in the same way as the sprocket wheel with roller chain in which a link surrounds a tooth.

The "P.I.V." chain consists of composite links formed of parallel plates with a longitudinal slot punched through containing a sleeve or casing open at each side, in which is a pack of small vertical thin steel plates or slats which are, however, loose in the sense that they can each move in a direction at right angles to the travel of the chain. These slats project in turn from each side into the grooves between the ribs, and in running, as a link enters the "V" of the pulleys, the ribs or teeth of one pulley push the requisite number of slats across into the space on the opposite pulley face so that the chain must always engage with the pulley face. Also, to ensure continuous and easy running, it should be stated the driving edges of the wheel teeth are not at right angles to the wheel faces, but are inclined at an angle.

In order to alter the speed of the driven shaft, all that is necessary is to slide the halves of each of the split pulleys along a very slight extent, using a common lever or handle. On one shaft the two halves are brought closer together, and the chain, being, of course, always the same width across the slats, therefore rises automatically in the grooves, giving the same effect as a driving pulley of a larger diameter, while the other split pulley, on being correspondingly widened out, causes the chain to fall deeper in the grooves, the speed alteration within the limit of the gear supplied being infinite, while perfectly smooth and noiseless in action. The enclosed box at short centres has the lower part of the pulleys dipping in oil, and is quite impervious to heat, dust, gases, steam, or other deleterious influences, and for a.c. motors a special modification is available. In this case an expanding split pulley is mounted on the motor shaft and the special chain is arranged to operate with a larger non-expanding pulley on the driven shaft. On these lines, for example, a motor running at 1 000 revolutions per minute can be arranged to give direct an infinite number of speed variations to the driven shaft between the ranges of 250–500 revs. per min.

As typical of the conditions for the ordinary totally enclosed gear box, the smallest standard "P.I.V." model is rated up to 5 H.P., which, with a driving shaft speed of 750 revs. per min., allows of an infinite range of speed being given to the driving shaft within the range of 300 and 1 800 revs. per min. In N.P.L. tests the 5 H.P. gear has shown a transmission efficiency of 91 per cent. at 375 revs. (1:2) as compared with the driving shaft and 87 per cent. at 1 500 revs. (2:1), while at even speeds of 750 revs. (1:1) the figure is 95 per cent.

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NEWS IN BRIEF.

Electric Fires for Aeroplanes—Japan's Electrical Machinery Imports Down in 1925—Proposed Flood-lighting of Liverpool Building.

OF Japan's 3 027 miles of railways 2 104 miles are electrified.

Electric fires are fitted in a new French monoplane which is to attempt a flight to New York.

Gaily coloured gas cookers are being pushed in the U.S.A. in efforts to combat electrical competition.

"Light as an Advertising Medium" was the subject of a lecture by Mr. H. Girdlestone before the Bradford Publicity Club.

Accrington Electricity Committee has made a contribution to the British Electrical and Allied Industries Research Association.

Last Friday the Electrical Trades Commercial Travellers' Association held an enjoyable dance at Victory House, Leicester Square, London.

Electricity is rapidly gaining favour in Clayton-le-Moors. Messrs. Walkden's mill has adopted it for power purposes, and there is every probability that other mills will follow suit.

Special electrical decorations and effects were a feature of the annual whist drive and dance of the staff and friends of the Paisley Corporation Electricity Department at the Town Hall.

In 1924 Japan imported dynamos, electric motors, transformers, converters and armatures valued at 21 million yen, but the following year's total for this group was only 12 million yen.

The huge organ at the Plaza (London) Cinema, which has had to be removed to a soundproof erection on the roof, is linked to the console by 125 miles of electric wire. The contacts are of solid silver.

Electricity consumption continues to increase in Japan, in spite of industrial depression, and, according to the Commercial Secretary at Tokyo, there are indications of an approaching surplus production of power.

Prompt action by the staff quickly subdued a fire at the power switchboard at the Oxford automatic telephone exchange last week. Considerable damage, however, was done to the switchboard and main cables.

It is reported that splendid gallantry was displayed by Telegraphist Sydney Lotter, of the steamer "Valerian." When the ship's wireless was carried away he attempted to erect a jury aerial, but in staying behind he lost his life.

The Indo-European Telegraph Co. announces specially reduced rates for daily letter telegrams. The new rates apply to Irak, India, Burma, Ceylon, Straits Settlements, British North Borneo, Sarawak, Australia, Tasmania and New Zealand.

The first annual luncheon of the Glasgow and West of Scotland Branch of the Electrical Association for Women took place at the Grosvenor Restaurant, Glasgow, last week. Lady Paxton, the wife of Sir Thomas Paxton (ex-Lord Provost), presided, and the company numbered 316.

The Eastern and Associated Telegraph Companies announce that Christmas and New Year greetings may be sent by their cables at reduced rates, on forms which are designed in colour. This special service will be available from December 15th to 30th. The minimum charges are for 10 words or under, and they vary from 7s. 6d. for China and Japan and parts of South America to 2s. 6d. for Egypt and Cyprus.

At the Physical Society's meeting this (Friday) afternoon, Dr. F. Wenner will read a paper on "The Principle Governing the Distribution of Current in a System of Linear Conductors." A paper describing "A Capacitance Bridge of Wide Range, and a New Inductometer" will be read by Mr. Albert Campbell, and a demonstration of "The Behaviour of Bodies with Non-Conducting Surfaces in Electrostatic Fields" will be given by Mr. L. G. Vedy.

At the annual dinner of the West Yorkshire section of the E.P.E.A. at Leeds last Saturday, Ald. D. B. Foster (Leeds) said the Government's Electricity Bill did not go far enough for him. Mr. A. J. Ostler, president of the Association, agreed with Ald. Foster's view of the Bill and Mr. A. L. Lunn (Manchester) and Mr. H. R. Webster (Harrogate Electricity Committee) spoke of the good feeling which existed on the National and District Joint Boards

Aberdeen Cleansing Committee is recommended to instal an electrically-driven refuse disposal plant.

Of a total of 66 vessels propelled on the Diesel-electric system 59 have been ordered during the last five years.

On Tuesday members of the N.A.S.E. heard a lecture on "Cables," illustrated by lantern slides, by Mr. A. I. Tracey.

Col. Lane-Fox (Minister of Mines) was the principal guest at the inaugural dinner of the Institution of Fuel Technology on Tuesday.

According to the U.S. Geological Survey, the total production of electrical energy in the U.S.A. during September was 6 166 591 000 kWh, the biggest total ever recorded for one month.

Spaces are already being allotted to intending exhibitors at the forthcoming Shipping, Engineering and Machinery Exhibition to be held at Olympia, London, from September 8th to 24th, 1927.

In the fifth lecture of the Illumination Design Course at the Scottish Electric Lighting Service Bureau, Glasgow, on Wednesday, Mr. P. J. Spencer was to deal with "Light as a Decorative Medium."

Comparative tests are being undertaken at the National Poultry Institute, Newport, Salop, on the egg-laying capacity of two groups of hens, one housed in electrically lighted roosts and the other kept under normal conditions.

Liverpool Corporation has under construction 250 all-electric houses similar to the demonstration house on St. George's Plateau, and is supplying energy at a fixed price of 5 per cent. per quarter on the assessment, and ½d. per kWh.

Mr. E. Maxwell Fry, the architect, suggests that the front of St. George's Hall, Liverpool, should be flood-lighted at night. He states that six pedestals, originally intended to carry statues could be adapted to house the flood-lighting projectors.

The Home Secretary has issued a warning that electric toy railways designed to work off the ordinary domestic lighting mains may in certain circumstances give serious injury by shock. The use of these railways on bare ground or near earthed metal, he points out, in particular, is dangerous. Most British-made toy electric railways derive their energy from accumulators.

The annual dinner of the Imperial College of Science and Technology, incorporating the Royal College of Science, the Royal School of Mines, and the City and Guilds (Engineering) College, will be held at the Hotel Cecil, London, on December 13th, with Sir Thomas Holland in the chair. Speakers will include Sir Alfred Mond, Mr. Prideaux, Sir John Cadman, and Sir Sefton Brancker.

A whist drive and dance arranged by the staff of Mr. J. Dyson, electrical wholesaler, of Bradford, was held on December 3rd, the company of over 120 people including representatives of various manufacturers and Bradford contractors. Mr. A. J. Johnson, of the Siemens and English Electric Lamp Co., and Mr. W. Butler were the M.C.'s, and the prizes were distributed by Mr. Harry Moss.

With reference to overtime and Sunday payment for shift working staffs at electrical generating stations, the Admiralty notify that absence from duty on ordinary leave (without pay) within the regulation limit of 14 days a year, or on sick or hurt leave during the arranged shift hours, is to be reckoned as time worked for the purpose of determining whether any of the time actually worked during the unit period is payable at overtime rates; any other absence from duty is not to be so reckoned.

An exhibition, organised by the Engineering Society of the College to raise funds in aid of the centenary appeal, was held last Friday and Saturday at University College, London. There were demonstrated apparatus for making visible the sound waves of the human voice, the control of light by selenium cells, experiments by aid of polarised light on the action of cutting tools, the determination of plastic areas in metals under stress, and apparatus for use in connection with the study of vibrations of machinery. Short lectures included one by Dr. J. A. Fleming on "Oscillations, Mechanical and Electrical."

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W.O.B. CAMPAIGN PROGRESS.

Scottish Interest in Demonstration Houses—An Intriguing Story from Birmingham—Interesting School Children at Newcastle.

SO remarkable has been the public interest in W.O.B. demonstration electric houses in Scottish centres that it is only with the greatest difficulty that we can refrain from congratulating the Scots on their appreciation of a free show. But, seriously, the attendance figures really show how the electric house idea is appealing to this proverbially cautious race. Over 20 000 people visited the Edinburgh house; the Paisley house drew nearly 6 000 visitors, and in eight days the Dundee demonstration attracted 1 850 members of the public.

Birmingham Demonstration House, Hall Green. Sold, with two others, on opening day.

Scotland, however, is not alone in showing good results in this particular sphere of campaign activity. Leeds reports the attendance of 3 500 people in seven days, Halifax and Huddersfield had extensive local Press reports of the opening ceremony, and Lincoln's demonstration house is being kept open for a further week, owing to the great interest that is being displayed in it.

It is an intriguing little story that has to be told concerning the opening of the demonstration house at Hall Green, Birmingham, writes an ELECTRICIAN representative. It had been arranged by the circle committee that the official opening should be on a Monday, and this was well advertised. The builder of the house, however, took it upon himself to throw the house open to the public on Sunday afternoon. It had not been open long before a party of visitors came; soon they were pouring in, and by evening between two and three hundred people had visited the house, and had evinced considerable interest in the electrical fittings. But of much more concern to the builder was the fact that before tea-time he had sold the house as it stood—and two more along with it! Altogether he must have spent a very pleasant Sunday afternoon.

Direct Orders.

During the subsequent period the house attracted a large number of visitors, and contractors reported the receipt of orders as a direct result. This had also been reported in connection with the other Birmingham houses.

Two houses are being opened in Nottingham—at 58, Rolleston Drive, Lenton Sands, and 97, Gordon Road, West Bridgford. The houses are being well advertised, and the committee has arranged for large posters to be shown on all the delivery vans of local electrical traders and manufacturers, while posters will be displayed in the Corporation trams, and banners and hoardings will be shown in the streets. A special brochure has been prepared, containing the names of all the local traders and contractors who are helping the campaign, and these will be distributed to visitors who see the houses. On the front page of the brochure the gift of an All-Electric House is announced, and visitors are urged to obtain the competition booklet from any one of the firms mentioned in the list. This, it is held, is a better way than putting the booklets in the demonstration houses, as has been done at other centres.

It was found necessary to postpone the opening of the two demonstration houses at Walsall, which will be opened a few days after Christmas. At Lichfield a small exhibition has been held in connection with the campaign. A meeting is to be held at Chesterfield on January 6th with a view to the formation of a circle there. From most parts of the South Midlands area our correspondent has received reports indicating a rising demand for the competition booklets, and many traders express their satisfaction with the type of inquirer to whom the booklets are being given.

A novel scheme has been devised in the North-East Coast area, which might well be emulated in other parts of the country. Briefly, the idea is to get all the electrical circles in the area to approach the various schools in their neighbourhood with an offer of prizes for the best model house made by a scholar, for the best colouring of the illustrations in the competition booklet, and for the best slogan. At a meeting of the area Committee it was agreed to grant £1 to each circle for this purpose, leaving it to individual circles to augment the prizes themselves if thought desirable.

In addition, the area Committee has agreed to give special prizes for the best model house, best painting and the best slogan submitted to the area Committee by the circles. These prize-winning efforts will be exhibited in a suitable place. Other brain-waves were put forward, many of which will probably be put into operation in the near future. Meanwhile, campaigners are advised to "watch Newcastle."

Newcastle Reports.

At the Newcastle meeting (states an ELECTRICIAN correspondent), Mr. E. S. Evans reported that lectures are being arranged at Alnwick, where a demonstration house is also being organised. Ashington reported a good demand for booklets and in the new year a W.O.B. house will be opened there, as well as at Morpeth and Newbiggin. At Berwick the books were in fairly good demand, but it had not yet been possible to open a demonstration house there; one dare not say *why*! Darlington, Bishop Auckland, Durham, Saltburn, Redcar, South Shields, Sunderland, Whitley Bay, and Carlisle are all arranging for demonstration houses, and in most cases special co-operative advertising campaigns are being planned.

In the Newcastle district there is to be more local advertising and further demonstration houses are being organised. The Newcastle Electric Supply Co. has disposed of nearly 8 000 booklets. West Hartlepool is putting into operation a new "hired-wiring" scheme which, it is anticipated, will be very effective in conjunction with the campaign. Middlesbrough contractors are taking energetic steps to profit by the campaign, with Mr. Baker, of Baker Bros., as secretary of the circle. South Shields has appointed a W.O.B. sub-committee, comprising a house furnisher, a hardware merchant, an architect, a builder, and an electrical contractor. Full-page advertisements have been inserted in the local newspapers, and there has been an excellent response to the publicity.

In the Huddersfield area 21 000 circular letters have been sent to residents inviting them to visit the W.O.B. house. The letter is reproduced below for the benefit of other circles which may be contemplating similar action:—

Le Marchant Avenue,
off Thornhill Road,
Marsh,
Huddersfield.

DEAR MADAM,

Have you seen the Exhibition Electric Home at Le Marchant Avenue, Marsh? It is one of the most interesting events which has ever taken place in this district. *You must see it.*

This is a joint effort of the Huddersfield Corporation Electricity Department and the Electrical Contractors of the District.

We can show you how to secure better lighting; how to obtain heat without creating dust, dirt, smoke, or fumes. We also show you spotlessly clean, hygienic cookers, as well as a host of wonderful electrical labour-saving appliances.

Take advantage of this splendid opportunity to see a really ideal Electric Home. Please take this as a special personal invitation. Rest quite assured that you will not be importuned to buy; our whole purpose is to interest you in new labour-saving methods of running an up-to-date home.

The House is tastefully furnished by Messrs. Brown's Successors, and piano by Messrs. Whitfields. Open from 12 to 8 p.m. each day, from November 29th.

Do come!

Yours very truly,
(Sgd.) C. DYSON,
Hon. Sec.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

SIR William Noble, formerly engineer-in-chief of the General Post Office, has been appointed a Warden of the Guild of Makers of Playing Cards.

Mr. W. R. Elston, Secretary of the Burma Electric Supply Co., Ltd., is to be presented with a piece of silver, as a token of appreciation of his 25 years' service with the company.

Mr. G. Mure Ritchie, chairman of Siemens Brothers and Co., Ltd., and one of the leading iron and steel trade authorities of this country, has resigned his chairmanship of Palmers Iron and Shipbuilding Co., Ltd.

Mr. Charles Tricker, who has completed 38 years in the electrical department of the Port of London Authority at Victoria Dock, London, E., was, on December 1st, presented by his colleagues with a semi-hunter gold watch.

The Municipal Reform Party of London County Council has decided to nominate Mr. J. M. Gatti (a director of the Charing Cross Electricity Supply Co., Ltd.) for election as chairman of the Council in March, 1927.

Mr. J. D. Barron has been appointed chief assistant engineer to the Boston and District Electric Supply Co., Ltd. Mr. Barron was formerly district engineer in charge of the southern area of the Lothians Electric Power Co.'s system.

Upon his retirement from the position of works' superintendent of the Hackney Council's Millfields Road generating station, which he has held for 20 years, Mr. T. J. Dalby has been presented with an easy chair subscribed for by his colleagues.

Guests at a London luncheon to promote the cause of "Peace in Industry," included Lord Ashfield, Sir Hugo Hirst, Sir Ernest Petter, Sir Edward Manville, Sir Ernest Benn, Mr. E. Garcke, Sir Clarendon G. Hyde, Sir Charles Bright, Mr. T. R. Martin and Mr. Dane Sinclair.

Mr. G. A. Hopkins, who twelve months ago was appointed tramways manager at Wigan, the appointment to be reconsidered after the completion of the first year, was, at last week's meeting of Wigan Town Council, appointed tramways general manager at a salary of £600 per annum.

Ald. Mrs. S. E. Hammer has been appointed chairman and Coun. W. J. Stapleton vice-chairman of the Hackney Electricity Committee. Mrs. Hammer has also been appointed as the Council's representative on the District Joint Board of Employers and Members of Staff (Electricity Supply Industry) Area No. 10.

Prof. Thomas Turner, who has retired from the chair of metallurgy in the University of Birmingham, received presentations last Friday from past and present students, colleagues and friends. The gifts consisted of a framed photograph of Prof. Turner, a Wolseley motor car and a volume containing the names of the subscribers. It was stated that presentations to Prof. Turner had also been made by the Council, Senate and staff.

Mr. James Dalrymple, who is retiring from the general managership of the Glasgow tramways, has been engaged in an advisory capacity by a South American municipality for at least three months at a fee of £1 000 a month. He expects to sail for South America on January 14th. Mr. Dalrymple has asked that his retirement should date from the end of December. It has been remitted to a committee on superannuation to fix his retiring allowance, which is understood to be about £850, and a special sub-committee has been appointed to consider the steps to be taken to appoint a successor.

Obituary.

MR. A. B. Robertson, founder and chairman of A. B. Robertson and Sons, Ltd., electrical contractors, died on November 29th, at 12, Royfield Crescent, Aberdeen, aged 74 years. Mr. Robertson had been in business in Aberdeen for 47 years, and he and his firm carried out a large number of important electrical engineering contracts all over Scotland as well as on the southern side of the border—in London, and in the Midland and southern counties. Six years ago, the firm was formed into a limited liability company with Mr. Robertson as chairman. Mr. Robertson served for 23 years on the Town Council, and was twice elected a magistrate. He was also one of the founders of the Aberdeen Master Plumbers' Association, of which he was president for six years. Mr. A. B. Robertson (Junr.) is a past president of the E.C.A. of Scotland.

BUSINESS ITEMS.

Changes of Address, Representatives, and other Developments.

MR. W. H. Stanger, electrical engineer, has opened premises at 13, New Road, Spalding, Lincs.

Messrs. Yeldon and Gardiner, electrical engineers, have opened premises at 4, Reservoir View, Tavistock Road, Plymouth.

A New Zealand agent wishes to represent a British manufacturer of electric cooking ranges. Details from the Department of Overseas Trade. (Reference No. 639.)

A New Zealand firm offers to represent British manufacturers of plain and insulated bronze wires. Apply to Department of Overseas Trade. (Reference No. 603.)

An Australian merchant, returning to Australia, desires to represent British electrical engineers. Inquiries to Commercial Bureau, Australia House, Strand, London, W.C.2. (Reference No. 405.)

An Indian firm, with headquarters at Jamnagar and branches at Bombay and Karachi, desires to secure the representation of British manufacturers of wireless apparatus. Particulars from the Department of Overseas Trade. (Reference No. 633).

Long and Crawford, Ltd., manufacturing electrical engineers, 2, Gorton Road, West Gorton, Manchester, inform us that they have re-opened their London office at Bush Lane, House, Bush Lane, Cannon Street, London, E.C.4. The telephone number is City 2753. Mr. H. H. Leage is in charge of the London office.

Legal Intelligence.

Fines for Fraudulent Use of Electricity.

AT Nottingham Guildhall, H. E. Parnell, garage proprietor, of 139, Allington Avenue, Lenton, and W. Slack, of 36, Willoughby Street, Lenton, were fined £5 each for fraudulent use and abstraction of electricity, respectively.

Mr. A. S. Drabble (prosecuting for Nottingham Corporation) said Parnell occupied a garage near a new house which was at that time unoccupied. The Corporation Electricity Department discovered that wires had been connected to conduct electricity from the garage to the house.

A Bogus Wireless Traveller.

Sentence of six months' hard labour in each of two cases of false pretences was passed upon Frederick Norris described as an electrician, of no fixed residence, but formerly of Drakelowe, Burton-on-Trent, by the Burton County Bench.

Prisoner (who pleaded guilty) obtained 5s. from Emily Whitmore Welch, of Tatenhill, on the representation that he was travelling for the Wireless Distributing Co., of New Street, Birmingham, and undertaking to charge her wireless accumulators for 10s., payable in three months, but 5s. down. He was paid the 5s. and nothing more was heard of him, nor was there any such address in Birmingham as the prisoner gave. In a second case he obtained 10s. from Jane C. Ritchie, of Rolleston, saying that he was an inspector from the Post Office and required to see her wireless licence. The wireless set had only just been installed, and as the prosecutrix had not got her licence, he said he would get one for her and post it on if she would give him 10s., which the prosecutrix handed over, but she received no licence. It was shown that prisoner was in no way connected with the Post Office.

Sentence was passed as stated, to run consecutively.

Slander Charge Against Mr. Dalrymple Dismissed.

In the Glasgow Sheriff Court last Friday, Sheriff Blair dismissed an action brought by Mr. William Reid (a member of Glasgow Corporation) against Mr. James Dalrymple (manager of the Corporation Tramways) and charging the latter with slander. As stated by the Sheriff, the facts out of which the charge arose were that when Mr. Reid went to London in November, 1925, on two deputations—one for the tramways and the other for the Committee on Special Acts—he received from each committee a first class railway fare and his expenses. Mr. Dalrymple inquired into the matter, and reported it to the Town Clerk. His letters on the subject to the pursuer and to the Town Clerk were alleged to be the basis of the slander.

The Sheriff held that the defender was privileged, and he (the Sheriff) did not think there was any incident in the case which conclusively imported malice. He dismissed the case, with expenses to the defender. The pursuer had appealed to the Second Division of the Court of Session.

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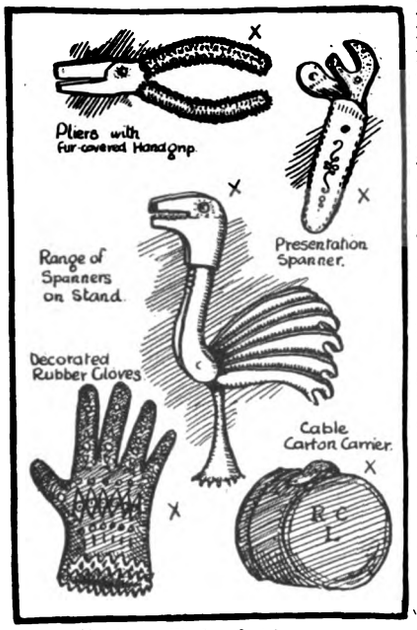
IN LIGHTER VEIN.

Choosing Suitable Christmas Presents—A Few Hints for the Ladies.

NOW that the Christmas Phase is advancing, once more brows become beetled in choosing presents, and this column has been devoted to help the ladies in selecting really suitable gifts.

Wives please note.—if you see your husband's copy of THE ELECTRICIAN open at this page, and a tiny cross against any of the illustrations, your troubles are over; puzzle no longer, for your search is ended.



Christmas gifts for electrical men.

The first suggestion is a pair of fur-covered pliers. (Note.—Be sure and ask for a *pair* of pliers—not a couple or brace, as pliers are always found in pairs. A single plier is as much use as an odd glove.) Remember the cold and frosty mornings when the snow is on the ground: think of a poor man grasping icy cold pliers. Brrrr . . . ! But when working with warm fur-covered pliers, kind thoughts flow to the giver like flux from a salient pole. Their unusual appearance combines art with utility, making a most acceptable gift.

Another very useful present is the spanner and case. The one shown in the illustration is called the Star Bangled Spanner, because of its wonderful decoration. It is made in all the favourite sizes, in silver with platinum and steel insertions, or in nickel plate. Find out the favourite size—some men swear by (and at) three-quarter, whilst others cling to seven-eighths. A smart leather case gives a finishing touch to a very useful present.

For anyone who is likely to be mixed up with high voltages a pair of decorated rubber gloves will be very much appreciated. Buy a pair of ordinary rubber gloves and fasten in the inside a woollen lining, and then proceed to work the outside with coloured wool. Three hemstitch, two lockstitch and a gusset repeated makes a nice design which can be elaborated by knitting two seam two until you feel that you have seemed to knit too long, and then stop. A monogram worked on the back completes a present which gives the wearer an individuality and immunity from shock.

For the electrician or contractor no more suitable present could be chosen than the Cable Carton Case. Electricians are unusually sensitive souls who blush furiously when caught carrying cartons advertising their calling and someone's cable.

The carrier is a black leather case with a red piping, so constructed that it expands to take one, two or three cartons. It serves a double purpose, making an excellent hat box, and therefore may come home again to the giver.

There is another delightful present in the form of an artistic set of spanners, so arranged that they are always standing and easily picked up. For many special occasions which necessitate working in an inverted position, the set of spanners, standing up or rampant, proves a boon.

Points of View.

THE urgent need of the engineering industry at the present time is for greater application of physical science.—*Mr. G. W. Marlow.*

* * *

This country has still to learn how to consume electricity.—*Lord Weir.*

* * *

We are expanding our telephone business in this country at a rate which is faster than that of any other country in the world.—*Sir W. Mitchell-Thomson.*

IN PARLIAMENT.

Electricity (Supply) Bill Passes Report Stage in the Lords.

THE Electricity (Supply) Bill was considered on Report in the House of Lords on Tuesday.

On Clause 6, Lord Oranmore and Browne moved an amendment providing that before setting up a new generating station in a district in which a joint electricity authority had been constituted, the Electricity Board should endeavour to enter into arrangements with the joint authority.

Viscount Peel said he could not accept the amendment, but he was prepared to allow it to be added to the clause, and to take its chance of survival in another place.

The amendment was agreed to.

Lord Gainford moved an amendment to provide that where a power company was prejudiced by the fact that the Board had selected one of its stations, and thereby affected the cost of running other stations in its area, it should be entitled to make a claim. The amendment was negatived.

Lord Dynevor moved an amendment to provide that where the Board compulsorily acquired land for the purpose of constructing main transmission lines it should, at the request of the owner of the land, accept, in lieu of any easements, servitudes, or other rights of way, a permanent wayleave at a nominal rent, and that this wayleave should entitle the owner, subject to the sanction of the Railway and Canal Commission, to have the electric line removed from land likely to be developed industrially or in other ways, to other land owned by him.

Viscount Peel said the object of this amendment was partially achieved by a later amendment. In practice the Minister of Transport reserved the right to waive his consent to the compulsory acquisition of land after a specified time.

An amendment moved by Viscount Peel, protecting Government observatories or laboratories from being injuriously affected by electric or electro-magnetic action or influence was agreed to.

Lord Montagu of Beaulieu moved a new clause enabling a local authority which objected to the construction of an overhead line to make representation to the First Commissioner of Works, who might require the diversion of the line or the placing of the works underground.

Viscount Peel said the First Commissioner of Works was not equipped to consider the technical matters which would be involved in exercise of the powers suggested. The Minister of Transport, under the Bill of 1919, had already to take the amenities into consideration. The amendment was withdrawn.

On the motion of Viscount Peel a new subsection was added, providing that the Minister of Transport should take into consideration any recommendation made to him by the Commissioner of Works before consenting to the placing of any electric line above ground in places where representations were made that the line would prejudicially affect any ancient monument.

The Report stage of the Bill was completed.

Electricity Special Orders.

In the House of Lords last week the following electricity Special Orders were approved:—Horley and District Electricity (Extension), Midland Electricity Power Distribution and Lighting (Extension), Wrexham Electricity (Extension), Porthcawl Electricity, Brynamman and District Electricity, and Chessington Electricity.

Replies to Questions.

The following are points from answers to questions in the House of Commons this week:—

The average cost of issuing a wireless licence is estimated at about 1s. 3d.

Since the passage of the Wireless Telegraph (Explanation) Act, 1924, legal proceedings have been taken against 487 persons for installing or working wireless apparatus without a licence.

In accordance with the recommendation of the Committee of Civil Research, certain preliminary investigations are now taking place with regard to the possibility of utilising the tidal power in the Severn Estuary.

The Minister of Transport thinks there would be considerable congestion, and certainly delay, if the system in vogue in Paris, whereby passengers boarding tramcars do so in the order of tickets obtained from lamp standards at various stopping places, were adopted in London.

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THE NATIONAL REGISTER.

Further List of Contractors on the Register in October, 1926.

DURING recent weeks we have published by instalments the latest list of registered electrical installation contractors. Here is a further instalment for the information of consultants and others who desire to place orders with registered contractors. We hope to conclude the list in our next issue :—

Rochdale.—G. L. Adamson, Ltd.; Clegg and Coupe; Fryer and Hartley, Ltd.; Rochdale Electric Co., Ltd.; Fred Rothwell, Ltd.; Hy. Tattersall, Ltd.

Rotherham.—Deans Electrical and Engineering Co., Ltd.; Lilleker Bros., Ltd.

St. Albans.—R. A. Giffen.

St. Annes-on-Sea.—Harold Leake and Son; J. L. Schofield.

St. Leonards-on-Sea.—B. Petts.

Salford.—G. Billington, Ltd.; W. Birtwell and Co.; Crowther and Coulthard; John Shaw and Sons (Salford), Ltd.

Salisbury.—Clayton Bros.; Salisbury Electric Light and Supply Co., Ltd.

Scarborough.—F. Greathead.

Sheffield.—Joseph Bramwell; T. B. and W. Cockayne, Ltd.; Makin and Co., Ltd.; Marsh Bros. (Electricians), Ltd.; John Walsh, Ltd.; Wilkinson, Bentley and Co., Ltd.

Sherborne.—Sherborne Elec. Supply Co., Ltd.

Shildon.—Gray Bros.

Skegness.—George Cooper.

Skipton in Craven.—Craven and District Electrical Construction Co., Ltd.

Slough.—W. G. Bedford.

Southampton.—F. W. Cook and Co. (Southampton), Ltd.; B. A. Corry; Lankester and Son, Ltd.; George Vivian and Sons.

Southport.—Butterworth and Robinson; C. E. Palfree; F. W. Smith and Co.

Southsea.—Bowerman Brothers.

South Shields.—G. Gompertz; Law and Burns; Chas. Ramsay; A. B. Sigsworth and Co.; L. Stoves; A. J. Wares, Ltd.; Westoe Electrical Co.

Southwold.—Southwold Elec. Supply.

Sowerby Bridge.—John Quain.

Staleybridge.—C. H. Davies.

Stamford.—Urban Elec. Supply Co., Ltd.

Staveley.—H. E. Drabble.

Stockport.—J. E. Hallam and Sons; Douglas C. Rowland; A. Schofield and Co.; William A. Shaw and Co.; James Harold Whiteley.

Stockton-on-Tees.—T. B. Watson and Son, Ltd.

Stoke-on-Trent.—Barnett and Soans; Blackburn, Starling and Co., Ltd.; E. M. Evans and Son, Ltd.; Hawley and Ingram; Potts and Co.; J. Richards and Co.; Staffordshire Electrical Accessories Co., Ltd.; Woodward, Smith and Co.

Stowmarket.—East Anglian Electric Supply Co., Ltd.

Stroud (Glos.).—Edwards and Armstrong, Ltd.

Sunderland.—Brantingham Bros.; H. A. Davie, Ltd.; Davison, Taylor, Ltd.; Finningan and Pollock; W. Watson and Co.; Alfred White.

Surbiton.—Surbiton Contract Co., Ltd.

Swansea.—Furneaux and Thomas; Morgan Brothers; E. Nener and Sons; Smith and Co.; Torque Electrical and Eng. Co., Ltd.

Swindon.—W. J. Moran; Teesdale and Jones.

Thame.—Holland Beachy and Co.

Teddington.—R. Langston-Jones and Co.

Teignmouth.—Agra Engineering Co., Ltd.

Tenterden.—C. Milsted and Sons.

Torquay.—S. E. Hunt; Sydney Truscott.

Tunbridge Wells.—Advance Electrical Co.; G. and A. J. Cross, Ltd.; C. Elphick; H. Featherstone; E. Powell, Ltd.; Premier Eelctrical Co.; Harry A. Stonham and Co., Ltd.; Strange and Sons Electrical Engineering Co., Ltd.

Twickenham.—Twickenham and Teddington Elec. Supply Co., Ltd.

Ventnor (I.W.).—Isle of Wight Elec. Light and Power Co., Ltd.

Wakefield.—Walter Robb, Ltd.

Wallesley.—Robert J. Chatham; Hawkins and Hunter; D. Johnson; Frederick Charles Ivor Morgan.

Wallingford.—Wallingford and District Electric Supply Co., Ltd.

Wallsend-on-Tyne.—Watson-Norie, Ltd.

Walsall.—Birch and Evans; County Borough of Walsall Electric Supply Department; Truman Electrical Co.

Warrington.—Harry Bibby and Co.; Warrington Electrical Co., Ltd.

Watford.—Rogers and Gowlett, Ltd.; J. W. Russell.

Westcliff-on-Sea.—H. A. Lee.

West Hartlepool.—E. D. Barker; Cuthbertson and Co.; Edgar Phillips, Ltd.; L. Robson, Ltd.

(To be concluded).

Telephone Progress.

Report on a Year's Developments in the Manchester District.

IN the annual report by Mr. W. J. Medlyn (superintending engineer) and Mr. J. G. Maddan (postmaster-surveyor) on telegraphs and telephones in the Manchester District, satisfactory progress in nearly every direction is recorded, and good progress has been made with the arrangements for introducing automatic telephone working in the Manchester District. Complete new exchange equipments have been provided and brought into use at Knutsford, Openshaw and Whaley Bridge, and substantial additions have been made to the equipment at sixteen exchanges. Arrangements are in hand for the opening of an automatic exchange at Shaw.

During the year ended September 30th, 1926, 10 679 new telephones were fitted, a net increase of 5 475, or 7¾ per cent. The underground wire mileage has increased by 53 412 miles. To supplement existing services, new main cables have been provided from Manchester to Bolton, Blackburn, Bury and Burnley; additional cables will shortly be laid from Manchester to Rochdale, Liverpool, Huddersfield, Ashton, Middleton, Heaton Moor, and Stockport.

Several additional long-distance circuits from Manchester and the surrounding industrial areas to London and other important centres have been brought into use by means of the various repeater stations associated with the main underground cable routes. The temporary repeater station at Manchester is equipped with 65 repeaters, of which 53 are already in use. Permanent equipment of the latest type will shortly be provided in the Head Post Office for 90 repeaters, and accommodation has been arranged for an ultimate provision of 300. Street kiosks have increased from 119 to 193 during the year. Considerable progress has been made throughout the district in the transfer from manual to automatic working of internal private branch exchanges. The possibilities of voice frequency telegraph circuits between Manchester and London are being investigated by the Post Office Research Department, and it is expected that an experimental circuit will be installed shortly to try out the system.

I.E.E. Examinations.

List of Successful Candidates in October Associate Membership Examination.

THE Institution of Electrical Engineers announces the following results of the Associate Membership examination held in October :—

PASSED WHOLE EXAMINATION.—Addenbrooke, J. H. (Wolverhampton); Aldis, R. E. (Southampton); Aust, J. H. (Longton); Bennett, J. (Preston); Benson, R. H. (Felixstowe); Bishop, H. (London); Brown, W. (Morecambe); Browne, W. F. (Norwich); Clements, V. A. H. (London); Dawtry, J. E. (Manchester); Dunlop, M. (Manchester); Evans, R. L. (London); Holder, J. E. D. (Newbury); Kerr, A. E. (Wallasey); Kilpatrick, J. S. (Glasgow, etc.); King, A. F. (Oxford); Kishk, M. M. (London); Lucas, E. (Pontypridd); McLaughlin, C. F. (St. Helens); Philip, A. (Manchester); Slater, K. A. H. (London); Stanton, H. B. (Birmingham); Symes, G. L. (Southsea); Taylor, D. B. (London); Taylor, G. E. (London); Walker, W. G. (Stockton-on-Tees); Yelf, E. W. (Southsea).

PASSED PART I ONLY :—Bahna, G. Y. (London); Davies, A. H. (London); Dore, C. U. (Azores Islands); Purkins, L. (Hull); Shuttleworth, J. I. (Hull).

PASSED PART II ONLY :—Edwards, C. H. (London); Gerard, A. G. L. (Conway); Macmillan, A. (Cape Town); Norris, H. (Wallasey); Somerville, A. W. M. (Brighton); Topliss, M. J. (Grimsby); Woodall, R. H. (Coventry).

Further results relating to candidates who sat for the examination abroad will be published later.

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TRADE PUBLICATIONS.

Details of Catalogues and Dealer-Helps Issued by Manufacturers.

The D.P. Battery Co., Ltd., Bakewell, Derbyshire, has issued a booklet on "Acid and Water Testing." Chlorine, nitrates, arsenic ammonia, iron and lime decrease the life and efficiency of storage batteries, and instructions are given in the booklets for tests to discover these impurities in water or acid. Full particulars are given of the solutions necessary for the various tests, the quantities required, and the apparatus which must be used. Colour standards for acids are also printed in colours in an appendix to this useful publication.

We have received from the Siemens and English Electric Lamp Co., Ltd., 38 and 39, Upper Thames Street, London, E.C.4, the latest edition of their illustrated list (No. 156) of Silvaray glass ware fittings; their monthly price list; a folder on their Silvalux and gasfilled and vacuum type lamps, with a novel "mileometer" for finding the distance to any place in England; leaflets Z.102 dealing with Siemens bridge type fuse boards, and Z.111, on the Siemens "Ideal" switch and fuse; a price list (No. 215) of wireless valves; catalogue (Z.110) of improved "Zed" safety fuses; catalogue (150) of wall brackets, electroliers, pendants, etc.; a small folder (No. 210) on "Purlite," "Silvalux," and spray enamelled lamps; and "Publicity by Siemens," a folder giving a cleverly arranged view of the outsides of the Lamp Department's publications, numbered for the convenience of retailers.

The English Electric Co., Ltd., Queen's House, Kingsway, London, W.C., will send to applicants a handy little booklet on "English Electric Motors for all Industrial Purposes." Illustrations show squirrel-cage motors driving a cold saw for steel-cutting, centrifugal pumps, hydro-extractors in a chemical factory, and an agitator, d.c. motors on lineshafts (used in umbrella manufacture), slipring motors driving compressors—for refrigeration, a hydraulic pump and a steel-plate mangle. The company offer to assist in the planning of industrial plants. They will also send to any of our readers publications No. 769, describing English Electric Transformers for Power Transmission and No. 770, dealing with 33 000 V shell type transformers for outdoor service. The latter contains particulars of the 10 000 kVA banks of transformers recently supplied to the Liverpool Corporation.

Amongst numerous publications issued recently by the British Thomson-Houston Co., Ltd., Rugby, are lists Nos. 2 531B, on fabroil gears and blanks; 4 172, oil-immersed circuit breakers, type OY-208, form A1; 5 225-D, a.c. rheostatic rotary starters; 5 111D, air-break Y-delta starters, type B.T.; 4 401-D, drum-type relays; 5 356, a.c. motor control pillars, type ATP.; 4 327, switch fuses for outdoor service; a set of folders giving instructions for using B.T.-H. valves; folders on the Pearl Mazda internally frosted lamp, B.T.-H. electric fans, Mazda gasfilled, vacuum and colour sprayed and daylight lamps, electric bulbs for motor cars; and B.T.-H. Read telephones and loud speakers; "Mazda Publicity, 1926" (a list of publications from which dealers may make a selection); a pamphlet on B.T.-H. radio valves; a complete illustrated catalogue (A.G. 201) of B.T.-H. valves and the new Mazda lamp catalogue (L369). Striking showcards advertising the company's specialities are also available.

Work in Prospect.

Trade Possibilities for Electrical Installation Contractors.

BALLANTRAE.—Public hall (£4 000). Particulars, the architect, Mr. Allan Stevenson, Ayr.

BATTLE (SUSSEX).—Housing scheme (22). Particulars, the Surveyor.

BIRKENHEAD.—Schools (700 places), Trinity Street, for Education Committee. Particulars, the clerk, Mr. E. W. Tame.

BRIDGWATER (SOMERSET),—Housing scheme (56). Particulars, the Surveyor.

CALNE.—Housing scheme. Particulars, the Borough Surveyor.

CARSHALTON.—Eleven detached houses, Briar Lane, for MR. A. J. Morris.—Houses (22), Milton Avenue. for Edser and Brown.

WINDSOR.—School (800 places). Particulars, Mr. Francis Brooks, Victoria Street.—Rebuilding premises, Castle Hill, for Waitrose, Ltd.

E.T.B.I. SUBSCRIBERS.

Further List of Contributions to Fund by Electrical Firms.

WE continue below the publication of the list of subscribers in connection with the annual festival dinner of the Electrical Trades Benevolent Institution. This list is only a preliminary one and additional donations made since it was compiled will be published when the final list is completed:—

F. Lonsdale, £1 1s.; Liverpool G.E.C. Staff, £10 9s.; J. Lyon and Co. £1 1s.; Leif, Sundt and Co. (1908), £1 1s.; London Lead Oxide Co., Ltd., £5 5s.; J. Lave and Sons, £2 2s.; O. E. Lloyd, £1; Loewenstein and Hecht, £10; J. Lingard, Ltd., 10s. 6d.; H. O. Lamb, £2 2s.; M. Levenger, £3 3s.; Longmore Bros., £5 5s.; J. B. and S. Lees, Ltd., £3 3s.; W. Lusty and Sons, £1 1s.; London Electric Supply Corporation, Ltd., £25; W. Lucy and Co., Ltd., £10 10s.

Macrau, Ltd., £2 2s.; Manchester Billposting Co., £5 5s.; Maj.-Gen. the Hon. Sir Newton J. Moore, K.C.M.G., M.P., £3 3s.; Mica Manufacturing Co., £1 1s.; W. J. Moran, 10s.; Martin, Winn, Ltd., £2 2s.; Marconiphone Co., £3 3s.; E. J. Melling, £1 1s.; W. A. Monbrum, £1; P. W. Mitchell, £1 1s.; Thos. Mayer and Co., Ltd., £4 4s.; Melville and Halley, £2 2s.; H. Martin, Barnes and Co., Ltd., £1 1s.; W. May, £1 1s.; Methylating Co., Ltd., £5 5s.; Moray Engineering Co., £2 2s.; A. A. Mead, £1 1s.; Marryat and Scott, Ltd., £10; H. Moss, 10s.; Metallic Seamless Tube Co., Ltd., £2 2s.; Mayor, Sworder and Co., Ltd., £5 5s.; Metropolitan Railway Baker Street, £2 2s.; "Mining Magazine," £5 5s.; Mavelli and Co., Ltd., £5 5s.; Midland Employers' Mutual Association, £5 5s.; G. W. Mullins, £1 1s.; Micanite and Insulators Co., Ltd., £1 1s.; Macintyre, J. and Co., Ltd., £3 3s.; R. Massey and Co., £2 2s.; F. G. Minter, Ltd., £5 5s.; W. Masters, 10s. 6d.; Mosses and Mitchell, Ltd., £2 2s.; C. G. Morley New, 10s. 6d.; Marconi's Wireless Telegraph Co., Ltd., £5 5s.; Mavor and Coulson, Ltd., £10 10s.; Midland Electric Corporation for Power Distribution, Ltd., £5 5s.; J. J. Macdonald, 10s. 6d.; Maxwell, Butcher and Co., Ltd., £3 3s.; Dr. G. T. Moody, £5 5s.; Magnet House (Collecting Box), 11s.; — Miles, Esq., £1 1s.; W. J. Murphy, 10s. 6d.; Madeira Electric Lighting Co., £21; W. R. May, £1 1s.; Wm. A. Morton, 10s.; Mann, Egerton and Co., Ltd., 10s. 6d.; A. L. Marden, 10s. 6d.; Ryle Marsden, 10s. 6d.; Morgan Crucible Co., Ltd., £10 10s.; Midland Bank, Ltd., £105; Mander Bros., Ltd., £1 1s.; Mole and Son, Ltd., £2 2s.; J. Mercer, £2 2s.; Sir W. McAlpine and Sons, £25; D. McRae and Co., £1 1s.; J. McMorran, £1 1s.; McCorquodale and Co., Ltd., £1 1s.; J. McMillan and Co., Ltd., £1 1s.; McLeod and McLeod, £1 1s.; Wm. McGeoch and Co., Ltd., £21; R. McGee and Co., Ltd., £2 2s.; R. McLeod, £1 1s.; May's Advertising Agency, Ltd., £1 1s.; Midland Iron and Hardware Co., Ltd., £2 2s.; Chas. Marshall, Esq., £2 2s.; Members of Taunton Corporation Electricity Dept., £1 1s.; Marshall and Webster, £1 1s.; J. Macgregor, £1 1s.; F. W. Money, 10s. 6d.; T. B. Morley and Co., Ltd., £2 2s.; H. F. Morgan, 10s.; B. R. Morgan, 10s.; Metal Workers, Ltd., £2 2s.; Moss Gear Co., Ltd., £1 1s.; R. J. Morris, £1 1s.

G. Newnes, Ltd., £5 5s.; Nissen and Arnold, Ltd., £2 2s.; W. Neill and Co., 6s.; Geo. Nobbs, Ltd., £2 2s.; W. J. Newman, £2 2s.; Alfred Neale and Co., £1 1s.; New Garter Foundry (1920), Ltd., £3 3s.; C. J. Neale, 10s. 6d.; J. North, Hardy and Son, Ltd., £2 2s.; G. O. Nye, £1; H. Nash, £3 3s.; D. H. Nye, £1 1s.; P. H. Nye, £1 1s.

O. Oberlander, £3 3s.; H. V. Owen, 10s.; Osborne and Co., £2 2s.; J. Ogden, £1; J. Murray O'Hara, £2 2s.; Ormerod Bros., Ltd., £5; C. W. Outram and Co., 10s. 6d.; Oil and General Products Co., £1 1s.; J. Oakley and Sons, Ltd., £2 2s.; Octavius Steel and Co., £21; R. Orsettich, £2 2s.; Osram Lamp Works Staff, 12s. 6d.

J. A. Phelp, £1 1s.; F. E. Parker, £5 5s.; Page and Miles, Ltd., 10s. 6d.; R. H. J. Pearson, Ltd., £2 2s.; Partington's Advertising Co., £3 3s.; G. S. Peckham and Co., £1 1s.; Pinchbeck Bros., £1 1s.; P. Pring, 10s. 6d.; Pinchin, Johnson and Co., Ltd., £50; F. W. Potter and Co., £1 1s.; Phœnix Telephone and Electrical Works, Ltd., £5 5s.; T. J. Priestman, £2 2s.; E. B. Pearson, £1 1s.; G. P. Pearson, £1 1s.; W. G. Pearson and Sons, Ltd., £3 3s.; W. Price, 10s. 6d.; Parkinson, Spencer, Ltd., £2 2s.; C. C. Paterson, £2 2s.; R. M. Pell, 5s.; T. C. Pulman, Esq., £5 5s.; Petters, Ltd., £3 3s.; Pratt Bros., £1 1s.; H. H. and F. Parsons, £1 1s.; Plessey and Co. (1925), Ltd., £1 1s.; Phœnix Foundry Co., £5 5s.; C. F. Proctor, £1 1s.; F. Parker and Co., £5 5s.; Picklords, Ltd., £2 2s.; B. Prochobradsky, £2 2s.; Priestley and Ford, £1 1s.; Parkes and Co., £2 2s.; Page and Miles, Ltd.; £2 2s.; E. J. Page, £1 1s.; H. B. Pyne, £2 2s.; W. Perrin, £1 1s.; Plating Co., Ltd., £1 1s.; W. Porter and Co., 10s.; L. Pennell, £1 1s.; Palatine Trade Protection Office (Liverpool), £2 2s.; W. Pring, 10s. 6d.; Perry, Bevan and Co., Ltd., £5 11s. 6d.; Phllips Lamps Ltd., £105; Pritchett and Gold and E. P. S. Co., Ltd., £2 2s.; Pirelli-General Cable Works, £105; P. J. Plevin, £1 1s.; S. A. Pirelli, Esq., £10 10s.; A. B. Price, 10s.; W. B. Phelp, £1 1s.

Quilter and Co., £26 5s.; F. G. Quance, £1 1s.; C. Quitman, £5 5s.

H. H. Runnals, £1; Riddle, Smith and Duffus, £10 10s.; A. R. Russell, £2 2s.; Rowe and Co., Ltd., £1 1s.; Rose, Downs and Thompson, Ltd., £5; Reesoils, Ltd., £3 3s.; H. S. Richards, £1 1s.; H. Rollet, and Co., £1 1s.; Rubber Co. (of Scotland), Ltd., £1 1s.

(To be continued)

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited, with the closing date, if available.

CLAYTON HOSPITAL, WAKEFIELD.—Rewiring the hospital for electric lighting and heating. Specifications, etc., can be seen between 2 and 4 p.m. to-day (December 10th) at the hospital.

DEWSBURY AND DISTRICT GENERAL INFIRMARY, December 10th.—Installation of wireless receiving set, capable of operating 50 pairs of phones and three loud speakers, and for wiring and supply of phones. Specification from Electricity Department, Bradford Road, Dewsbury.

INDIA STORE DEPARTMENT, December 10th.—Two 5-ton electric overhead travelling cranes (62 ft. span). Specification (5s.), from the Director-General, Branch No. 11, Belvedere Road, London, S.E.1.

KERRY COUNTY COUNCIL, December 10th.—Supply and erection of two 6 kW, 200 V, d.c. generators, coupled to heavy oil engines; supply and erection of one storage battery of 126 cells and about 110 Ah capacity; supply and erection (or supply only) of one four-panel switchboard; and complete wiring installation for new County Hall, Tralee. Specifications from McEntee and O'Kelly, 23, Upper O'Connell Street, Dublin; deposit £2 2s. for each section.

BELFAST CORPORATION, December 11th.—Penstocks for circulating water channels and ducts at the Harbour power station. Specification (W. 54) from Mr. Johnstone Wright, city electrical engineer and manager, East Bridge Street, Belfast; deposit £2 2s.

CLEETHORPES URBAN DISTRICT COUNCIL, December 11th.—Supply and laying of e.h.t. feeder and l.t. distributor cables, with section pillars and disconnecting boxes; supply and erection of transformers and switchgear equipment; and house services, including meters. Specifications, etc., from Mr. A. S. Baxter, Council House, Cleethorpes; deposit £2 2s.

DUBLIN CITY COMMISSIONERS, December 11th.—Supply of capping and casing and wire. Specifications from the City Electrical Engineer, Fleet Street, Dublin; deposit £1 1s.

EAST LOTHIAN EDUCATION AUTHORITY, December 11th.—Electrical installation work in connection with the erection of a new Infant School at Tranent. Forms of tender, etc., from R. and A. K. Smith, 44, Queen Street, Edinburgh; deposit £1 1s.

PORTSMOUTH GUARDIANS, December 11th.—Electric light and bell installation for the night nurses' quarters, St. Mary's Infirmary, Milton, Portsmouth, and for work in connection with electric lighting of the kitchen at St. Mary's Institution, Milton. Specification from Mr. G. E. Smith, architect, Victoria Road North, Southsea.

DARTFORD URBAN DISTRICT COUNCIL, December 13th.—Electric light installation in 200 houses on the Lowfield Street Estate. Particulars from the Surveyor.

LONDON COUNTY COUNCIL, December 13th.—Electrical installation at Lomond Grove elementary school, Camberwell, S.E. (about 122 points). Specification, etc. from the Chief Engineer, Old County Hall, Spring Gardens, S.W.1; deposit £1.

COMMISSIONER OF PUBLIC WORKS, DUBLIN, December 14th.—Electric light installation at new military barracks, Limerick. Specification from the Office of Public Works, Dublin, or the District Office of Works, Limerick; deposit £1.

INDIA STORE DEPARTMENT, December 14th.—Supply of (1) 200 000 large double-shed porcelain insulators and 50 000 large pot-head porcelain insulators: and (2) 5 000 yards 40-wire armoured composite cable. Specifications (5s. each) from the Director-General, Branch No. 30, Belvedere Road, London, S.E.1.

MANCHESTER CORPORATION, December 14th.—Supply of steel girder tramway rails. Specifications from Mr. Hy. Mattinson, Corporation Tramways, 55, Piccadilly, Manchester.

SUTTON COLDFIELD CORPORATION, December 14th.—Supply and erection of 1 000 kW steam turbine and gear driven d.c. generator, with condensing plant, auxiliaries and piping. Specification from Mr. T. Bloore, Electricity Works, Sutton Coldfield; deposit £2 2s.

SOUTHMEAD HOSPITAL, WESTBURY-ON-TRYM, December 17th.—Supply and installation of X-ray apparatus. Tenders to Mr. T. S. Lamb, St. Peter's Hospital, Bristol.

RADCLIFFE URBAN DISTRICT COUNCIL, December 20th.—Two centrifugal pumps, with motors, for sewage works. Particulars from the Engineer, Council Offices, Radcliffe.

CARDIFF GUARDIANS, December 21st.—Cables, wiring, etc., for electric lighting of Ely Lodge Institution, Cardiff. Specifications from the Clerk, 11, Park Place, Cardiff; deposit £5 5s.

NORTHERN CO-OPERATIVE SOCIETY, December 23rd.—Supply of 20 cwt. electric goods hoist, in connection with the erection of a dairy at Berryden, Aberdeen. Specification from Tawse and Allan, 10, Bon Accord Square, Aberdeen.

HASTINGS CORPORATION, December 24th.—Electric lighting installation (including complete re-wiring) and heating installation, at the Town Hall, Hastings. Specification from Mr. R. F. Ferguson, borough electrical engineer, 20, South Terrace, Hastings.

MELTHAM PARISH CHURCH, HUDDERSFIELD, December 31st.—Electric light installation. Particulars from Mr. W. R. Carter, secretary of the Church Council, Birchfield.

NOTTINGHAM CORPORATION, December 31st.—Two 30-inch electrically driven centrifugal pumps (section F.F.); one motor-driven twin booster; each for an output of 10 kW (section K.K.); and one storage battery of 256 cells, capacity 275 Ah at one-hour discharge rate (section M.3), for North Wilford power station. Specifications, etc., from Preece, Cardew and Rider, 8, Queen Anne's Gate, Westminster, S.W.1; deposit £2 for each section.

MANCHESTER CORPORATION, January 3rd.—Supply and erection at Barton power station, of 33 000 V, 420 V, and 240 V switchgear. Specification (B.52), from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

INDIA STORE DEPARTMENT, January 4th.—Supply of about 264 650 copper bonds for track rails. Specifications (5s.) from the Director-General, Branch No. 30, Belvedere Road, London, S.E.1.

PORT OF BRISTOL AUTHORITY, January 10th.—Grain-handling machinery at Royal Edward Dock, Avonmouth, including motors and switchgear. Specifications from Mr. T. A. Peace, engineer, Avonmouth Docks; deposit £5.

NORTH BRITISH ALUMINIUM CO., LTD., February 1st.—Construction, delivery and erection at the company's power house, near Fort William, Inverness-shire, of (1) water turbines (impulse type) (specification No. 100); and (2) direct current generaters (specification No. 101). Specifications, etc., from the company's offices, Adelaide House, King William Street, London, E.C. Preference will be given to contractors on the King's Roll.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

NEW ZEALAND GOVERNMENT RAILWAYS, December 10th.—Electric motors. (Reference B.X. 2 801.)

JOHANNESBURG MUNICIPALITY, December 11th. — High tension cable (contract 714). (Reference B.X. 3 017.)

ANTWERP MUNICIPAL COUNCIL, December 13th.—Supply of armoured cable for the America Dock. (Reference B.X. 3 068).

DURBAN CORPORATION, December 14th.—Supply of standard tramway points and crossings. Specification from Webster, Steel and Co., 36, Leadenhall Street, London, E.C.3; deposit £2 2s.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, December 14th.—Sub-station cables and cable boxes for Arapuni (section 188). (Reference B.X. 3 010.)

CAPE TOWN MUNICIPALITY, December 15th.—Oil-cooled transformers. (Reference B.X. 3 028.)

KEETMANSHOOP (SOUTH AFRICA) MUNICIPALITY, December 15th.—Supply and delivery of material for an electric lighting scheme for the town. (Reference B.X. 3 007.)

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NEW ZEALAND GOVERNMENT RAILWAYS, December 15th.—Switchgear, cable, motor-generator sets, junction boxes, etc., for Hutt Valley Locomotive Workshops. (Reference B.X. 2 949.)

SIAMESE POST AND TELEGRAPH DEPARTMENT, December 15th.—Telephone and submarine cable. (Reference B.X. 3 026.)

VICTORIAN ELECTRICITY COMMISSION, December 15th.—Water tube boiler with superheater, economiser, etc., for Yallourn power scheme. Specification (No. 28/82) from the Agent-General for Victoria, Melbourne Place, Strand, London, W.C.2 deposit £3 3s.

EGYPTIAN MINISTRY OF EDUCATION, December 16th.—Five a.c. motors and switchboard for Assiut model workshops. (Reference B.X. 3 016.)

INDIA STORE DEPARTMENT, December 21st.—Supply and erection of overhead transmission line, 110 000 V, about 280 miles in length. Specification (5s.) from the Director-General, Branch 14, Belvedere Road, London, S.E.1.

INDIA STORE DEPARTMENT, December 21st.—Supply of 55 electrically operated mild steel sluice gates (25 ft. span, three-tier) for irrigation feeder canals.

VICTORIAN RAILWAY COMMISSIONERS, December 22nd.—Supply of a wheel lathe, with electrical and other equipment. (Reference A.X. 3 735.)

VICTORIAN GOVERNMENT RAILWAYS, December 29th.—Electric rivet heaters. (Reference B.X. 3 014.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 30th.—Switchgear, cables and transformers. (Reference B.X. 3 040.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 1st.—Supply and erection at site of Seru pumping and power station, of four Diesel engine alternator groups, three pumps and accessories. Specification (10s. 6d.) from Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1.

INDIA STORE DEPARTMENT, January 4th.—Supply and erection of overhead equipment (1 500 V) and steel structures for about 140 miles of railway route, in connection with the Great Indian Peninsula Railway electrification. Specification (£2) from the Director-General, Branch No. 10, Belvedere Road, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 4th.—Supply of switchgear and transformers for Waikaremoana electric power scheme. (Reference B.X. 2 872.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 4th.—Bells and buzzers (schedule C.147). (Reference B.X. 2 984.)

SYDNEY CITY COUNCIL, January 10th (extended date).—High and low tension cables (contract 1 057). (Reference B.X. 2 959.)

JOHANNESBURG MUNICIPALITY, January 13th.—Supply of 10 miles of 4/0 s.w.g. round section h.d. copper trolley wire. (Reference A.X. 3 938.)

CHINA, January 15th. — Turbo-generators, condensers, boilers, switchgear, transformers, etc. Tenders are invited by a Chinese company holding a concession for water and electricity supply. (Reference B.X. 2 998.)

NEW ZEALAND GOVERNMENT RAILWAYS, January 17th.—Switchgear, cables, motor-generators, lamps, etc. (Specification E.14.) (Reference B.X. 3 020.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 18th.—Transmission line steel towers for Waikaremoana electric power scheme (section 31). (Reference A.X. 3 732.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 18th.—Switchboard cable (schedule C.151). (Reference B.X. 3 013.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, January 19th.—Electric bells and tumbler switches. (Reference B.X. 3 011.)

STATE ELECTRICITY WORKS, MONTEVIDEO, January 19th.—Supply of 100 500 metres of 250 V wires and cables. (Reference B.X. 3 042.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, January 20th.—Electric railway car equipments, including motors, control equipment, air compressors, etc. Specification (No. 1 065) from the Chief Mechanical Engineer, Wilson Street, Redfern, N.S.W.

STATE ELECTRICITY WORKS, MONTEVIDEO, January 24th.—Supply of 220 V cables, telephone cables (20-pair) and branch and terminal boxes.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 25th.—Telephone transmitters and parts. (Reference B.X. 3 012.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, January 25th.—Telephone receivers and associated parts (schedule No. C. 153). (Reference B.X. 3 041.)

NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMWAYS, January 26th.—Manufacture and supply of electric train equipment for 105 motor cars and 100 trailer cars. (Reference A.X. 3 810.)

STATE ELECTRICITY WORKS, MONTEVIDEO, January 28th.—Supply of 923 000 metres of special wires and cables for outdoor use.

NEW ZEALAND GOVERNMENT RAILWAYS, January 31st.—Electrical equipment for Otahuhu car and wagon workshops. (Reference B.X. 3 038.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 1st.—Storage battery and booster for Waikaremoana Electric Power Board (section 28). (Reference B.X. 2 937.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, February 2nd.—One 30-ton five-motor electric overhead travelling crane.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 15th.—Transformers, for Waikato (section 207). (Reference B.X. 2 985.)

Tenders Accepted.

AYLESBURY CORPORATION.—General Electric Co., Ltd., switch cubicle, etc., £203 6s.

ABERDEEN.—J. B. Reid, electrician's work of eight houses at Tanfield Walk, Woodside.

AMPTHILL GUARDIANS.—Flitt Motor Co., wireless installation at the Institution, £73 8s.

RICHMOND (YORKS) GUARDIANS.—D. M. Maclean, electric light installation at the Institution.

BRIGHTON GUARDIANS.—Supply of 15 lightning conductors for buildings, £149 5s. (recommended).

DUMFRIES CORPORATION.—John Marshall, electric light installation in 98 houses, £22 and £23 18s. per block.

ESSEX COUNTY COUNCIL.—Bailey and Ingledon, electric light wiring and fitting at Monoux Grammar School, £669 12s.

ASHFORD URBAN DISTRICT COUNCIL.—H. A. Neale and Co., 30 kW, 400 V three-phase motor generator, £144 18s. 6d.

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—Broom and Wade, Ltd., portable air compressor, £627 (recommended).

LEIGHTON BUZZARD URBAN DISTRICT COUNCIL.—Purser and Furlong, electric light installation at the Council Offices, £10.

HIGH WYCOMBE CORPORATION.—Wycombe (Borough) Electric Light and Power Co., Ltd., cable for street lighting, £138.

ROCHDALE CORPORATION.—R. D. Sidgwick, electric light power installations to 128 houses on the Albert Royds Street housing estate.

ADMIRALTY.—Siemens and English Electric Lamp Co., Ltd., Siemens gasfilled, standard vacuum and spiral filament traction lamps.

FORDEN GUARDIANS.—Smallwood & Co., electric light installation at the Institution, £790 (Eight tenders received, highest £1 329 9s.)

BURNLEY CORPORATION.—Ashworth and Parker, of Bury, supply of two 100 kW steam-driven electric generating sets for the local gasworks.

SLOUGH URBAN DISTRICT COUNCIL.—Rees Roturbo Manufacturing Co., Ltd., installation of motor-driven turbine pump for new borehole, £495.

WIRRAL GUARDIANS.—Ashwell and Nesbitt, supply of new and alterations to existing generating plant at the Clatterbridge Institution, £1 873.

STIRLING CORPORATION.—Lockhart and MacNab, electric light wiring of new houses in Broad Street: D. Henderson, ditto, in Burnside Street.

AUSTRALIAN FEDERAL CAPITAL COMMISSION.—Australian General Electric Co., Ltd., installation of 1 500 kW turbo-alternator at Canberra, £13 145.

ABERDEEN CORPORATION.—A. M'Robb, electric light wiring of 56 two-apartment and 40 three-apartment houses in Erroll Street, Seaforth Road and Sunnybank Road, £711.

DORCHESTER CORPORATION.—Johnson and Phillips, Ltd., laying cable in Maud Road and part of Coburg Road, £159, and reinstatements, £24; and laying cables in various localities £1 833.

CROYDON CORPORATION.—Babcock and Wilcox, Ltd., two 50 000 lb. water-tube boilers with mechanical stokers, etc., £33 888, with additional £155 for substitution of steel for c.i. economisers.

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MELBOURNE (VICTORIA) CHRISTIAN SCIENCE CHURCH.—Henry Willis and Sons, three-manual electric organ.

SOUTHERN RAILWAY.—Johnson and Phillips, Ltd., supply and laying of about 78 miles of three-core cable in connection with the extension of the suburban electrified lines to Tattenham Corner, Epsom Downs.

ILFORD TOWN COUNCIL.—Ferguson Pailin, Ltd., one transformer kiosk, including Foster transformer, switchgear, etc.; Crompton and Co., Ltd., one switch kiosk, including switchgear and l.t. paper insulated cable.

METROPOLITAN ASYLUMS BOARD.—T. Clarke and Co., automatic telephones and fire alarms, North Eastern Hospital, £2 417; Douglas Electric Lighting and Power Co., alterations to electric lighting, North Eastern Hospital, £150 (both recommended).

ST. PANCRAS (LONDON) BOROUGH COUNCIL.—Standard Telephones and Cables, Ltd., l.t. cable, £4 291 (recommended). Also tendered: Siemens Bros. and Co., Ltd., £4 345; Macintosh Cable Co., Ltd., £4 349; Pirelli-General Cable Works, Ltd., £4 363; Hackbridge Cable Co., Ltd., £4 373.

GREAT WESTERN RAILWAY.—British Thomson-Houston Co., Ltd., 12 months supply of Mazda gasfilled lamps; Siemens and English Electric Lamp Co., Ltd., Siemens gasfilled lamps during period ending October 31st, 1927; Metro-Vick Supplies, Ltd., Cosmos gasfilled tungsten filament lamps.

BELGIAN POST AND TELEGRAPH DEPARTMENT.—Ateliers de Constructions Electriques de Charleroi, manufacture and laying of underground dry-core telephone cables between Brussels and Luxembourg (247 kilometres), and between Brussels, Charleroi and Mons (89 kilometres) at a total cost of about £450 000.

INDIAN STORES DEPARTMENT.—Belliss and Morcom, Ltd., compresser set, R.8 150, f.o.r. Khewra; I. Jones, Ltd., electric lamps, R.3 600, f.o.r. Calcutta; W. T. Henley's Telegraph Works Co., Ltd., joint box compound, R.2 127; Russa Engineering Works, fans (ceiling), R.4 680; Jessop and Co., Ltd., motor (shunt wound), R.1 348.

NEW ZEALAND GOVERNMENT.—Metropolitan-Vickers Electrical Co., Ltd., generators, £57 869, and transformers, £15 794; Armstrong, Whitworth and Co., Ltd., turbines, £21 686; and Cory Wright and Salmon (for English Electric Co.), indoor control and switch gear, £5 424, in connection with Waikaremoana hydro-electric scheme.

HACKNEY (LONDON) BOROUGH COUNCIL.—Bruce Peebles and Co., two 1 000 kW Peebles-La Cour motor converters, with necessary automatic features, £3 485 each; and two series wound mid-wire boosters, one coupled to each converter set, with adjustable field diverter, £150 each, for Stamford Hill sub-station (recommended).

GLASGOW CORPORATION.—P. R. Jackson and Co., Ltd., accumulators, for the Tramways Department; C. A. Parsons and Co., Ltd., two 800 kVA transformers for Ann Street sub-station, £634 19s. 5d. each; Bruce Peebles and Co., Ltd., four 200 kVA transformers for Mosspark School, Balornock, Lennox Street and Cumlodden Drive sub-stations, £240 each, and six 400 kVA transformers for Kelvin Hall, McDonald, Ltd., Woodlands Road and Hollins Mill sub-stations, £386 each.

MANCHESTER CORPORATION.—H. Middleton, supply and fixing of electric coal lift at Victoria Square Dwellings, Oldham Road; A. Cooper, supply of an electric food-mixer, for the Public Health Committee; Hadfields, Ltd., Edgar Allen and Sons, Ltd., and Titan Trackwork Co., Ltd., tramway special track work; Equipment and Engineering Co., electric arc welding plant and rail-filing machine; Pirelli-General Cable Works, Ltd., Standard Telephones and Cables, Ltd., and W. T. Glover and Co., Ltd., cable supplies.

LONDON COUNTY COUNCIL.—Alpha Manufacturing and Electrical Co., Ltd., electric light, power and bell wiring and fitting at Wandsworth County School, Putney, £1 160 18s. (recommended). Also tendered: T. Clarke and Co., Ltd., £1 291 15s.; A. E. Humphreys, £1 342 9s.; T. H. Buxton, £1 358 10s.; Gaillard, Robinson and Co., £1 373; Smethurst and Co. (London), Ltd., £1 492 2s. 2d.; A. Hawkins and Sons, £1 539; R. Hunt and Co., Ltd., £1 541; G. E. Taylor and Co., £1 582 12s. 2d.; Morris Electrical Co., Ltd., £2 900.

SALFORD CORPORATION.—W. T. Glover and Co., Ltd., 7 000 yards of l.t. cable of varying sizes, £2 397. Hackbridge Electric Construction Co., Ltd., one 5 000 kVA three-phase transformer unit, £2 305, for Agecroft power station. C. H. Johnson and Sons, Ltd., all-metal scraper conveyor with Crossley engine, £170. Metropolitan-Vickers Electrical Co., Ltd., equipment for new 33 000 V feeder cubicle at Agecroft power station, £2 209, less 2½ per cent. Ferguson Pailin, Ltd., supply and delivery of 33 000 V switchgear for equipping a blank-feeder unit at Frederick Road power station, £1 198 (all recommended).

LEYTON CORPORATION.—A. E. Humphreys, electric light installation at Knott's Green Special School, £227. Also tendered: Alpha Manufacturing and Electrical Co., Ltd., £270; Burdette and Co., Ltd., £316; T. Clarke and Co., Ltd., £300; Commercial Lighting, Heating and Power Co., £325; Douglas Electric Lighting and Power Co., £345; Drake and Gorham, Ltd., £240; Eastern Armature Winding Co., £287; Electric Power Installation Co., £273; Ellis and Ward, Ltd., £399; A. Higginbotham and Sons, £279; Richard Hunt and Co., Ltd., £288; A. Hawkins and Sons, £335; J. Levitt, £335; C. Mortlock, Ltd., £384; Malcolm and Allan, Ltd., £415; Morris Electrical Co., Ltd., £399; S. Mulliner, Ltd., £321; G. A. Weston, £285.

MANCHESTER CORPORATION.—Annual supplies to the Electricity Department:—Electric cookers—Cable Accessories Co., Ltd., Metropolitan-Vickers Electrical Co., Ltd., and Jackson Electric Stove Co., Ltd.; double-pole quick break switches—J. H. Tucker and Co., Ltd., and J. A. Crabtree and Co., Ltd.; single-pole ironclad cut-outs—Siemens and English Electric Lamp Co., Ltd.; l.t. rubber cable—W. Geipel and Co., Ltd., and Callender's Cable and Construction Co., Ltd., for 33 000 V 3-core cable; street lanterns—Simplex Conduits, Ltd., Cable Accessories Co., Ltd., and Wardle Engineering Co., Ltd.; electric vehicle batteries—Chloride Electrical Storage Co., Ltd., and D.P. Battery Co., Ltd.; 40 000 kW turbo-alternator, etc., Barton power station—Metropolitan-Vickers Electrical Co., Ltd.; two water-tube boilers, with super-heaters, economisers, etc., for Barton power station—Babcock and Wilcox, Ltd.; fans—Davidson and Co., Ltd.; motors—Lancashire Dynamo and Motor Co.

Electrifying London Railways.

Advisory Committee's Conclusions as the Result of Recent Inquiries.

THE London and Home Counties Traffic Advisory Committee has prepared two reports dealing with travelling facilities in East London and North and North East London. In regard to East London the Committee is of opinion that electrification of the steam railway lines in the area would afford the speediest means of providing a substantial improvement in the train services, that every effort should be made by the London Midland and Scottish Railway Co. to conclude the work of improving the signalling arrangements upon the section of the Metropolitan District Railway owned by it, that other schemes should precede the construction of a new railway from Liverpool Street to Waltham Cross—e.g., an augmentation of the number of trains from 24 to 28 during the peak hours on the Metropolitan District Railway between Barking and Central London. The provision of a connecting link between the Metropolitan Electric Tramways and the tramways of Walthamstow Urban District Council would be valuable. It is only by the elimination of wasteful, uneconomic competition that it will be possible for any considerable improvements to be effected, particularly in the way of the construction of new railways.

The London Electric Railway Co. should be invited to give serious consideration to the question of extending the Piccadilly Railway to Manor House in the immediate future, and in conjunction with the Metropolitan Tramways Co. examine the proposal for an interchange station at Manor House, with a view to its provision at the earliest practical date. It is recommended that the London Electric Railway Co. should explore the possibility of extending the Piccadilly Railway to Wood Green or Southgate.

The difficulty of passenger transport between the districts north and north-east of Finsbury Park and the Central London area is primarily due to the fact that there has been no adequate increase in through travelling facilities.

The Committee intends to investigate the practicability of a physical connection between the Great Northern and City Electric Railway and the London and North-Eastern Railway Co.'s system at Drayton Park, and the possibility of an extension of the Highgate branch of the London Electric Railway to connect with the London and North-Eastern Railway at East Finchley.

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ELECTRICITY SUPPLY.

Birmingham Corporation Applies for Big Loan—Irish Electrical Schemes—Important Extension Proposed at Brighton.

CLAYTON-le-Moors U.D.C. has decided to invite tenders for an electrical installation at the Council offices.

Sheppey (Kent) Guardians have decided to have an electric light and power installation at the Institution at Minster.

The Electricity Commissioners have sanctioned borrowing powers of £50 000 applied for by Accrington electricity undertaking.

Birmingham Electric Supply Committee proposes to seek sanction to a loan of £400 000 for extensions of the distribution system.

A committee of inhabitants of Clogher is negotiating with Johnston Bros. for a supply of electricity for public lighting in the town.

Burnley Electricity Committee has referred to a sub-committee the question of permitting shop-window lighting at a reduced rate after hours.

Northampton Co.'s Extension.

The Ministry of Transport has agreed to the use by the Northampton Electric Light and Power Co. of overhead cables at Wolverton, New Bradwell and Stony Stratford.

Seaton (Cumberland) P.C. has recommended to the R.D.C. the adoption of an overhead scheme for the supply of electricity to the parish at an estimated cost of £3 992.

The supply of electricity at Whitehead by the Northern Electrical Co. was commenced last week. There are 50 electric street lamps and over 80 householders have applied for supplies of current.

Armagh U.D.C. has approved a scheme prepared by Mr. P. A. Spalding for supplying electricity to the city and the immediate surrounding district. It has been decided to apply for a Special Order to carry out the scheme.

At a recent meeting of Colchester T.C., a proposal to construct a glass roof on the new power station was criticised, but an amendment that the Electricity Committee should reconsider the proposal was defeated by 14 votes to 13.

Liverpool Corporation is recommended by the Power and Lighting Committee to seek the Electricity Commissioners' sanction to the installation of another 25 000 kW turbo-alternator, with auxiliaries, two cooling towers, switchgear, etc., at a cost of about £185 700.

Mr. J. W. Burr, borough electrical engineer of Swansea, advises the Corporation that a scheme to provide electricity for the whole of the borough should be carried out, and he asks for authorisation to prepare such a scheme. So far he has not found a suitable site for a new power station.

The Electricity Commissioners have informed Leeds Corporation that they are prepared to receive a definite application for permission to construct a new generating station on the Redcote Farm estate at Kirkstall. The Town Clerk has been authorised to give notice to terminate tenancies on the estate.

Marylebone (London) Borough Council is recommended to apply to the Electricity Commissioners for permission to borrow £8 400 for transformers, switchgear, etc., in connection with the supply of electricity to the Zoological Gardens, Regent's Park, and £3 800 for cables and switchgear required for increasing the supply to Hampstead Borough Council.

Lichfield Projected Extension.

Lichfield City Council has decided to apply to the Electricity Commissioners for an Order to extend the area of supply so as to include various outside parishes. Whittington R.D.C. has accepted an offer to substitute a charge of 8d. per kWh. for lighting and 2d. for power, in lieu of a guarantee of 8 per cent. of the capital charges for the whole term of the loan for the extension to the parish.

Fulham (London) Electricity and Lighting Committee recommends the Council to adopt the scheme of reorganisation of the staff of the Electricity Department proposed by Mr. A. J. Fuller, Borough Electrical Engineer. It is proposed to appoint a power station engineer (instead of the present station superintendent), an assistant station superintendent, a mains assistant and a meter assistant.

At last week's meeting of Liverpool City Council, the chairman of the Housing Committee, replying to questions as to the four all-electric houses in Lauriston Road, stated that three of the tenants were perfectly satisfied, and the fourth was Mr. Chadwick (the questioner) himself. Electricity was supplied at ½d. per kWh, and 7s. per week was about the average cost of electricity to each tenant.

At a meeting of Ballymoney Chamber of Commerce a letter was read from Portadown Chamber relative to the Bann and Lough Neagh drainage and hydro-electric schemes. It was decided to support both schemes. The chairman said if the hydro-electric scheme were passed Ballymoney would be placed in a favourable position, as they would be in the area of supply on the shortest transmission line.

A deficiency is anticipated on the current year's working of the Hackney (London) electricity undertaking, in consequence of the increased price of coal and reduced output. The Finance Committee, therefore, recommends that application should be made to the Electricity Commissioners for permission to borrow £5 000 for prepayment meter supply installations and £10 000 for cooking and heating apparatus for hire.

Mr. G. Broadhurst, electrical engineer to Clacton U.D.C., has reported to the Electricity Committee that it is necessary to instal additional plant at the electricity works, at an estimated cost of £15 900. He considers it essential to have the new plant working by September of next year. He also proposes to lay a high tension main to Little Holland, at a cost of £8 500. The Council has adopted the proposals, and decided to apply for permission to borrow the money required.

It is understood that Brighton Electricity Department will shortly seek sanction to borrow £2 000 000 for enlarging the power station at Southwick and extending the plant. The output of energy last year was double that of the previous year, and the demand is still rapidly increasing. The new scheme includes proposals for building a large wharf for ships bringing coal, and a water cooling pond which, it is suggested, might be used as a swimming bath. The new machinery will be bought from British firms.

Business Expansion at Blackburn.

Blackburn T.C. has authorised a loan of £105 000, including new electrical services £40 000, mains and sub-stations £50 000, and domestic apparatus £15 000. During the first seven months of the current year the expansion of business largely exceeded the estimate for the full year, there being over 1 500 applications, whilst during last month these numbered 405. The Council has appointed a special committee to consider a proposed extension of the electricity showroom, which was opened not many months ago and has been well supported by the public.

At a recent meeting of Llandudno U.D.C. it was reported that the Nevill Hydro Co. had decided not to agree to the Council's proposal in regard to the suggested installation of prepayment electric meters in hotel bedrooms fitted with electric heating appliances. The Council resolved, however, to adopt the principle of making such installations on application, subject to the undertaking by the applicants to pay annually during five years such sum as will cover the cost incurred by the Council. The Clerk has been instructed to write to the Mines Department stating the the Council fails to see any real reason why the ordinary consumption of electricity (for display and shop window lighting) in the district should not be maintained, having regard to the fact that the current is generated by water power.

The Cambridge Electric Supply Co., Ltd., has put before the Cambridge householders, by means of an announcement in the local Press, the circumstances which restrict the company's efforts to improve and extend its system and preclude it from reducing the price of current. The company says if the Cambridge Corporation will agree to extend the period after which it can exercise its option to purchase the undertaking for another 40 years from the date of the new agreement, the company will forthwith reconstruct and extend its distribution system so as to make it thoroughly up to date, and will either build locally a thoroughly modern generating station of ample power, and with proper provision for extension, or, if found cheaper and equally satisfactory, arrange for a bulk supply from elsewhere, and so soon as the Corporation has agreed to the 40 years' extension, the company will make an immediate and substantial reduction in the price of electricity.

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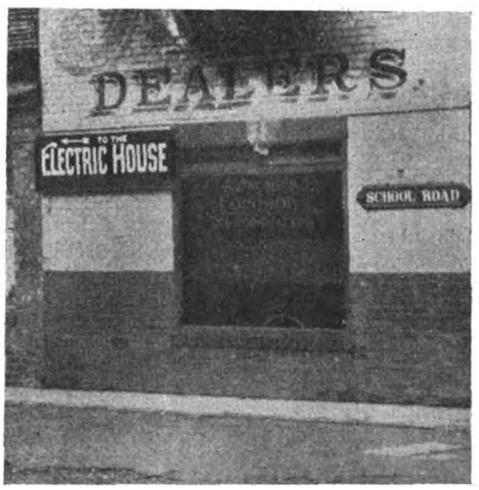
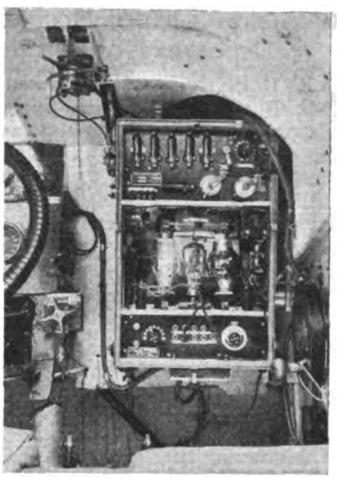
NEWS IN PICTURES

Ald. Mrs. Hammer, who has been elected chairman of the Hackney (London) Electricity Committee, is believed to be the first woman to hold such a position. An enthusiastic worker in extending domestic use of electricity, she makes the fullest use of it in her own kitchen.

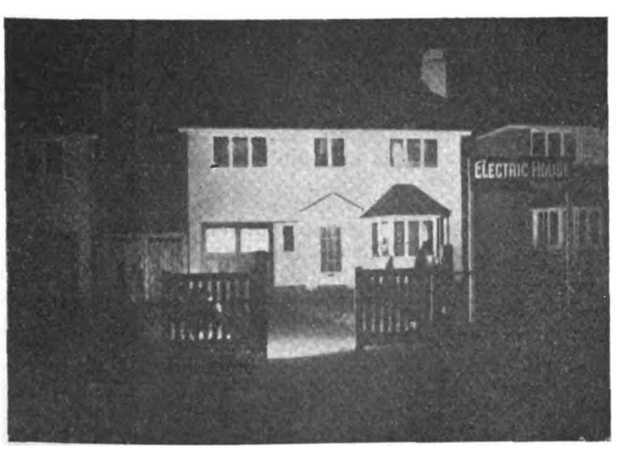


In recent issues we have illustrated various phases of W.O.B. activity in Birmingham. Here is a further example of a signboard situated opposite a tram stopping-place at Hall Green.

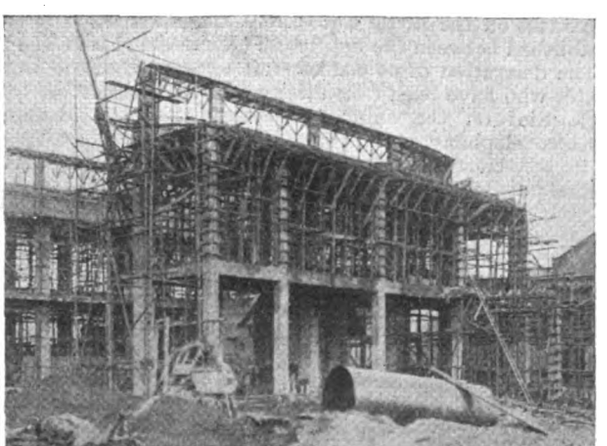


In the pilot's cockpit on one of the Imperial Airways machines is seen a Marconi transmitter and receiver, both of which are housed in the same instrument box and operated by remote control switches. On the right of the picture is the aerial coiled on the aerial winch.

It is very hard to find the E.D.A.—E.L.M.A. Competition Booklets in many electrical windows. Such a criticism, however, could not be applied to this forceful display at the Blackburn Electricity Department's Darwen Street premises.



Demonstration electric houses are contributing towards the success of the W.O.B. Campaign in Birmingham. This picture shows the Erdington house floodlighted at night.



A view showing the rapid progress that has already been made in the construction of the new municipal power station at Peterborough.

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WIRELESS NEWS.

Japanese Trade Prospects for British Exporters of Radio Apparatus.

REVIEWING wireless trade possibilitits in Japan, Mr. R. Boulter, Commercial Secretary, H.M. Embassy, Tokyo (in a report on conditions in Japan issued by H.M. Stationery Office at 2s. 6d.), states that the overstocking of the market which followed the introduction of broadcasting in Japan is still, to a certain extent, in existence. Dealers expect at least a 20 per cent. margin, but few are able to work on this basis. There are really no fixed wholesale and retail prices. Expensive items move very slowly indeed.

There is, however, according to Mr. Boulter, an opening for loud speakers which could be retailed at not more than 20 yen (about 38s.). At present one or two types are being offered, but they are not proving satisfactory. Equally, a market exists for receiving sets giving reasonable results at a moderate price, but the average Japanese cannot afford to pay a high price for a wireless set.

The simpler types of receivers, and also cabinets for more expensive sets, are being made in Japan. In imported goods, American, and to a lesser degree German, apparatus offers the principal competition to be faced by British makers.

The R.M.A. Executive Council.

At the first annual general meeting of the Radio Manufacturers' Association in London on Wednesday, it was announced that 43 firms had already joined the Association. From these the meeting elected the following to serve as Executive Council :—Bowyer-Lowe Co., Ltd. ; Brandes, Ltd. ; Brownie Wireless Co. of Great Britain, Ltd. ; Burndept Wireless, Ltd. ; Climax Radio Electric, Ltd. ; Dubilier Condenser Co. (1925), Ltd. ; Graham Amplion, Ltd. ; Igranic Electric Co., Ltd. ; L. McMichael, Ltd. ; Metro-Vick Supplies, Ltd. ; Mullard Radio Valve Co., Ltd. ; and Radio Instruments, Ltd.

The election of a president was deferred.

Increased U.S. Radio Production.

It is reported that last year the manufactures of radio apparatus in the United States were valued at £34 078 000, an increase of 215·5 per cent. compared with the production in 1923. In 1923 the number of valve receiving sets manufactured was 190 374, and in 1925 it was 2 180 622. The number of radio valves turned out last year was 23 934 658 compared with 4 687 400 in 1923. In 1923 crystal sets, numbering 223 303 and worth £134 000 were professionally made, compared with 112 656 valued at £68 800 last year. The loud speakers manufactured last year were 2 606 866 compared with 623 196 in 1923, the values being £3 832 000 and £1 121 000 respectively. Headphones supplied in 1925 were valued at £453 000 compared with £1 069 000 in 1923 ; transformers, £1 500 000 in 1925, against £785 900 ; rheostats, £417 000 against £191 000 in 1923 ; lightning arresters £101 200 against £84 400 in 1923 ; and miscellaneous parts, £5 595 600 compared with £2 599 900.

Wireless News in Brief.

The Clyde Lighthouse Trustees have approved of the decision of the committee of management to instal a wireless telephone apparatus on the Little Cumbrae. Communication is to be established between the lighthouse on the island and Toward.

The delegation of official wireless experts from the United States who have been consulting with the British Post Office authorities on the subject of establishing a commercial wireless telephony service between London and New York is on its way back to America. It is anticipated that the service will be possible early in the new year.

A Manchester Exhibition.

AMONGST the exhibitors at the National Coal Products Chemical and Engineering Exhibition at Manchester was Electroflo Meters Co., Ltd., who were showing their electric fluid flow meter in distant operation. Other exhibits of electrical interest included those of Geo. Kent, Ltd., and the Thermal Syndicate, Messrs. Negretti and Zambra displayed the latest types of electrical distance thermometers and pyrometers of fume and dustproof type, together with electric alarm thermometers and hygrometers. Bolton's Superheater Co. exhibited a new patent boiler feed pump which utilises the waste heat of the exhaust steam to heat the feed water. The Lea Recorder Co. had a good show of meters and recorders.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

BLACKPOOL Corporation has decided to purchase seven new double-deck, top covered saloon-type tramcars.

A motion to discontinue the Sunday morning tramcar service was defeated in the Hull City Council last week.

It is stated that by the New Year there will be 43 passimeter-equipped stations on the London Underground railways.

Scarborough T.C. has decided not to purchase the local street tramway undertaking. The Council will again have the option to purchase in 1935.

At Bolton T.C. meeting last week a proposal to extend a length of the tram track at a cost of £2 800 met with some opposition, but eventually the proposed expenditure was approved.

A special meeting of Bradford Corporation has approved the promotion of a Bill in the next Session of Parliament to extend the Corporation's powers in regard to the running and maintenance of omnibuses and railless trolley vehicles.

Liverpool Corporation has instructed the Parliamentary Committee to include in the next application to Parliament powers to enable the Corporation to construct several new tramways and a tramway tunnel with approaches beginning in Prince Edwin Street at Kermode Street.

In a broadcast address from the B.B.C.'s Glasgow station, Mr. James Dalrymple, the retiring general manager of the Glasgow tramways, said that if the tramcar was to be able to hold its own it would be necessary for the Glasgow system to spend £1 500 000 on new cars mounted on bogies to give the necessary speed and comfort.

The Hastings and District Tramways Co. has submitted to Hastings T.C. proposals for the substitution of a railless trolley vehicle service for the present rail tramways, and the company proposes to seek Parliamentary sanction to the change. A special committee of the T.C. has reported favourably upon the scheme.

The London Underground Railways Group has approved plans for a new office building to be erected over St. James's Park Station. It will be in the form of a Latin Cross, will cover a large area, and will exceed in height any of the surrounding buildings. Each of the four arms of the "cross" will consist of offices only, without corridors, and the central portion of the building will be occupied by the hall, staircases, lifts and lavatories.

It is stated that the Ministry of Transport is not satisfied with the design of the six-wheeled trolley vehicles constructed by a local firm for Wolverhampton Corporation. The Ministry's inspector is of opinion that the overhang at the rear should be measured from a point midway between the two rear axles, and, upon that basis, the new vehicles are 7½ in. over the length permitted. The vehicle has been tried on the Wolverhampton-Sedgley route, and appears to work satisfactorily.

Balham Station on the new Morden Extension of the Underground Railways has been reopened for traffic this week and the services between the Hampstead and City Tubes have been accelerated so as to allow of a 5-minute service throughout the day, with shorter intervals during peak traffic. Altogether, 112 trains per hour are in operation over the four tracks through Kennington Station, and there are 535 cars running over the Hampstead and City lines, made up into 87 trains. Cheap return fares from Clapham South, Clapham Common and Clapham North to Moorgate or Leicester Square and from Clapham South to Piccadilly Circus (6d. in each case) have been introduced and are available on week-days after 10.0 a.m.

Lord Ashfield, chairman of the Underground Group, explaining to a Press representative why the Underground companies supported the proposal of the Traffic Advisory Committee that there should be a common management of London traffic services and a common fund, said his companies were committed to spend £15 000 000 on extensions and improvements, and they were compelled to pause in their efforts to meet the demand for tube railways until the existing tubes were self-supporting. It was impossible to borrow more money until an assured return could be earned on that money as well as on the present capital. What was wanted was a programme for ten years ahead, which should include extensions of tube railways to districts at present inadequately served and the doubling of lines in central London. He did not think any system of subsidies would be necessary.

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COMPANY NEWS.

Electrical Share Market Quiet—Cornwall Power Co.'s New Issue—City of London Co.'s Figures Not Accepted by Authorities.

QUIETNESS still characterises the market for electrical shares—supply, traction and manufacturing—and our usual comparison of price quotations this week shows few changes compared with a week ago. City of London Electric Lighting ordinary shares are 1s. 3d. down; County of London, on the other hand, have improved to a like extent. London Electric Supply shares at 35s. have eased a shilling, and Metropolitan ordinary 7½d. British Electric Traction ordinary stock has reversed the dividend deduction, but District and Metropolitan Railway ordinary stocks have fallen 1 and ½ respectively. In the equipment department, General Electrics have declined a shilling, to 30s. 6d., and Siemens 7½d. to 28s. 9d. Marconi's remain steady at 16s. 3d.

Last Annl. Divd %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
	Electricity Supply.				
10	Brompton & Kensington Ord. ..	30/-	30/-	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	89	89	100	67
15	Charing Cross Elec. Ord. (£1) ..	46/3	46/3	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	25/-†	25/-†	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	49/1½	50/7½	52/6	20/3
6	,, ,, 6% C.P. ..	23/-	23/-	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	63/9	62/6	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£1)	24/6†	24/6†	104/6	13/-
10	Lon. Elec. Sup. Ord. (£1) ..	35/-	36/-	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	40/-	40/7½	41/6	8/-
4½	,, ,, 4½% C.P. ..	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/6	22/6	23/9	10/1
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/
17½	St. James' & P.M. Ord. (£1) ..	24/6†	24/6†	62/-	22/-
15	W'minster Elec. Sup. Ord. (£1)	25/6†	25/6†	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
6	,, ,, 6% C.P. ..	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	144½	142½	123	24
6	,, ,, 6% Pf. Stk. ..	109	109	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69	69	89½	40
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	77½	77½	102½	50½
3½	Lon. Elec. Rly. Cons. Ord. Stk.	57½	57½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	76½	76½	89	65
4	Lon. Un. Trams. 1st Deb. ..	42½	42½	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	65½	65½	101½	49
5	,, ,, 5% Deb. ..	66½	66½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	61½	62	84½	19
3½	,, 3½ Pf. Stk.	63½	63½	88½	40
3½	,, 3½% Deb.	69½	69½	92½	51
3½	Met. Dis. Rly. Ord. Stk. ..	55½	56½	58	12½
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80½
4	S. Met. Elec. Trams. 4% Deb. ..	68	68	73½	48
5	Yorks. (W.R.) Trams. Ord. ..	12/6	12/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	72	72	87	52½
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	66/10½	66/10½	62/-	26/6
6	,, ,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	22/9	22/9	23/4	19/7
7	,, ,, ,, 7% Deb.	104½	104½	107½	92
10	Brush Electrical Ord.	26/3	26/3	29/-	10/-
‡15	Callender's Cable Ord.	65/-	65/-	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref.	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)	12/9	12/9	28/9½	1/1
7½	,, ,, 1st Pref. ..	22/6	22/6	26/-	5/-
10	Elec. Construction Ord. ..	31/3	31/3	30/4	6/7
7	,, ,, 7% C.P. ..	22/6	22/6	25/3½	16/-
—	English Elec. Ord.	15/-	15/-	29/3	7/3
6	,, ,, 6% C.P. ..	17/6	17/6	21/3	10/6
—	Ericsson Telephones 7% Pref.	21/10½	21/10½	21/-	12/7
6	Ferranti 6% Pref.	19/3	19/3	18/6	16/9
7	,, 7% 2nd Pref. ..	18/9	18/9	19/-	13/9
7½	General Elec. Ord.	30/6	31/6	59/-	13/6
20	W. T. Henley's Ord.	80/-	80/-	86/6	23/3
17½	Johnson & Phillips Ord. ..	56/3	56/3	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	23/9	23/9	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	46/3	46/3	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	28/9	29/4½	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	29½	29½	56/2/6	19
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	74½	74½	87½	60
10	Eastern Ord. Stk.	180½	180½	213½	113/2/6
3½	,, 3½% Pref. Stk. ..	65½	65½	84/17/6	49
4	,, 4% Deb.	77½	77½	103½	60
10	Eastern Extension Ord. (£10) ..	18	18½	21½	10/12/6
4	,, ,, 4% Deb. ..	77½	77½	97½	60
22	Gt. Northern Telegraph (£10) ..	27	27	42/12/6	19
‖10	Indo-European (£25)	47½	47½	59½	25
—	Marconi's Wireless T. Ord. ..	16/3	16/3	9/16/3	20/9
7½	,, Int. Mar.	22/6	22/6	5/11/3	14/11
4	Western Tel. Ord. (£10) ..	17½	17½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	77½	77½	10	60/2/6

‡ Plus share bonus. † Ex share bonus. ‖ Including bonus.

BRAZILIAN TRACTION LIGHT AND POWER CO., LTD.—Quarterly div. 1½ p.c. on cum. pref. shares.

PETTERS, LTD.—Intm. div. on 7½ p.c. cum. pref. shs. for half-year ended September 30th, payable December 20th.

CORNWALL POWER CO., LTD.—Applications have been invited for an issue of 150 000 7 p.c. convertible pref. shs. of £1 each at par.

YORKSHIRE (WEST RIDING) ELECTRIC TRAMWAYS CO., LTD.—Fin. div. on 6 p.c. cum. pref. shs. of 3 p.c. for half-year ending December 31st, 1926.

METROPOLITAN ELECTRIC SUPPLY CO., LTD.—Capital is to be increased to £2 000 000 by creation of additional 500 000 ord. shs., which will be issued to ord. shareholders in proportion of one bonus sh. for each two ord. shs. held. To meet issue, £500 000 of reserve will be capitalised.

WEST INDIA AND PANAMA TELEGRAPH CO., LTD.—Receipts for year ended December 31st, 1925, £48 899, agst. £94 995; working exes., £67 224, net loss £18 326. After providing for deb. int., res. for repairs (£2 500) and depreciation and renewals of c.s. "Henry Holmes" (£4 921), debit blce. is £28 710, making, with deficit brt. fwd. from 1924, total debit blce. £105 800.

OFFICIAL QUOTATIONS.—The Stock Exchange Committee has ordered the following securities to be quoted in the Official List: 148 308 £1 fully paid ord. shs. of Chelsea Electricity Supply Co., Ltd.; 430 000 £1, fully paid, ord. shs. of International Automatic Telephone Co., Ltd.; £27 500 5 p.c. 1st mtge. debs. of International Light and Power Co., Ltd.; 10 000 £1, fully paid, 6 p.c. cum. pref. shs. of the Llanelly and District Electric Supply Co., Ltd.: 503 746 £1, fully paid, ord. shs. of Westminster Electric Supply Corporation, Ltd.

SOUTH AMERICAN ELECTRIC CO.—It is stated that the syndicate which has formed this new company (with a capital of 30 000 000 Swiss francs) includes the Compania Italo-Argentina de Electricidad, Soc. Anon. d'Entreprises Electriques (Ballen), and Brown, Boveri and Co. (Baden). Amongst the directors are Dr. W. Boveri, Mr. R. T. Durran (a director of the A.E.G. Machinery and Apparatus Co., and several Continental and South American electrical companies), and Sir Bernard Greenwell (a director of the County of London Electric Supply Co., Kent Electric Power Co. and South Metropolitan Electric Light and Power Co.).

CITY OF LONDON ELECTRIC LIGHTING CO., LTD.—The directors report that, for reasons for which the company is not responsible, they are not yet able to present a balance sheet showing the financial position of the company under the London Electricity (No. 1) Act, because the authorities concerned have not yet accepted the company's figures At the moment, there appears to be no alternative but to submit the whole case to arbitration. The directors have prepared a balance sheet showing the position of the company as on December 31st, 1925, assuming that all the claims made on behalf of the company are admitted. The revenue account for the year 1925 shows income £799 200, and total expenditure £401 504, leaving balance £397 696. After payment of interest divs. on pref. and ord. shs. and writing off cost of assets demolished (£51 054) and depreciation of physical assets (£21 066), there was a balance of pft. £103 785, which has been added to reserves. With regard to arrangement for co-ordination of generating resources into which the four companies scheduled to the London Electricity (No. 1) Act are required to enter, proposals have been submitted for the formation of a Joint Committee to direct the manner in which the generating stations are to be operated.

Company Meetings.

LISNASKEA ELECTRIC LIGHTING CO., LTD.—At a recent special meeting, the accounts were adopted and a dividend of 5 per cent. was approved. At the annual general meeting, held some time previously, the solicitor, Mr. B. L. Winslow, resigned his post and took exception to the action of the directors in having allotted themselves 600 unpurchased shares without offering them to other shareholders. At the special meeting the new solicitor, Mr. M. E. Knight, stated that the directors' action was perfectly legal.

NORTH WALES POWER CO., LTD.—Mr. K. M. Clarke, presiding at the annual meeting last week, said this company had, at the date of the balance sheet, liquid resources for the

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completion of the construction programme, amounting to about £1 400 000. It was evident that there were many districts in which neither the authorities nor private enterprise were prepared to undertake the task of dealing with a bulk supply, and, with a view to bringing electricity to those districts, they had interested themselves in the formation of a distribution company which was arranging to lay the necessary cables and connections in 16 townships. They were offering the collieries an arrangement by which the company would not only place their resources of power at the collieries' disposal, but if they so desired they would be able to generate electricity with coal at the pit-head and sell to the company, either the whole of the energy they developed, or the surplus after supplying their own needs.

Burma Electric Supply Co., Ltd.—Mr. C. O. Webb, presiding at the annual meeting, said the profit was £26 185, an increase of £4 152. To the working profit were added interest on investments, transfer fees, profit on exchange, and £2 824 brought in, making the total available £33 972, or £31 781 after deducting Indian income tax and contribution to gratuity fund. Interest absorbed £7 200, interim dividend on ordinary shares £4 000, and final dividend (making 8 per cent., less tax, for the year) £4 000; there had been £10 000 placed to general reserve and depreciation, and the amount carried forward was £6 581. The report and accounts were adopted, and resolutions were carried authorising an increase of the capital to £270 000 by the creation of 20 000 new ordinary shares of £1 each, the capitalisation of £20 000 of the reserve and depreciation fund, and the distribution of the same in the form of ordinary shares to the shareholders, in the proportion of one new share for every five ordinary shares held.

Cape Electric Tramways, Ltd.—Mr. L. Breitmeyer, presiding at the annual meeting, said the number of passengers carried during the year on the tramways in Cape Town was 26 890 112, and the receipts were £324 262, increases on the preceding year of 362 927 and £1 154, respectively. In Port Elizabeth 6 128 369 passengers were carried and the earnings were £81 129, increases of 1 102 120 passengers and £9 926. Working expenditure had also been higher. The company had entered into an agreement with representatives of the men fixing wages for the next five years, with the right of revision in case of an unexpected serious revenue shrinkage. They not only had to meet but to anticipate motor-bus competition, and the expenditure consequent upon this had been charged to the accounts. The power station in Cape Town had been inadequate during peak loads, and the extra power required had been purchased from the municipality. To bring the plant up to present requirements would have entailed a large outlay, and it was considered advisable to make arrangements with that body for the supply of all the power required. An agreement to this effect had now been entered into. An agreement had also been concluded with the municipality of Port Elizabeth for supply of current to supplement the output of the company's station. The net profit for the year was £77 929, and, after transferring £20 000 to special reserve and £2 500 to staff benefit fund, the directors recommended a final dividend of 4 per cent., tax free (making 7 per cent. for the year), leaving £11 199 to be carried forward.

New Companies.

Wickham (Maidstone), Ltd.—Cap., £30 000. Manufacturers of and dealers in electrical apparatus, etc. Solicitors: W. C. Cripps, Son and Harries, Tunbridge Wells.

Wickham (Tunbridge Wells), Ltd.—Cap., £30 000. Manufacturers and dealers in electrical apparatus, etc. Solicitors: W. C. Cripps, Son and Harris, Tunbridge Wells.

Electrodes, Ltd.—Cap, £500. Manufacturers and repairers of electrodes for electric arc welding, electrical, wireless and general engineers, etc. Solicitors: Rothera and Sons, 46, Bridlesmith Gate, Nottingham.

General Engineering Co. (Hucknall), Ltd.—Cap., £3 000 To acquire the business of an electrical engineer and contractor carried on by G. K. Burrows at Ogle Street, Hucknall, Notts, as the General Engineering Co.

Dasnieres, Ltd.—Cap., £10 000. To acquire business now carried on as "V. Dasnieres," to carry on business of carbon merchants, dealers in electrodes, etc. Reg. office: 21, Water Lane, Great Tower Street, London, E.C.3.

Greyhound Racing Association, Ltd.—Cap., £5 000. To promote and establish in the U.K. a system of racing greyhounds in chase of an electric hare, etc. Solicitors: Swann, Hardman and Co., 10, Norfolk Street, Strand, London, W.C.2.

Tecta Products, Ltd.—Cap., £100. To manufacture and sell burglar alarms and anti-thief devices protected by patent No. 258 669 granted to L. A. de Becker, and to adopt an agreement with C. C. Fyson. Reg. office: 86, High Street, Crawley, Sussex.

Gedaref Railway and Development Co. (Sudan), Ltd.—Cap., £100. To construct, work, use, etc., railways, tramways, electric and gas works, telegraph, telephones, and other means of communication, etc. Reg. office: Wellington House, Buckingham Gate, London, S.W.1., (Public company).

Radioptics, Ltd.—Cap., £1 000. Manufacturers and importers of and agents for dynamos, magnetos, accumulators, and batteries; manufacturers, importers and distributors of and dealers in wireless instruments, sets and parts, electrical fittings and apparatus, etc. Reg. office: Spon End Works, back of No. 53, Spon End, Coventry.

Electracts, Ltd.—Cap., £1 000. To acquire business of a consulting and contracting electrical engineer carried on by W. T. F. Andrews at 10, Spring Street, Paddington, W.2, as "Henderson and Lawson," and to carry on the business of electricians, electrical engineers, manufacturers of telephones and telephonic apparatus, etc.

C. A. Sothers, Ltd. Cap., £1 000. To acquire the business of an electrical engineer carried on by C. A. Sothers, at 156, Hockley Hill, Birmingham, and to carry on the same and the business of wireless, mechanical and general engineers, manufacturers of and dealers in electric, magnetic, telephonic, telegraphic, wireless and other appliances, electrical and wireless plant, etc.

Metal and Chemical Prices.

Tuesday, December 7th.

		Price.	Inc.	Dec.
***Copper*—**				
Best Selected	per ton	£63 0 0	—	7s. 6d.
Electro Wirebars	,,	£64 10 0	—	15s. 0d.
H.C. Wire, basis	per lb.	9¾d.	—	⅛d.
Sheet	,,	9⅞d.	—	—
***Phosphor Bronze*—**				
Wire (Telephone) basis	per lb.	1s. 0¼d.	—	⅛d.
***Brass* 60/40—**				
Rod, basis	per lb.	7½d.	—	—
Sheet, basis	,,	10¼d.	—	—
Wire, basis	,,	10¼d.	—	—
***Pig Iron*—**				
Cleveland Warrants	per ton	£4 7 6	—	£1 17 6
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 0 0	—	—
***Lead Pig*—**				
English	,,	£30 5 0	—	10s. 0d.
Foreign or Colonial	,,	£28 15 0	—	12s. 6d.
***Tin*—**				
Ingot	,,	£314 0 0	—	£6 5 0
Wire, basis	per lb.	38. 11½d.	—	¼d.
Aluminium Ingots	per ton	£112 0 0	—	—
Spelter	,,	£33 2 6	—	12s. 6d.
Mercury	per bottle	£17 15 0	—	—

***Sulphur* (Flowers)—Ton** £11 15 0 ***Sodium Chlorate*—Per lb. 2¼d.**
,, (Roll-Brimstone)—,, £10 10 0 ***Sulphuric Acid* (Pyrites, 168°)**
***Copper Sulphate*— ,,** £25 to £25 10s. **per ton, £6 15 0**
***Boric Acid* (Crystals) ,,** £37 ***Sodium Bichromate*—Per lb. 3¼d.**
***Rubber*—Para fine, 1s. 5¼d.; plantation 1st latex, 1s. 6¼d.**

The metal prices are supplied by British Insulated Cables Ltd., and the rubber prices by W. T. Henley's Telegraph Works Co., Ltd.

The Lead Market.

Prices Touch Lowest Ebb—Prospect of Better Demand in New Year.

Arrivals of lead during November (James Forster and Co. state in their latest lead market report) were not as large as generally anticipated, the total being about 20 000 tons, against 23 320 tons in October. Consumption, however, is now at its lowest ebb, and this explains why, with only moderate arrivals, there has been almost a glut of lead.

With the coal strike virtually settled, it is considered that the worst of the fall in prices has been seen, and a better demand for lead and lead products is anticipated after the turn of the year.

Closing prices on December 4th were £28 15s. for December and £29 3s. 9d. for March, a fall on the week of 12s. 6d. and 7s. 6d. a ton respectively.

Appointments Vacant.

An assistant district engineer is required in the Singapore Municipal Electricity Department.

A resident engineer is required for an electricity supply station in India. Applications to Martin and Co., 6 and 7, Clive Street, Calcutta.

Applications are invited for the position of head of the Electrical Engineering Department of St. Helens Municipal Technical School. Forms from the Secretary, Education Offices, St. Helens.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

BEDWORTH BATTERY CO., Leicester Road, Bedworth, wireless dealers. £13 13s. 6d. October 28th.

COOK, (M. R.) AND SONS, 13-15a, Southchurch Road, Southend-on-Sea, wireless dealers. £27 6s. 10d. October 28th, and £10 10s. 6d. October 27th.

FREEMAN, Mrs. (trading as K. FOOT), Crown Works, Poet's Road, Highbury, manufacturer of wireless materials. £37 7s. 11d. October 26th.

HARKO, LTD., 172, Bishopsgate, E.C., electricians. £20 0s. 2d. October 18th.

RADIO SUPPLIES, Finedon, Wellingborough, wireless dealers. £11 8s. 2d. October 25th.

STEPHEN BROS., 83, Stretford Road, Manchester, wireless dealers. £50 2s. October 8th.

Deeds of Arrangement.

CASS, William Henry, 6, Park Place and 7, Beechwood Terrace, Burley, Leeds, electrical, mechanical and general engineer. Filed November 24th. Trustee, C. H. Baker, Standard Buildings, City Square, Leeds, accountant. Liabilities unsecured £334; assets, less secured claims, £140.

SMITH, Samuel, 45, Lapwing Lane and 117, Burton Road, West Didsbury, Manchester, electrical engineer. Filed November 27th. Trustee, R. A. Eccleston, 2, Leamington Avenue, West Didsbury, I.A. Liabilities unsecured, £400; assets, less secured claims, £230.

Receiverships.

EXCELSIOR MAGNETO AND IGNITION CO., LTD. C. R. W. Menzies, of 2, Mount Street, Manchester, C.A., was appointed receiver and manager on November 29th, 1926, under powers contained in debenture dated October 5th, 1922.

UNIQUE WIRELESS CO., LTD. E. E. Jennings, of 3, Baker Street Chambers, Baker Street, W.1, was appointed receiver on November 23rd, under powers contained in debenture dated July 16, 1926.

WILSON AND CROWE, LTD. C. H. Shelvoke, of 1, Newhall Street, Burmingham, was appointed receiver and manager on November 19th, under powers contained in debenture dated August 24th, 1926.

Mortgages.

[NOTE.—*The Companies Act of* 1908 *provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

ATTAIX, LTD., Southampton, manufacturers of electrical appliances.—Registered November 16th, mortgage, to Bank; charged on 106, High Street, Southampton, with fixtures, etc.

BRITISH DI-ELECTRIC CO., LTD., London, S.W.—Registered November 9th, £1 000 debentures (filed under sec. 93 (3) of the Companies (Consolidation) Act 1908), present issue £150; general charge.

CITY OF LONDON ELECTRIC LIGHTING CO., LTD.—Registered November 20th, Trust Deed dated November 19th, 1926, securing £600 000 consolidated debenture stock; general charge (except uncalled capital). *£900 000. April 8th, 1925.

CLEARTRON RADIO, LTD., London, S.W.—Registered November 15th, debenture to Bank; general charge.

NORTHAMPTON ELECTRIC LIGHT AND POWER CO., LTD.—Registered November 17th, £286 000 debenture stock (secured by Trust Deed dated November 9th, 1926, and inclusive of £86 000 secured by Deed dated June 2nd, 1924); general charge. *£200 000. March 4th, 1926.

PERAK RIVER HYDRO-ELECTRIC POWER CO., LTD., London, S.W.—Registered November 18th, £1 350 000 participating debenture stock and premium of 5 per cent. (secured by Trust Deed dated November 12th, 1926); charged on a certain concession etc., also general charge (subject to charge to be created to secure £1 250 000 guaranteed debenture stock).

PRITCHETT AND GOLD AND E. P. S. CO., LTD. (late AMALGAMATED FIRMS, LTD.), London, S.W., electricians.—Registered October 20th, £18 000 charge, to Samuel Williams and Sons, Ltd, 8, Lloyd's Avenue, E.C.; charged on property at Chequers Lane, Dagenham. *Nil. April 15th, 1926.

STEARN ELECTRIC CO., LTD., London, S.W.—Registered November 3rd, £2,000 debentures, dated October 20th, 1926, part of £10,000; general charge. *£7 500. October 21st, 1926.

Satisfactions.

GENERAL ELECTRIC CO., LTD., London, W.C.—Satisfaction registered November 13th, £45 900, part of amount registered July 26th, 1921.

GRAVESEND AND NORTHFLEET ELECTRIC TRAMWAYS, LTD.—Satisfaction registered November 3rd, £39 235, part of amount registered April 25th, 1903.

MARCONI'S WIRELESS TELEGRAPH CO., LTD., London, W.C.—Satisfaction registered November 5th, £75 453, part of amount registered November 23rd, 1922.

WORTEX MANUFACTURING CO., LTD., London, W., manufacturers of electrical apparatus.—Satisfaction registered November 22nd, £1 000, registered July 1st, 1926.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Company Winding-up Voluntarily.

ST. HELENS ELECTRIC LIGHTING CO., LTD. By special resolution, October 22nd, confirmed November 12th, C. H. Jones, Broad Sanctuary Chambers, Westminster, S.W.1, appointed liquidator. Meeting of creditors at liquidator's office on Tuesday December 14th, at 12 noon. All creditors have been, or will be paid in full.

Notices of Dividends.

RENNIE, John George Fowler, 10, Bridge Street, Andover, Southampton, electrical engineer. First and final dividend, 2s. 7¾d. per £, payable December 3rd, Official Receiver's office, City Chambers, Catherine Street, Salisbury.

TREND, James Anthony, 31, Chapel Street, Luton, Beds, electrician. First and final dividend, 10s. 3d. per £, payable December 6th, offices of Keens, Shay, Keens and Co., 11, George Street West, Luton.

Notices of Intended Dividends.

ATKINSON, Herbert Henry, 33, Princess Avenue, Old Trafford, Manchester, electrical engineer. Last day for receiving proofs, December 11th. Trustee, J. G. Gibson, Byrom Street, Manchester, Senior Official Receiver.

HORNE, Peter William, 260, Linthorpe Road, Middlesbrough, trading as HORNE BROS., electrical engineer. Last day for receiving proofs, December 13th. Trustee, C. L. Townsend, 80, High Street, Stockton-on-Tees.

PARKER, Charles Elliott Fowlds, "Greendale," Privett Road, Gosport, Hants, electrical engineer. Last day for receiving proofs, December 11th. Trustee, H. Ashton, 87, High Street, Portsmouth.

WOOD, Henry Lunnon, 7, Taswell Road, Southsea, Hants, electrical engineer. Last day for receiving proofs, December 14th. Trustee: H. Ashton, 87, High Street, Portsmouth, Official Receiver.

Order Made on Application for Discharge.

JAMES, Leonard Lloyd, 62, Canterbury Street, Gillingham, Kent, also 137, High Street, Rochester, Kent, trading as W. G. James and Son, electrical engineer. Discharge suspended for two years, until November 10th, 1928.

Partnerships Dissolved.

BRUN RADIO AND ENGINEERING CO. (formerly the D.S.F. CO.) (William DUGDALE and Joseph FOXCROFT), electrical engineers and wireless experts, 88, Manchester Road, Burnley, by mutual consent as from November 13th, 1926. J. Foxcroft will continue the business in his own name and on his own account.

ELYSIUM GARAGE AUTO AND ELECTRICAL ENGINEERS (William Alfred CATHERWOOD and Sidney Herbert AUBREY), motor engineers, 60A, High Street, Streatham, by mutual consent as from July 31st, 1926. Debts received and paid by W. A. Catherwood, who continues the business.

PARSONS AND SOTHERS (Howard PARSONS and Charles Arthur SOTHERS), electrical engineers, 156, Hockley Hill, Birmingham, as from October 1th, 1926. All debts received and paid by C. A. Sothers, who will continue the business.

SUTTON AND CO. (E.) (Mary Adelaide Elsie LOWER and Eland SUTTON), electrical engineers and contractors, and inventors and patentees, and electrical massage and wireless engineers, Northgate, Darlington, by mutual consent as from November 1st, 1926. Debts received and paid by E. Sutton, who will continue the business in his own name.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London. W.C.2, at 1s. each.

Applications for Patents.

November 8th.

28 039 British Thomson-Houston Co., Ltd. Geared turbine installations. (6/11/25, U.S.)
28 040 British Thomson-Houston Co., Ltd., and A. G. Salisbury. Electric starting mechanism for engines.
28 048 Cie Franc. pour l'Exploitation des Procedes Thomson-Houston. Voltaic cells, etc. (12/11/25, France.)
28 014 M. Dewhurst. Electromagnetic brakes.
28 049 Dixonia, Ltd. Electric lamp holders.
28 073 G. Forbes. Safety switching devices.
28 042 N. Guagliumi and G. Muratori. Burglar alarms, etc.
28 067 Nalder Bros. and Thompson, Ltd., and F. H. Nalder. Electric measuring instruments.
28 056 Radiofrequenz Ges. Device for indicating frequency of oscillations. (7/11/25, Germany.)
28 057 Radiofrequenz Ges. Selective indicator for reception of electrical oscillations. (7/11/25, Germany.)
28 058 Radiofrequenz Ges. Piezo electric resonance relay. (7/11/25, Germany.)
28 045 R. J. Rodd. Incandescent hand lamps.
27 979 E. Selby. Tramcar trolley heads.
27 982 L. O. Sparks. Aerial lightning arrester.
28 114 W. A. Stevens. Earthing device for frames of railless trolley vehicles.
28 019 R. C. Wood. Devices for controlling electrical apparatus.
28 060 G. de L. Wooldridge. Electric bulbs for vehicle head lamps.

A reproduction of the fine double-crown coloured poster which has been prepared by the Hart Accumulator Co., Ltd., for use by wireless dealers this winter.

November 9th.

28 179 W. E. Beatty (Western Elec. Co.). Electric remote control systems.
28 152 D. G. Bower and E. L. Bower. Electrical resistances.
28 180 British Thomson-Houston Co., Ltd., and T. H. Kinman. Radio receiving circuit.
28 138, 28 139 Ferro Arc Welding Co., Ltd., and B. Turner. Electrodes, etc.
28 161, 28 162 R. L. Howard-Flanders and W. M. Rolph. Wireless receiving apparatus, etc.
28 199 L. D. Macgregor and E. P. Willdern. Wireless receivers.
28 189, 28 190, 28 191 Metropolitan-Vickers Electrical Co., Ltd., and E. Y. Robinson. Vacuum electric tube devices.
28 163 H. Nielson. Stabilising compound dynamos.
28 204 A. Rogers. Variable condensers.
28 171 Telefonaktiebolaget L. M. Ericsson. Fine adjusting d vices for regulating members. (1/6/26, Sweden.)
28 172 Telefonaktiebolaget L. M. Ericsson. Variable condensers. (22/7/26, Sweden.)

November 10th.

28 315 A. Bray and G. Bray and Co., Ltd. Electrical connecting devices.
28 296 British Thomson-Houston Co., Ltd. Electric control systems. (10/11/25, U.S.)
28 256 M. H. Goldstone. High tension battery eliminators.
28 304 T. E. Houghton and United Alkali Co., Ltd. Control of a.c. induction motors.
28 297 General Electric Co., Ltd. (A. Just). Cathodes for thermionic valves.
28 266 B. H. Lefson, J. Mirrey and A. Reyrolle and Co., Ltd. Oil-break switches.
28 340 M. Levenger and S. D. White. Switch plugs.

November 11th.

28 362 B. J. Axten. Television system.
28 412 E. W. Baker and A. E. Lomas. Electric signalling and recording devices.
28 418 British Thomson-Houston Co., Ltd. Electric regulating apparatus. (18/11/25, U.S.)
28 419 British Thomson-Houston Co., Ltd., and H. Drechorn. Alternating current commutator motors.
28 399 H. Causton, E. C. Gardiner and E. C. Roderick. Electric resistances.
28 443 H. L. Down, F. F. Fuller and C. Leaver. Thermionic valves.
28 420 Dubilier Condenser Co. (1925), Ltd. Electric condensers, etc. (12/11/25, Germany.)
28 431 Eastern Telegraph Co., Ltd., and H. V. Higgitt. Calling devices for electric telegraphy.
28 408 A. H. Brackensey, and Franco-British Electrical Co., Ltd. Reflecting devices for advertising signs, etc.
28 413 General Electric Co., Ltd., R. J. Kaula and F. G. Quance. Electric couplings.
28 392 A. G. Lobley and H. Wiggin and Co., Ltd. Jointing resistance strip for electric furnaces.
28 393 A. G. Lobley and H. Wiggin and Co., Ltd. Electric furnaces.
28 442 S. C. Miller. Cathodes of thermionic valves.
28 363 J. K. M. Roberts. Wireless oscillator and amplifier.
28 383 A. Wildes. Apparatus for radio reception.

November 12th.

28 557 Sir W. G. Armstrong, Whitworth and Co., Ltd., and E. Windle. Electric furnaces.
28 536 M. R. Balsera. Thermionic lamps. (12/11/25, Spain.)
28 572 R. M. Balston and G. Gilliver. Electrical sounding devices.

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Friday, December 10th (To-day).

Electrical Trades Benevolent Institution (North-East Coast Section).—Old Assembly Rooms, Newcastle. 8th Annual Ball.

Liverpool Engineering Society.—9, The Temple, Dale Street. Joint meeting with the Institution of Mechanical Engineers. The Fifth Report of the Marine Oil-Engine Trials.

Physical Society of London.—Imperial College of Science and Technology, South Kensington, London. Papers by Mr. F. Wenner on "The Principle Governing the Distribution of Current in a System of Linear Conductors," and Mr. A. Campbell on "A Capacitance Bridge of Wide Range and a New Inductometer." 5 *p.m.*

Institute of Transport (Western Local Section).—Bristol University. Paper by Major F. Bustard on "The Internationalising of European Communications." 5.30 *p.m.*

Institution of Mechanical Engineers.—Storey's Gate, St. James's Park, Westminster. Fifth Report of the Marine Oil-Engine Trials Committee. 6 *p.m.*

Institution of Electrical Engineers (London Students' Section).—Automatic Training School, King Edward Buildings, General Post Office. Paper by Mr. F. I. Ray on "Automatic Telephony." 6.30 *p.m.*

Junior Institution of Engineers.—Institution, 39, Victoria Street, Westminster. Lecturette on "The Determination of Temperature in Cylinders of Internal Combustion Engines," by Mr. C. E. Foster. 7.30 *p.m.*

Saturday, December 11th.

Association of Mining Electrical Engineers (South Wales Branch).—South Wales Institute of Engineers, Park Place, Cardiff. Paper by Mr. W. G. Hardie on "General Colliery Engineering." (Postponed from December 4th.) 6 *p.m.*

Institution of Electrical Engineers (London Students' Section).—Visit to the "News of the World" printing works. 6.30 *p.m.*

Monday, December 13th.

Institute of Transport.—Queen's Hotel, Birmingham. Paper by Mr. F. A. Boyce on "Road Passenger Vehicle Design." 6 *p.m.*

Institution of Electrical Engineers (Mersey and North Wales—Liverpool Centre).—The University, Liverpool. Paper by Messrs. H. W. Edmundson and G. B. Robertson on "The Making of a Radio Valve." 7 *p.m.*

Institution of Electrical Engineers (North Eastern Centre).—Armstrong College, Newcastle-on-Tyne. Paper by Messrs. J. R. Beard and T. G. N. Haldane on "The Design of City Distribution Systems, and the Problem of Standardisation." 7 *p.m.*

Institution of Electrical Engineers (London Students' Section).—Institution of Mechanical Engineers, Storey's Gate, Westminster. Paper by Mr. E. H. Lewis on "Payment by Results." 7 *p.m.*

Tuesday, December 14th.

Electrical Contractors' Association (Leicester Branch).—Corridor Chambers Ordinary meeting. 2.30 *p.m.*

Institution of Electrical Engineers (North-Western Centre).—Engineers' Club, Albert Square, Manchester. Joint meeting with the Institution of Post Office Electrical Engineers. Paper by Mr. G. F. O'dell on "An Outline of the Trunking Aspect of Automatic Telephones." 7 *p.m.*

Institution of Electrical Engineers (Scottish Centre).—Royal Technical College, Glasgow. Paper by Messrs. J. R. Beard and T. G. N. Haldane on "The Design of City Distribution Systems, and the Problem of Standardisation." 7.30 *p.m.*

Wednesday, December 15th.

Electrical Association for Women.—Visit to Electric House, Croydon. 3 *p.m.*

Institution of Electrical Engineers (North Midland Centre, Sheffield Sub-Centre).—Royal Victoria Hotel, Sheffield. Paper by Mr. G. H. Fletcher on "Electric Locomotive Drive." 7.30 *p.m.*

Thursday December 16th.

Institution of Mechanical Engineers (Manchester Branch).—Paper by Mr. T. A. F. Stone on "Electric Locomotives: A Method of Classifying, Analysing and Comparing their Characteristics."

Institution of Mechanical Engineers (Yorkshire Branch).—Leeds. Chairman's Address by Mr. J. H. Barker.

Electrical Contractors' Association (Liverpool Branch).—Ordinary meeting. 6 *p.m.*

Institution of Electrical Engineers.—Savoy Place, Victoria Embankment, London. Paper by Col. E. Mercier, "Notes on the 60 000 V Underground Network of the Union d'Electricité." 6 *p.m.*

Paisley Association of Electrical Engineers.—Town Hall. Discussion on "Home Lighting Campaign," led by Mr. W. Blair Smith. 7.30 *p.m.*

Electrical Society of Glasgow.—30, Gordon Street. "Notes from the Diary of an Electricity Salesman," by Mr. G. H. Rowbottom. 7.30 *p.m.*

Friday, December 17th.

Birmingham Electric Club.—Grand Hotel, Colmore Row. Annual meeting. 7 *p.m.*

Electrical Development Association.—Royal Society of Arts, John Street, Adelphi, London. Third E.D.A. Conference, "Secrets of the Selling Art." Speaker, Mr. G. S. Francis. 7.30 *p.m.*

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THE ELECTRICIAN

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The Electrician.

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Christmas Holidays.

The Editorial, Advertising and Publishing Offices will be closed from 4 p.m. on Friday, December 24th, to 9 a.m. on Tuesday, December 28th.

THE COMMISSIONERS' REPORT.

THE annual report of the Electricity Commissioners for the year ended March 31st, 1926, was issued on Monday and is the sixth of the series. It is rightly remarked that the outstanding feature of the period covered was the announcement of the Prime Minister in January of the proposals of the Government with regard to electrical development. This was followed, of course, by the introduction of the Electricity (Supply Bill) 1926 and the publication of the report of Lord WEIR'S committee. In their fourth report the Commissioners complained that the powers given them in the Electricity (Supply) Act of 1919 were insufficient to enable them properly to carry out the provisions of that measure. The Electricity (Supply) Act of 1926, for so it may now be described, is an attempt to remove those disabilities. That such a course is necessary is amply evidenced by the account given in the present report of the revived attempts to reorganise the Aire and Calder District. Following the withdrawal of the Yorkshire Power Co. from a co-operative scheme, the Conference of Local Authorities urged that the establishment of a Joint Electricity Authority should be proceeded with, but as the matter had not been advanced to a stage at which the formulation of definite proposals for reorganisation was practicable, it was necessary to wait and see what bearing the Government proposals would have on future developments. Suggestions, which were made for the interconnection of the principal generating stations in the district, also led to nothing, and again therefore a much needed reform will have to wait until the Central Electricity Board can get to work.

That is one phase of the immediate problem which awaits those who are concerned with the development of electricity supply in this country. Another phase is disclosed by the highly interesting analyses given of the position in the eight districts in which some form of Joint Electricity Authority, using this as a convenient general term, has got to work. South-East Lancashire, for instance, is a highly industrialised area, and the electrical progress that has been made in it is good. At present 95 per cent. of the population of the district is located within areas where an electricity supply is available, but only 55 per cent. of the total area is in that position. In the North Wales and South Cheshire District, which is, of course, of a much more rural character, only about 35 per cent. of the population could at present be supplied with electricity, and the electrified areas comprise the very small proportion of 4·7 per cent. of the whole. In London, again, 99 per cent. of the population is in a distribution area and 85 per cent. of the whole district is electrified. Considering that even in this district there are considerable rural areas this is not an unsatisfactory result, though the figures as a whole once again show the need for the consideration of the whole problem on national lines. It also shows the need for a great deal of intensive work in those areas in which a supply is available.

Turning to a pleasanter side of the picture it is gratifying to find that the uncertainty caused by impending legislation, an uncertainty that is now happily been removed, has not prevented considerable progress being made. The electricity generated during the year increased from 7 415·3 to 8 122·9 million kWh, or about 14·2 per cent. The increase over the 1920–21 figures is about 60 per cent., and, what is equally important, that increased output has been accompanied by progressive economy in the average consumption of fuel per kilowatt hour generated. Again, the aggregate capacity of new generating plant sanctioned during the year amounts to 585 700 kW, as against 480 000 kW in the previous year, and this at a time when stagnation was supposed to have set in owing to Government interference. Since January, 1920, 2 821 693 kW of new plant has been sanctioned, though this has been set off to some extent by the displacement of obsolete equipment. Some slowing up is, however, visible as regards new stations. Only one consent for the establishment of a large station, that at Oldham, was issued during the year. On the other hand it is obvious that this is only temporary, as applications are pending from many parts of the country.

Perhaps, however, the figures for sanctions to borrowing for electricity purposes by local authorities afford the best indication of the direction in which progress has mainly been made. The total amount sanctioned during the

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year was £9 685 301. Of this £3 055 930, or 31·6 per cent., was for plant and £5 212 368, or 53·8 per cent., was for mains and services. Comparative figures show in fact that since 1920 an increasing proportion of the loans sanctions have been for the latter purpose and, making due allowances, this indicates that the substantial programmes undertaken to overtake arrears of development during the war have now been completed and that increasing attention is being given to the development of the distribution network. In the near future this is likely to be the main concern of municipal undertakings, and we hope that it will be vigorously pushed forward. We note with interest that while in 1920–21 the loans for wiring consumers' premises and for domestic apparatus for hire were £2 500 and £4 450 respectively, in 1925–26 the figures had risen to £50 002 and £83 795 respectively. These are indications of increasing enterprise which is highly to be commended.

Space only permits us to refer to two other points. One concerns policy and is likely to become increasingly important in future. The Weir Report indicated the advantage of distribution powers being exercised over large areas, but where this is done the schemes propounded sometimes clash with bodies who are already supplying without statutory powers. Legally such undertakings have no status, and the Commissioners would not therefore be disposed to refuse the grant of statutory powers for a well considered scheme of distribution merely by reason of the fact that supplies were being given by non-statutory bodies in a part of the area. Opportunity has, therefore, been given for negotiation or for those concerned to regularise their position. This is all part of a policy which envisages electricity supply generally being placed on a sounder basis.

The other point concerns the Commissioners themselves. Not only are they concerned with high policy, and the next few months will see a large, if temporary, addition to their work in this field, but they have to deal with multifarious details so that the duties imposed upon them by the various Acts may be adequately performed. All this is necessary to the well-being of the industry. They and their staff are, therefore, entitled to more gratitude than they often receive. It should be easier to distribute this gratitude for the staff is not very large.

Current Topics.

The Electricity (Supply) Act, 1926.

THE Electricity (Supply) Bill, 1926, received the Royal Assent on Wednesday, and thus, after the closest of examinations, becomes law. It is a testimonial, both to those who laid down its broad outlines and to those who drafted it, that it has emerged from its long-drawn-out ordeal with so little change. Amendment and re-amendment went on up to the very last and a careful comparison between the Bill as introduced and the final document will be necessary to discover exactly what alterations have been made. We hope to give such an analysis next week. For the rest the House of Lords read the Bill a third time after a pessimistic speech by Lord MONTAGU and after Lord PEEL had pointed out that "this country was compact and industrialised and should be able to produce electricity usefully and cheaply." On Monday and Tuesday the Commons devoted much consideration to the Lords' amendments and agreed with most of them. Thus an interesting chapter in electrical history is closed and a new one opened. We have always supported this measure, for we have realised the essential soundness of its broad principles, and we are optimistic of the results. Much depends on the personnel of the Central Electricity Board and perhaps more on the future attitude of the supply industry. But given goodwill there can be no doubt that progress will be greatly accelerated. As Mr. R. P. SLOAN has wisely said, all concerned must now do their best to make the Act as great a success as possible.

Twenty-Five Years of Radio.

ON December 12th, 1901, Mr. MARCONI sat in a room of a disused barracks on Signal Hill, St. John's, Newfoundland, and heard through a telephone sounds constituting evidence that signals from Poldhu in Cornwall had been projected into space and crossed the Atlantic. Within the last few weeks representatives of the American Telegraph and Telephone Co. have visited this country to arrange details of a radio-telephone service by means of which subscribers in London will be able to be connected with subscribers in New York. In the meantime also world wide telegraphic radio communication has been established and broadcasting has become a service of which everyone can take advantage with the minimum of personal effort and technical knowledge. This is a wonderful, even an awe-inspiring result, for twenty-five years' work, and deserves that a tribute should be paid to those earnest and painstaking investigators, including primarily Mr. MARCONI himself, who has made all this possible. This semi-jubilee comes with appropriate coincidence at a time when Mr. MARCONI has opened up the prospect of using the short beam system for long distance radiotelegraphy and has provided means whereby the most remote parts of the earth can be brought to our doors. The effect of this not only on the comity of nations, but on social and business intercourse cannot yet be gauged with accuracy; that it will be very profound no one can doubt. We do not want to speak to Mars, but it is not unimportant that we should know with the minimum delay what our fellow creatures on the other side of the world are doing and thinking.

The Scientific Basis.

FROM the scientific point of view the most important result of Mr. MARCONI'S 1901 experiments was to establish that the curvature of the earth was no bar to the transmission of long distance wireless signals. Much earlier work of a theoretical character had been done by CLERK MAXWELL and others and HERTZ'S and LODGE'S experiments with an open radiating oscillator and nearly closed circuit speech receiver had opened the door of practice. Another important improvement, due to Mr. MARCONI, was the earthing of the HERTZ oscillator and placing it in a vertical instead of a horizontal position; and the production of a transmitter and receiver the details of which are given in the famous "four sevens" patent of 1900. On another page of this issue we give some details, in Mr. MARCONI'S own words, of these first transatlantic experiments and some photographs of the original plant and equipment. Since then of course a great deal has been done, the principal achievement being FLEMING'S discovery of the oscillating valve. What of the future? Will the advances of the next twenty-five years be as great as they have been in the past. They can hardly be as spectacular. Mr. MARCONI'S own opinion is that during the next twenty-five years there will probably be almost as great a development in the means of obtaining directional wireless transmission and reception as there has been in other directions during the last twenty-five years. In addition television may become an actuality, and that broadcasting will develop greatly may very well be expected.

A Pleasing Contrast.

THOUGH during the coal strike the supply of electricity was maintained in the face of great economic and commercial difficulties, it is satisfactory to find that in only a few cases has it been necessary to raise its price, and generally where this course has been taken the question of reducing it again is already under consideration. In the case of bulk supply contracts, either to distributing undertakings or to large private consumers, a coal clause is often included, and its operation will unfortunately cause the price to have an

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upward tendency. The effect on the total cost is however not likely to be very large, and may well be counteracted by economies achieved in other directions. On the other hand, not only has the price of gas been pretty generally raised—but is still being raised. The reason given is that the companies have had to contract ahead for large supplies of foreign coal at high prices, and will not be able to take advantage of the reduction in British coal prices until these contracts run out. It may be doubted, however, whether these contracts are so rigid as might appear. Our information is that delivery dates were disregarded by foreign shippers, and that the supply has only become regular now it is no longer required. The position is probably complicated by the position in the bye-products market. However, it is not for us to grumble. The public are still showing a reluctance to return to the use of raw coal in the house. This is not altogether a matter of price. They have found that both electricity and gas are more convenient. Now that gas ceases to be so attractive in cost, a further swing towards the greater employment of electricity may be expected.

Telephone Progress.

"The Telegraph and Telephone Journal" gives some interesting data regarding the progress of the telephone system in this country. On September 30th, 1926, 1 444 302 stations were working, of which 507 127 were in London, 782 856 in the provinces, 135 502 in Scotland, and 18 817 in Northern Ireland. During the month of September 3 569 telephones were added in London, and 6 116 in the provinces, while one new exchange was opened in London, and 17 in the provinces. At that date there were 962 exchanges operating under the Rural Development Scheme, and 9 941 rural parties lines, while 787 rural railway stations were connected with the exchange. This is satisfactory so far as it goes, but more is needed, and we hope it will not be long before it is possible to communicate telephonically from every railway station in the country. These places are important industrial centres, and every effort should be made to connect them with outlying posts of activity. During August, 7 495 096 inland trunk calls were dealt with, an increase of 10·3 per cent. over the figure for the corresponding month in last year. Considering that more telephoning is done during times of trade prosperity than in a depression, this is an interesting indication of the growth of the telephone habit. Calls made to the Continent during August numbered 21 024, and from the Continent 23 564, representing increases of 4 505 and 3 004 respectively over August last year. This is quite satisfactory progress, and a tribute is due both to the Post Office and to the Telephone Development Association for the work achieved.

Smoke and Fuel Economy.

Last week a considerable amount of attention was paid by several public bodies to the allied subjects of smoke abatement and fuel economy. In the House of Commons the Smoke Abatement Bill was read a third time after Mr. Neville Chamberlain had refused an amendment to bring private chimneys within the scope of the Bill for the astounding reason that if this were done "there would not be enough gas and electricity to go round." We feel sure that not only electricity supply undertakings, but gas undertakings would like to be given a chance to prove the fallacy of this argument. He also refused to accept an amendment making the Bill applicable to new houses on the grounds that there were so few of them that they could not make any difference. Here is a case for propaganda, because we do not believe that smokeless fuel is the only solution of the domestic smoke problem. The question of fuel economy was dealt with from several points of view at the autumn meeting of the Institution of Fuel Technology last week. An important item, also with an economic bearing, was the fusion of that body with the Institute of Fuel Economy Engineers. The result can only be an access of energy to both, and, therefore, a greater potential usefulness. In the course of his Presidential address, Sir Alfred Mond said that the main problems of fuel technology to-day were (1) fuel economy in existing plants, (2) fuel economy resulting from the development of electricity, (3) future developments. In all these three lines the problem must be divided into the industrial and domestic aspects. He hoped we should get nearer to the German practice of buying coal by the heat unit, for coal which was cheaper in price might be a good deal dearer in regard to heat value. He referred to the importance of the "oil from coal" problem, and added that to solve this and other questions, no miracle was required, but only the application of common sense, energy and research. The future battlefield of the world would be economic and we had in this country all the material required. These points were emphasised by Sir Philip Dawson, who further pointed out that much might be done in utilising the vast dumps of inferior coal now lying idle at pit mouths for the generation of electricity and for distillation purposes. Speaking at the annual dinner of the Institution of Mechanical Engineers, Lieut.-Col. Moore-Brabazon said that the foundation of the prosperity of this country depended on coal, but we might have to become accustomed to using it in more convenient forms. If the change was necessary, they were entitled to look to the engineers to place this country in a position in which it would not only be a producer of fuel, but an exporter of fuel, and not as at present an importer of oil.

Increasing Electrical Exports.

Once more from among a mass of rather depressing figures we are able to find considerable comfort in the perusal of that portion of the Board of Trade Returns which relates to the electrical industry. In November, while the country was still in the grip of the disastrous coal stoppage, the electrical industry exported goods valued at £1 725 021. This figure shows an increase of £460 822 on the total for November 1925, but it exceeds the June 1925 amount—the highest for some years—by £16 650. The settled nature of this improvement can be gauged from the exports for the eleven expired months of 1925 and 1926 which were, respectively, £15,903 213 and £16 471 297, leaving a net increase on the present year to date of £568 084. While the November, 1926, imports of electrical goods have risen by £21 630 compared with November, 1925, the grand total so far shows a decrease of £446 615. On balance at the moment our exports are upwards of £12 000 000 in excess of our imports. These figures are a standing testimony to the perseverance of British electrical manufacturing interests and to the deservedly high reputation which their products hold in overseas markets. With an increasing demand in the home market the prospect is not a little encouraging.

The Trustification of Industry.

The most interesting feature of the recent Vote of Censure debate was Mr. Ramsay Macdonald's suggestion that we were about to see the trustification of the coal industry. That there are tendencies in this direction is clear. Sir Richard Redmayne, ex-chief Inspector of Mines, holds that unification is essential. Lord Beaverbrook openly advocates trustification and especially unification at the selling end. His policy is strikingly confirmed by the report of the Co-operation Selling Committee of which Sir Frederick Lewis is chairman. This body recommends co-operative selling by districts and ultimate co-ordination "with adequate safeguards against monopoly." Sir Alfred Mond not only believes that this tendency to merger is inevitable; he has just carried a large scheme of amalgamation out. In Germany trustification is of course usual. All this is of great interest to British industry and it will regard with suspicion any scheme which threatens to raise the price of a vital raw material. The problem is difficult, but it must be studied by all industrialists not only from their point of view as producers, but from the standpoint of the consumer.

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THE COMMISSIONERS' REPORT.

A Year's Progress in Electricity Supply—Position in the Delimited Districts—Aire and Calder Deadlock—Non-statutory Undertakings.

THE sixth annual report of the Electricity Commissioners for the year ended March 31st, 1926, has been published by the Stationery Office, price 3s. net. It states that the outstanding feature of the period under review was the announcement by the Prime Minister of the proposals of the Government with regard to electrical development, followed in March by the introduction of the Electricity (Supply) Bill, 1926, into Parliament, and by the publication of the report of Lord Weir's Committee, on which the main provisions of the Bill were based.

While the report of Lord Weir's Committee was under consideration and the Bill was being formulated, the Commissioners deferred questions relating to schemes of transmission and schemes of control of interconnected generating stations in certain electricity districts for further investigation at a later stage in the light of the Government's proposals. Some of the more important applications for consent to proceed with the establishment of new generating stations were also deferred. With regard to other aspects of electrical development, not affected to the same extent by the impending legislation, such as the inauguration and extension of distribution works, the year under review was marked by considerable activity and by a general increase in the number of applications for orders, consents, and approvals under the Electricity (Supply) Acts.

The total number of authorised undertakings in Great Britain at the end of the period was 596, of which 356 were in the hands of local authorities (including joint boards) and 238 in those of companies and persons, while two in England were controlled by joint electricity authorities. These figures, when compared with those for the previous year, represent an addition of 28 to the number of authorised undertakings. Allowing for cases of companies with undertakings not only in England but also in Wales and Scotland, the number of separate undertakers on March 31st, 1926, was 593.

Output and Fuel Consumption.

The electricity generated in Great Britain during the year under review, by 584 stations, was 8 122 961 823 kWh, and the fuel consumed included 8 263 880 tons of coal, 142 876 tons of coke breeze, and 38 810 tons of oil fuel. These figures show an increase as compared with the previous year of about 9·5 per cent. in the number of kilowatt hours generated, and an increase of about 5·2 per cent. in the consumption of coal and coke. The consumption of oil fuel showed a decrease of 15 600 tons, a reduction of over 28 per cent. A table of comparative figures for the six years ended March 31st, 1926, giving the percentage variation in the number of kilowatt hours generated and in the total quantity of coal and oil consumed shows that, in spite of the absence of normal conditions of trade, the production of electricity has increased by nearly 60 per cent. since 1920-21 ; and that the increased output has been accompanied by progressive economy in the average consumption of fuel per unit generated. The number of stations was the same as in the previous year, the exclusion of 20 stations at which local generation was discontinued being counterbalanced by the inclusion of 20 other stations which came into operation on or after April 1st, 1925.

The figures of the electricity sold for the calendar year 1925 show that the sales of electricity by authorised undertakers have increased by over 50 per cent. since 1922. On the basis of the estimated population of Great Britain in 1925, namely, about 44 000 000, the electricity sold by authorised undertakers in that year represented an average consumption of 125 kWh per head of population. This figure does not take account of the supplies used for traction purposes and generated at the stations of railway and tramway authorities, or of the further large supplies generated privately at stations belonging to industrial and commercial organisations, and accordingly provides a partial measure only of the *per capita* consumption of electricity in Great Britain in 1925.

At the end of the period covered by the report, schemes for the improvement of the organisation for the supply of electricity in eight electricity districts had come into force. Six of these schemes came into operation during previous years, the two additional schemes approved by Parliament after April 1st, 1925, being in respect of the London and Home Counties Electricity District and the West Midlands Electricity District.

The reports of the various advisory boards and Joint Electricity Authorities are published as appendices, but tables in the main report give a useful analysis of the various areas, and show the extent to which electricity supply is available in each.

J.E.A. Progress.

In South East Lancashire, for instance, nearly 95 per cent. of the population of the district is located in the distribution areas and the latter comprised upwards of 55 per cent. of the total area. In the South West Midlands 99 per cent. of the population of the district is located in distribution areas, which comprise 93 per cent. of the total area. In North Wales and South Cheshire on the other hand only about 35 per cent. of the population was located in distribution areas, and these comprise only 4·5 per cent. of the total area. In Mid Lancashire, another industrial district, about 90 per cent. of the population of the district is located in distribution areas, comprising 41 per cent. of the total area, while in the East Midlands about 85 per cent. of the population is located in distribution areas, which comprises about 28 per cent. of the total area. In the Edinburgh and Lothians district, 96 per cent. of the population of the district is located in distribution areas, comprising over 56 per cent. of the total area, and in the London and Home Counties district over 99 per cent. of the population is located in distribution areas, comprising 85 per cent. of the total area. In the West Midlands district 85 per cent. of the population of the district is located in distribution areas, comprising 23 per cent. of the total area.

As regards the Aire and Calder district, it is stated that at the end of the period covered by the report, the scheme providing for the establishment of a Joint Electricity Authority had not been advanced to a stage at which the formulation of definite proposals for the reorganisation was practicable, and the Commissioners found it necessary to defer further action until the bearing of the Government proposals on the future development of the district as a whole could be more clearly foreseen. During the year under review 13 applications were however made for special orders to authorise the distribution of electricity in various parts of the district. In order that the major question of reorganisation should not be prejudiced, so long as any prospect remained of reconciling the various interests in a scheme for the district as a whole, it was deemed expedient to defer consideration of these applications for the time being. The position was rendered increasingly difficult by reason of representations which were made to the Commissioners as to the present demand for the establishment of a supply of electricity in a number of areas affected. When it became apparent early in 1926 that the formulation of definite proposals for reorganisation was not possible, the Commissioners came to the conclusion that the development of the distribution could no longer be deferred, and accordingly proceeded with the consideration of the applications on their merits. A meeting was also called to discuss a suggestion for the immediate interconnection of the principal generating stations in the district, but the Commissioners were subsequently informed that certain objections had been raised to this course, and it was therefore decided to defer the consideration of the matter until Parliament had dealt with the new Bill.

In February, 1926, the Commissioners held a local inquiry into a scheme for the North-West Midlands Electricity District, but in the case of other districts refrained from proceeding further with the scheme of reorganisation owing to the new Electricity Bill.

Generating Plant.

The aggregate capacity of the generating plant for new stations and extensions of existing stations sanctioned during the year 1925–1926 amounted to 585 700 kW. This shows a substantial increase on the figure of approximately 480 000 kW recorded in the previous year. Since January, 1920, 2 821 693 kW of new generating plant had been sanctioned, of which 473 110 kW was for new stations, and 2 348 583 kW, or 83 per cent. of the whole, for the purpose of extensions. Of this plant 60·5 per cent. was installed in stations belonging to local authority undertakers. During the year under review the Commissioners issued 16 consents for new generating

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stations, representing an initial capacity of 46 460 kW. By far the largest of these stations was one for 37 500 kW for the Oldham Corporation. Six of them were given to non-statutory undertakers for the erection of new generating stations, all of which were very small.

Reference is also made to various important applications that have been received for the establishment of new generating stations, and to the progress of new generating stations which have already been sanctioned. As in the previous year, the Commissioners dealt with a number of important applications for consents to the establishment of main transmission lines. Formal consents were issued in respect of 42 of these applications, 16 of which related to 33 000 V transmission lines, and one to a 66 000 V line. These consents covered important interlinking schemes in the Edinburgh and Lothians Electricity District, in London and the Home Counties and in South East Lancs.

At the commencement of the period covered by the report 79 applications for special orders were under consideration, and during the year 93 further applications were made in respect of 70 of the applications, and of the remainder 8 were refused, and these were withdrawn, thus leaving 88 applications still under consideration. There was again a pronounced element of competition between applications, as many as 32 of those lodged during the year competing with current or prior applications.

Position of Gas Companies

The Statutory Gas Companies (Electricity Supply Powers) Act, 1925, enables persons authorised to sell gas by any Act or Order having the force of an Act, to apply for Special Orders under the Electricity Supply Acts. The Commissioners prepared draft Rules of Procedure with respect to the applications for Special Orders under this Act, which were based on the rules of 1920. Subsequently Provisional Rules were presented to Parliament, but though no representations were made during the prescribed period of 40 days, the Commissioners decided to defer making statutory rules for the time being, in order to ascertain through the operation of the provisional rules whether any variation might be desirable.

The report comments in some detail on certain of the applications made for Special Orders, and in the course of some general observations it is remarked that certain of these applications sought distribution powers in respect of areas where electricity was being supplied without statutory powers, and that representations were made that the bodies concerned would suffer hardship if statutory powers to supply were granted to another body. In certain cases the promoters of the Special Orders were able to negotiate for the acquirement of non-statutory undertakings, but in others, the parties were unable to come to terms, and it became necessary for the Commissioners to consider how the area of operation of the non-statutory undertaking should be dealt with where the public interest was best likely to be served by constituting the area an authorised area of supply. When the circumstances appeared to justify an opportunity being given to the non-statutory undertaking to place itself on a statutory footing the Commissioners retained the area in a Special Order as granted to the promoters, but inserted a clause to the effect that if within a specified period the non-statutory undertaking obtained the powers of supply within a defined area in which they were operating, the said area should cease to form part of the area of supply under the Special Order. Such cases may be expected to occur with increasing frequency in the near future, but as a general policy the Commissioners would not be disposed to refuse the grant of statutory powers merely by reason of the fact that supplies of electricity are being given without statutory authority in a portion of the proposed area of supply.

It has been represented to the Commissioners on several occasions that uncertainty as to the intentions of a local authority to exercise its option to purchase an undertaking has proved detrimental to development, and in some cases local authorities have been approached with a view to negotiating a basis on which they would agree to the suspension of their powers of purchase. The conditions which had been agreed between the parties concerned in some instances, namely an immediate reduction in the charges made by the company for electricity, although a desirable concession, cannot of itself be regarded as an adequate consideration for a substantial extension of tenure. The Commissioners came to the conclusion that in normal cases where a suspension of purchase powers was sought by a Special Order it was equitable that a provision for a sliding scale of price and dividend should be included in the Order.

At the commencement of the period covered by this report 197 applications from local authorities for sanction to borrow for electricity purposes were under consideration and during the year 694 further applications were received. Sanctions were issued in 588 cases, and 29 applications were either refused or not proceeded with for other reasons. The total amount of the loans sanctioned during the year was £9 685 301. Of this, £3 055 930, or 31·6 per cent. of the total was for plant, and £5 212 368, or 53·8 per cent. of the total was for mains and services.

Loans for Mains, &c.

The figures of the past six years show a progressive increase in the proportion of loans sanctioned for mains and services, and reflect the absence of large schemes of extensions of generating plant from the sanctions issued in 1925–26. The figures bear evidence of the substantial programme of replacement and extension which was undertaken by local authorities in the first three years to overtake arrears occasioned by the war-time restrictions, and in anticipation of the further growth in the demand for electricity. In 1925–26 loans amounting to £50 002 were sanctioned for the wiring of domestic premises, while £83 795 was sanctioned for domestic electrical apparatus for hire. The figures in the previous year were £24 844 and £31 071 respectively.

The remainder of the report gives details of the more formal duties undertaken by the Commissioners under the various Electricity Acts. Two sanctions were issued for the suspension of sinking fund payments. Eight applications for power to raise money for current expenses were dealt with. Ninety applications were referred to the Commissioners by the Unemployment Grants Committee, and in seventy cases the necessary certificate was given.

Further progress was made in regard to bulk supply developments, and at the date of the report 329 bulk supplies were being taken or arranged. Sixteen arrangements for mutual assistance were approved during the year. In five further cases the arrangements proposed involved the breaking up of streets in intervening districts, and the Order was submitted to the Minister for confirmation. Five other schemes for bulk supply were also approved.

Fifteen authorised undertakers were allowed to adopt systems other than those approved by the Board of Trade, and during the year fifteen consents to alterations in system were also given.

An account is given of a meeting with a Joint Committee representing the I.M.E.A. and the Provincial Electric Supply Committee on the subject of the regulations of overhead lines. The report submitted by the Committee was discussed in detail, the Commissioners pointing out that the existing regulations had been practically prepared by the industry, and that no radical change had taken place to necessitate their amendment. The technical suggestions made in the report seemed to be rather a retrogression than an improvement.

Local Authorities' Rights.

Regulations were prescribed in forty-four cases where lines had been erected without statutory authority, while 106 fringe Orders were granted. Reference is made to the cases at Inverness and Cambridge, where the local authority wished to exercise its rights of purchase before obtaining the Commissioners' consent. During the year four consents to purchase were given. Six applications for a downward revision of price were made, and an Order was made in these cases. Applications for the erection of overhead lines were made in 194 cases, and 187 consents were given. Twenty-four applications were made for wayleaves, and seventeen consents were given during the year.

After an interesting summary of the special acts passed in the year under review, the staff and organisation of the Commission is finally dealt with. The staff now numbers sixty. The estimated net cost of administration for the year was £54 700, and after allowing for a reduction in the working balance, the total amount to be apportioned was £53 000. As 4 997 963 253 kWh were sold during the year ended December 31st, 1924, this involved a payment by each undertaker of 2·54d. per 1 000 kWh sold. The electricity sold during the year ended December 31st, 1925, amounted to 5 515 345 364 kWh, or an increase of over 10 per cent. compared with the previous year.

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TRANSATLANTIC WIRELESS.

Twenty-fifth Anniversary of Mr. Marconi's Newfoundland Experiments—Foundation of Long Distance Wireless Communication.

IT was on December 12th, 1901, that Mr. Marconi succeeded in establishing wireless communication between Poldhu, Cornwall, and St. John's, Newfoundland. The result of this experiment was to prove that the curvature of the earth did not constitute an obstacle to the transmission and reception of long distance wireless messages, and gave an impetus to the progress which has enabled the position reached to-day to be attained.

Describing his experiences twenty-five years ago to a representative of THE ELECTRICIAN, Mr. Marconi said: "In 1895 and 1896 I had proved the possibility of transmitting signals to considerable distances by means of the raised antenna and earth connection; in 1899 I had proved that the curvature of the earth did not interfere with the propagation of ether waves over short distances; and in 1900 I felt that the time had come to venture further afield. Having regard to the many improvements I had lately introduced into the methods of tuning the transmitter and receiver I was absolutely convinced that transatlantic wireless telegraphy, not merely as an experiment, but as a sound commercial proposition was possible. Very naturally I realised that my first endeavour must be directed to prove that an electric wave could be sent out across the Atlantic and detected on the other side.

Poldu Station.

A wireless station was built at Poldhu in Cornwall for this purpose. An aerial system was built, supported by a ring of twenty masts, each about 200 ft. high, arranged in a circle 200 ft. in diameter and covering an area of about an acre. By the end of August, 1901, the erection of the masts was nearly completed. Then, unfortunately, a gale wrecked the whole construction and it was decided to make a preliminary trial with a simpler aerial. Therefore, ten of the masts, each 170 ft. high, were re-erected. A triatic stay was stretched between the two end masts, and from this triatic stay were suspended sixty almost vertical bare copper wires, the distance between the wires being about one metre at the top. These wires converged together at the bottom, making an aerial in the form of a fan.

By the middle of November I was able with this temporary aerial to obtain signals of such great strength at what was then my most distant station, Crookhaven, in the South of Ireland, that I felt sure they would be detectable at a ten times greater distance.

As it was clearly impossible at that time of the year to erect high masts to support the aerial at the receiving end I had arranged to have the necessary aerial supported in the air by a small captive balloon.

Messrs. G. S. Kemp, P. W. Paget and myself landed at St. John's on Friday, December 6th, and after taking a look at the various sites which might prove suitable, I considered that the best one was to be found on Signal Hill, a lofty eminence overlooking the port. On the top of this hill there is a small plateau of some two acres in area which I thought very suitable for the manipulation of either the balloons or the kites. On a crag on this plateau rose the new Cabot Memorial Tower which was designed as a signal station, and close to it there was an old military barracks which was then used as a hospital. It was in a room in this building that I set up my apparatus and made preparations for the great experiment.

Work at Signal Hill.

On Monday, December 9th, I began work on Signal Hill. On the Tuesday we flew a kite with 600 ft. of aerial, as a preliminary test, and on the Wednesday we had inflated one of the balloons which made its first ascent during the morning. Its diameter was about 14 ft. and it contained some 1 000 cub. ft. of hydrogen gas, quite sufficient to hold up the aerial which consisted of wire weighing about 10 lb. Owing, however, to the heavy wind that was blowing at the time, after a short while the balloon broke away and disappeared. I came to the conclusion that perhaps the kites would answer better, and on Thursday morning, in spite of the gale then blowing, we managed to fly a kite to a height of about 400 ft.

In view of the importance of all that was at stake I had decided not to trust entirely to the usual arrangement of having the coherer signals recorded automatically through a relay and a Morse instrument on a paper tape, but to use instead a telephone connected to a self-restoring coherer, the human ear being far more sensitive than the recorder. Suddenly, about half-past twelve, unmistakeably, three faint little clicks in the telephone, corresponding to three dots of the Morse code, sounded several times in my ear as I listened intently; but I would not be satisfied without corroboration.

"Can you hear anything, Mr. Kemp?" I said, handing the telephone to my assistant. Kemp heard the same thing as I, and I knew then that I had been absolutely right in my anticipations. The electric waves which were being sent out from Poldhu had traversed the Atlantic, ignoring the curvature of the earth which so many doubters considered would be a fatal obstacle, and they were now affecting my receiver in Newfoundland. I knew then that the day on which I should be able to send full messages without wires or cables across the Atlantic was not very far distant and, as Dr. Pupin, the celebrated Serbo-American scientist, very rightly said shortly afterwards, the faintness of the signals had nothing to do with it. The distance had been overcome and further development of the sending and receiving apparatus was all that was required.

Following the success of my experiment, I was notified on behalf of the Anglo-American Telegraph Co. that as they hold a charter giving them the exclusive right to construct and operate stations for telegraphic communication between Newfoundland and places outside the Colony, the work upon which I was engaged was a violation of their rights. I was asked to give an immediate undertaking not to proceed with my work and to remove my apparatus, or legal proceedings would be taken. When the reason for my discontinuing my experiments became known I was almost deluged with offers of sites for the erection of an experimental station and for the erection of a permanent station.

I arrived in England again on January 26th, 1902, and on February 22nd, I sailed for the United States of America *en route* for Canada, where I was due to sign the final draft of the agreement for the erection of a large wireless station at Glace Bay and to put in hand the construction of that station. I crossed on the "Philadelphia" of the American Line and before leaving arranged for Poldhu station to send out a programme of signals for me to receive on the ship during the voyage. On this voyage I was able to receive complete messages up to 1 551 miles and single letters up to 2 099 miles. Thus, within three months of receiving single letters at 1 800 miles I was receiving complete messages at 1 500 miles.

Future Prospects.

I was thus able to prove what I had set out to prove, that wireless communication could be satisfactorily carried out between countries separated by large stretches of ocean, and by December, 1902, it was possible to exchange messages at will between the station I had erected at Glace Bay and Poldhu. Wireless telegraph communication over long distances was thus proved to be a reality and not a dream.

Naturally it is very gratifying for me, after a lapse of 25 years, to look back upon those early experiments and to meditate upon the far-reaching effects that followed those early beginnings. It is a pleasing coincidence that almost exactly on the 25th anniversary I have been able to bring to fruition another far-reaching development in long distance wireless communication in the establishment of short wave beam stations which constitute practically a revolution in wireless communication."

Asked for his views regarding the possibilities of wireless during the next 25 years, Mr. Marconi said: "During the next 25 years there will probably be almost as great a development in means of obtaining directional wireless transmission and reception as there has been in other directions during the last 25 years. As to the application of wireless in the future, apart from the ordinary transmission and reception of wireless messages of which I have spoken there is a possibility that the transmission of power over moderate distances may be developed and that television will become an actuality. I must leave to your imagination the uses which can be made of these new powers. They will probably be as wonderful as anything of which we have had experience so far."

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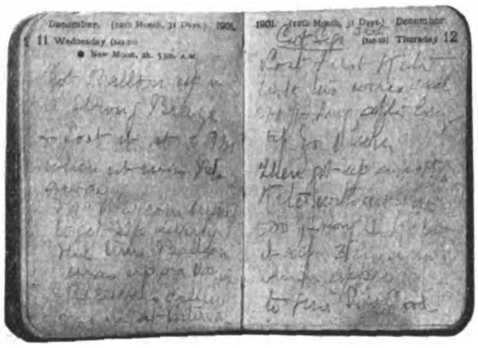
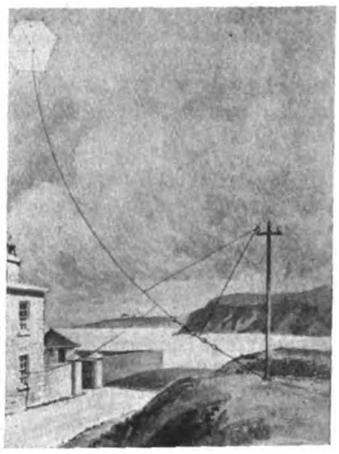
HISTORICAL PICTURES.

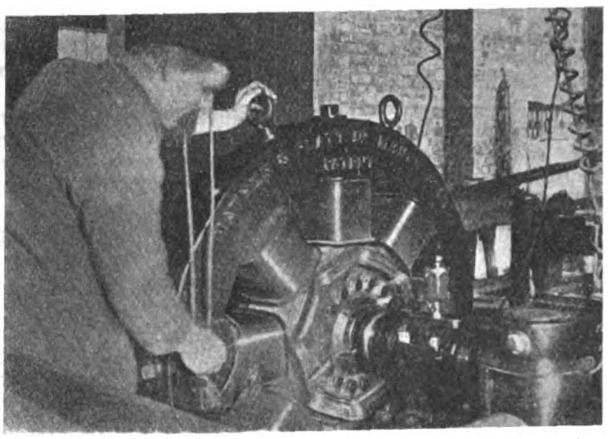
A new and hitherto unpublished photograph of Mr. G. Marconi which was taken recently in his office at Marconi House, Strand, London.



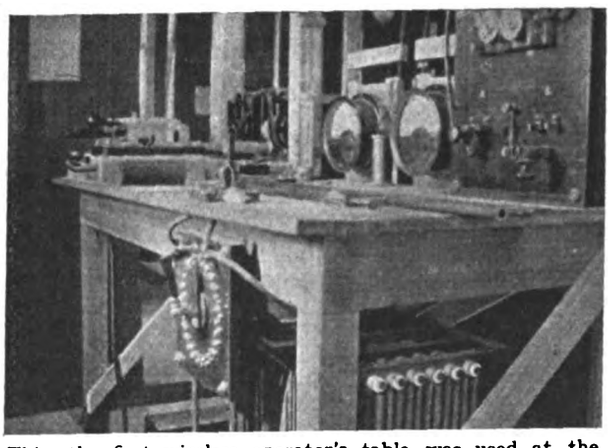
The diary of Mr. G. S. Kemp (Mr. Marconi's first assistant) open at December 12th, 1901, showing the record of the reception of the first wireless communication across the Atlantic.



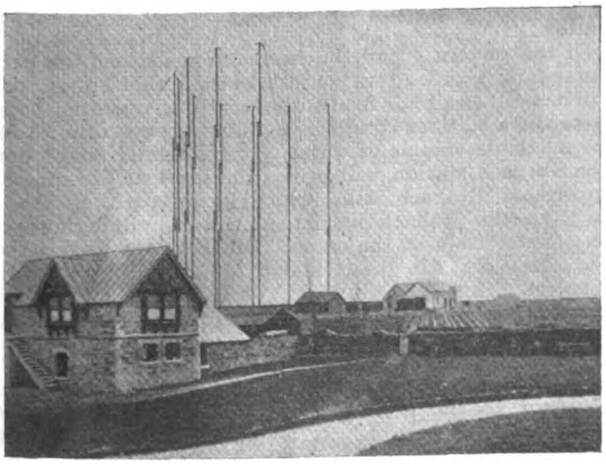
The kite-suspended aerial by means of which the first trans-Atlantic wireless message was received by Mr. Marconi at Signal Hill, Newfoundland.



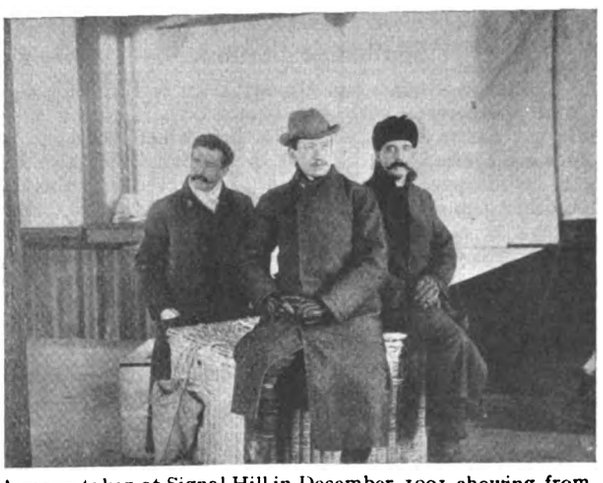
The 25 kW Mather and Platt 50 cycle alternator used at the Poldhu wireless station for transmitting the first signals to Newfoundland.



This, the first wireless operator's table, was used at the wireless station at Poldhu for sending out the first messages to St. John's.



The half-circle of masts and aerial erected at Poldhu in 1901 after the original circle of twenty 200 ft. masts had been brought down by a gale. These masts were 170 ft. high, and the aerial consisted of 60 wires in the form of a fan suspended from the triatic stay slung between the two end masts of the half-circle.



A group taken at Signal Hill in December, 1901, showing, from left to right, Mr. G. S. Kemp, Mr. Marconi and Mr. P. Paget. The basket upon which they are sitting contained the balloons which were intended to carry the aerial. When flown they blew away, and the kite seen in the background, and also in another picture, was substituted.

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AUSTRIAN ELECTRIC TRACTION.

Some Notes on Recent Progress—Advantages for Goods Working—Development of Hydro-Electric Power.

ELECTRIFICATION of railways is the order of the day, more especially, of course, in countries with only a limited home production of coal and where the transport of imported coal becomes a serious additional expense, but with ample water power. Austria comes under this latter category and the electrification of her railways is being pushed ahead with much energy.

The start was made in the year 1919, and the electrification of the Arlberg railway, the steepest full gauge mountain railway in the country, was completed in 1925. About the same time the electrification of the Salzburg-Wörgl and the Kufstein-Wörgl-Innsbruck-Brenner lines was ensured by the sum of 88 000 000 gold kronen from the League of Nations credit being made available.

Arlberg Railway.

The Arlberg railway receives its energy from the railways two power stations, the Ruetz station and the Spüllersee station. The former, with its three units, yields an aggregate of 16 000 H.P. and about 40 000 000 kWh annually. The Spüllersee power station is meant to exploit the entire catchment area of the Spüllersee area (this lake being situated some 1 800 m. north of Danöfen) and to collect the water in a basin enlarged by two dams. This means that a head of about 800 m. becomes available. The area of the Spüllersee basin is 10·7 sq. km., and the available average yield of water per annum works out at 17 250 000 cub. m. The lake originally held only about 2 000 000 cub. m., but the level having been raised from 1 795·3 to 1 825 m., the capacity has been increased to 13 000 000 cub. m. The water is led in a plate tube of 1·40 m. diameter through a tunnel about 1 900 m. long to the distributing installation, whence the water proceeds in two (eventually three) tubes to the power station in the valley. So far three units have been installed, each of 8 000 H.P. Room for a fourth has been provided, and when quite completed the power station will contain six units. Should such be required the volume of water of the Spüllersee can be increased by some 2 000 000 cub. m. by the construction of two short tunnels.

The Spüllersee power station is now virtually ready. The building of the southern dam has taken four years, during which an aggregate of 113 500 cub. m. of concrete construction has been built, the figures for the northern dam are 30 430 cub, m. concrete, the building occupying only a couple of years. The transport of material and men to this considerable height was brought about by a winch haulage and by suspended rope line, which during the time of construction carried 302 000 persons and 94 640 tons a distance in height of 725 m.

Spullersee Station.

The Spüllersee station has already been working for some time and co-operates with the Ruetz power station in an entirely satisfactory manner. The line which connects the two stations works at 55 kV and is 126 km. long; the sub-stations Zirl, Roppen and Flirsch are connected with this line. Although the time yet is much too short to give any definite experiences of electric traction versus steam, the former has so far worked to complete satisfaction; thus the heavy goods trains on the steep gradients of the Arlberg line now travel at a speed of 30 km. the hour against 15 for steam locomotives; in fact, the speed is faster than that of the former passenger trains.

So far the electrified section (Innsbrück-Blüdenz) only has a length of 136 km., the section Salzburg-Buchs, however, is 428 km., and the section Salzburg-Bregenz 446 km. The longer the line and the more the electrical energy is used the more advantageous the financial result naturally becomes. With regard to the function of the two power stations, the Ruetz power station may be said to attend to the normal daily requirements, whereas the Spüllersee station supplies the top-load requirements and otherwise when the smaller power station requires assistance. When the complex of electrified railways become larger and when the Ruetz station, the Spüllersee station and the Achensee power station attain to parallel co-operation in the same system, the Ruetz station with its almost unaltered continuous volume of water will become a pure bottom load control. It is a matter worth noticing that the 55 kV transmission line from Landeck to Danöfen which passes over the Arlberg mountain at a height of 2 019 m. above sea level has worked for a year without the slightest disturbance.

On the Innsbrück-Blüdenz line the electrification has brought about a saving of 56 per cent. in locomotive employment and of 21 per cent. in locomotive hands compared with the steam locomotive service, and the mileage yield is higher. The reduced requirement of locomotives is particularly striking in the goods traffic, amounting to 62 per cent. According to schedule the yield per month of steam locomotives for passenger trains was 4 200 km. and for goods trains 2 500 km., whereas the corresponding figures for electric traction are 7 200 and 5 000.

Of the railway west of Blüdenz the section as far as Buchs and the Feldkirch-Bregenz section will first be proceeded with, and they will be served from the Feldkirch sub-station, which is about ready; it will contain three transformers with a ground yield of 1 900 kVA. That in the matter of large transformer stations open-air installations more and more prove their superiority to such installed in buildings is being generally admitted. A couple of large open-air transformer and switch stations have already been built in Austria, and although the sub-stations Zirl, Roppen, Flirsch and Danöfen have been planned and built as pure building installations, the one at Feldkirch and those for the electrification of lines east of Innsbrück will be built half-open air stations. Apart from all other considerations, the above electrification works will, one way and another, provide work for some 20 000 to 30 000 men for three years, which must be considered a very great boon. There are considerable technical difficulties to be overcome in connection with the lines referred to above, with their heavy gradients and the mountainous country which has to be compassed. There are, for instance, 28 tunnels with an aggregate length of 5·26 km.

Energy Supply.

As regards the supply of energy for the electrification of the group of railways east of Innsbrück, two hydro-electric power stations, belonging to the railways (the Stubach station and the Mallnitz station) and one which does not belong to the railways (the Achensee station) have to be relied upon. These stations will work in conjunction whereby the working becomes far more rational both as regards supply of water and the electric working, in addition to which an ample reserve will be created. Further, it will be possible to connect the western power station group (Ruetz and Spüllersee) with the eastern group (Achensee, Stubach and Mallnitz) by a 55 kV line between the sub-station Hall and the Ruetz power station.

Of the eastern group the two first mentioned are decided storage and peak-load stations whilst the Mallnitz power station will be built as a basic load station. By co-operation between these three stations it will be possible always fully to utilise the available volume of water of the Mallnitz power station. The Stubach station will utilise the head of 520 m. of the uppermost Stubach fall, which forms part of the plan for the entire Stubach district and will be built in three stages. The exploitation of the second fall, between Enzingerboden and Schneider Alp (head about 480 m.) and of the third, between Schneider Alp and Vorderstubach (head about 180 m.) will in the meantime be left in abeyance. Several streams, much of the water in which comes from the glaciers of the surrounding mountains, combine and form the Hochmeer of about 180 hectares area; the river forms a steep fall of about 500 m. height, down to Enzingerboden, where it joins the Weiszenbach. It is this fall which the Stubach power station, now in course of construction, will use. For this purpose the Tauernmeesboden will be converted by means of a dam of 25 m. height into a storage reservoir capable of holding 22 000 000 cub. m. with an area of 145 hectares. Originally only a reservoir of 14 000 000 cub. m. capacity was projected, but subsequent investigations showed that the increased capacity would be advantageous. The dam will be built of concrete on the northern rocky trestle of Tauernmeesboden, with broken stones inserted, with an aggregate proportion of breadth to height of 75 per cent. It will be coated with masonry of broken stone. Corre-

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sponding with the highest working water level at about 2 003 m. above the level of the sea. The greatest height of the dam is 25 m., its greatest breadth at the base 19 m., its length at crown 201 m., and its volume 30 000 cub. m. The natural conditions have made it possible to keep the high water overflow completely separate from the dam, through a lowering in the rock some 400 m. from the dam. The water for the power station is first led through a pressure tunnel of 2·20 m. diameter and then through a pipe line in a sloping tunnel to the power station. The pressure tunnel is 25 m. and the sloping pipe line 1 750 m. long. The aggregate length of the three inlet tunnels is 520 m., and the head 522 m. The power station will in the first place contain four units consisting of an 8 000 H.P. turbine and a single phase alternator of 7 500 kVA with power factor 1·0 to 0·8. One of these units will always be in reserve. The present top capacity of this power station with three turbines is therefore 24 000 H.P. and with six units 40 000 H.P., for the accommodation of which space is being provided. The outflow canal, some 350 m. long, falls into the Stubach.

The single phase energy generated at the Stubach power station at 55 kV is transmitted in a double line to Zellam See, whence one line proceeds to the Saalfelden sub-station, the other to the Schwarzach sub-station. The increase of the reservoir, already referred to, to a capacity of 22 000 000 cub. m. makes it possible to maintain an all-year volume of water of 1·19 cub. m. per sec., which represents 6 200 H.P. at the turbine, or an annual production of 34 000 000 kWh.

The construction of the Mallnitz power station is well advanced. The power station of this installation will commence operations with two units of 5 000 H.P. each, two more will be installed when the second pressure tube is constructed and when the electrification of the Tauern railway will require more peak load energy from this station. In order to reduce the variation in the available volume of water between summer and winter the construction of a reservoir at the Stappitz lake has been projected.

Achensee Power Station.

The Achensee power station, which will play an important part in the electrification of Austrian railways, derives its water from the Achensee (lake) situated between the Karwendel and the Sonnerend mountains at a height of 929 m. above the level of the sea, covering an area of 675 sq. km. The average annual outflow is about 3 cub. m. per sec. The lower portion of the Achen river has a fall of 400 m. over a distance of 4 km., against a fall of 200 m. over a distance of 19·8 km, in the upper portion of the river. The northern outlet from the lake is to be closed, the water will be drawn from the south end of the lake and will be used with a head of 400 m. at the inflow into the Inn at Innbach. The Achensee serves as a reservoir, the capacity of which can be made to amount to 66 000 000 cub. m. With an outflow of 25 cub. m. per sec. this means a peak load capacity of 100 000 H.P., with an average annual production of 100 000 000 kWh. This capacity can be further increased by leading the water from a larger catchment area into the Achensee.

A 4·5 km. long pressure tunnel takes the water from the lake at a depth of 10 m. below the natural level of the lake, and from the distribution installation a pressure tunnel has been blasted in the rock with a slope of 45 deg. The power station to begin with has two units each of 15 350 H.P. capacity for the generation of alternating current for power and lighting, and a further three units of 8 000 H.P. capacity each for railway electrification purposes—an aggregate of 54 700 H.P., but the power station is large enough to accommodate three additional alternating current units of 15 350 H.P. each and one unit of 8 000 H.P. capacity; when completed the plant will thus have an aggregate capacity of 108 750 H.P.

The contract between the Austrian railways and the Tyrol hydro-electric power station refers to delivery of energy in the shape of single phase alternating current at a frequency of 16⅔ cycles and 55 000 V average voltage, to begin at the end of 1927. The amount to be supplied annually rises from 25 000 000 kWh to a maximum of 40 000 000 kWh the first year and then by 3·5 per cent. annually. The top yield for the railways means 10 600 kW, but can at their request be increased to 15 900 kW by the installation of a fourth unit.

The Mallnitz, the Stubach and the Achensee power stations are connected by a 55 kV transmission line, with which the sub-stations are connected. This transmission line starts from the first-named station with a section of 2 by 95 cub. mm. to Seebachsthal; from there a bronze line of 2 by 120 cub. mm. as far as Anlaufthal, and then again a copper line of 2 cub. mm. section through the Gastein valley to the railway.

The completion of the different power stations to which reference has been made coincides satisfactorily with the gradual electrification of the railways. The Ruetz and the Spüllersee stations will supply the energy to the lines ready for electrification in the beginning of 1927 and the Achensee station should be able to supply current to other sections at the end of 1927, whilst the Stubach and the Mallnitz stations are expected to commence delivery for further sections of railway by the end of 1928.

After the completion of the second phase of electrification 623 km. of railways will have been electrified, which it is calculated will lead to a saving of some 420 000 tons of coal per annum.

U.S. Electrical Development.

AT the last informal meeting of the Institution of Electrical Engineers, Mr. Ll. B. Atkinson opened a discussion on "The Trend of Electrical Developments in the U.S.A. and Canada."

Mr. Atkinson said the impressions he formed during his recent visit were confined to a somewhat limited area as he did not go to California nor the Western States, but he saw the entirely different systems of the industrialised American States with coal fuel stations, and the more scattered areas of water-powered Canada. The most striking features of the electricity supply in the U.S.A. were the tremendous concentration of distribution within small localities, and next the remarkable concentration of electricity supply duties into the hands of a few public utility companies. He instanced the single area of New York with a load of 800 000 kW distinct from the Brooklyn load of 250 000 kW. Then the strikingly compact demand from the huge skyscraper offices with as many as 20 000, 30 000, even 40 000 people in one building; this concentration being repeated in the enormous apartment houses.

As the supply was generally by three wire 230/115 V, the streets were often congested with cables, and this had produced difficulties that were not yet solved. The coal stations, except in size did not differ greatly from our own, but one or two special departures were mentioned, notably a turbine at Boston on a pressure of 1 200 lb. but, with its 12 in. thick boiler, it did not seem to be a final design.

The general domestic load did not seem to have advanced as far as in some European countries, and this was partly to be attributed to the cost of current which, after allowing for the difference in money values, was not so cheap as in many parts of England.

In Canada the water-power was all scheduled and State controlled, while the huge output of the State of Ontario was sold at less than cost to almost every voter in the State, so that political annihilation awaited the politician who would introduce an economic price. At Niagara the original turbines installed some thirty years ago were still in service side by side with the new monster generator of 70 000 kW at 160 revs. per min.

Col. R. E. Crompton, C.B., said he recently went to the U.S.A. expecting to learn, but he was disappointed, for the problems that were so vital to us did not seem to concern them over there. Our careful and delicate control of capital costs did not exist in the U.S.A., and their wasteful use of electric lighting had no parallel. He praised the system of electric welding which had been developed, and which, he thought, is very considerably in advance of our methods.

An Electrical Derby.

AS we announced last week the Southern Railway has placed an important contract for the manufacture and laying of 78 miles of high tension cable with Johnson and Phillips. This contract forms part of the work connected with the electrification of the Caterham, Tattenham Corner and Epsom Downs lines, via Streatham and Mitcham, Norwood and West Croydon. It is provided that the Tattenham Corner line is to be finished by Derby Day 1928 so that electrical engineers and others who attend that annual national festival will do so in added comfort. It is hardly necessary to add that the entire cable will be manufactured at Charlton.

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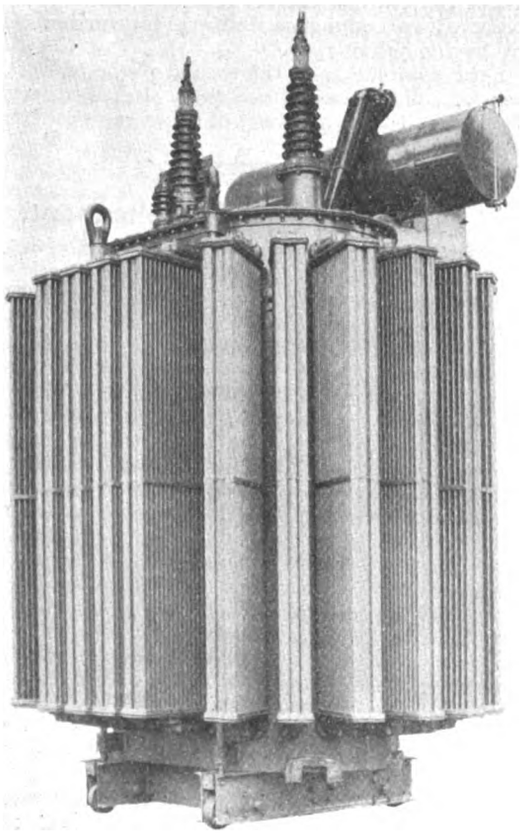
An Unusual Installation Introduced by American Firm.

THE Philadelphia Electric Co. has recently installed in its Schuylkill station the largest self-cooled single phase transformers built to date. The total capacity is 120 000 kVA in two banks and the complete transformers were shipped assembled in their permanent tanks, immersed in oil. The



A large self-cooled transformer.

transformers are of General Electric manufacture, being of the standard core type, circular coil construction used by that company. The rating is 60 cycles, self-cooled, 20 000 kVA, 72 450 V star connected to 13 800 V delta connected.

In addition to being unprecedented in size, these transformers are supplemented by separate voltage regulating transformers so connected into the main circuit at the neutral end of the high voltage side as to afford a boosting and bucking effect over a total range of 10 per cent.

The equipment controls a tie line between the Schuylkill and Chester stations of the Philadelphia Electric Co. Similar provision for voltage variation was made at the Chester end of the line some time ago, and the combination affords a flexibility of operation which is extremely valuable, due to the constant variation in power demand at the respective stations.

The method used in the control of voltage embodies what is claimed to be a new development by which it is possible to vary the transformer ratio either of the main power transformers or of auxiliary regulating transformers without bringing the tap voltage leads out of the main transformers and with only two circuit-breaking devices for each three-phase circuit.

This involves the use of two separate but identical circuits for winding which is to afford the voltage variation. These circuits are normally in parallel, but during times of voltage change (a few seconds) each circuit alternately carries the total load while the other is killed and undergoing tap changes.

The actual changing of the taps is accomplished by special ratio adjusters designed for low torque and high contact pressure. The proper sequence of operations is insured by a single master mechanism for each bank which is motor-operated and remotely controlled at the switchboard.

A complete system of automatic mechanical and electrical protection is provided by which correct operation is insured and faults prevented either due to failure of control circuits or operating error. The mechanism may be operated by hand in an emergency. All the apparatus is weather-proof and designed for outdoor use. The single operation of a push button (at any convenient distance from the transformers) starts the mechanism, which goes through one tap change in a few seconds, after which it is stopped automatically and is ready for the next change.

This is a typical example of a new practice which is becoming more and more valuable due to the modern tendency toward inter-connection between circuits varying widely in load demand. The result is a large saving in connected generator capacity without loss of flexibility.

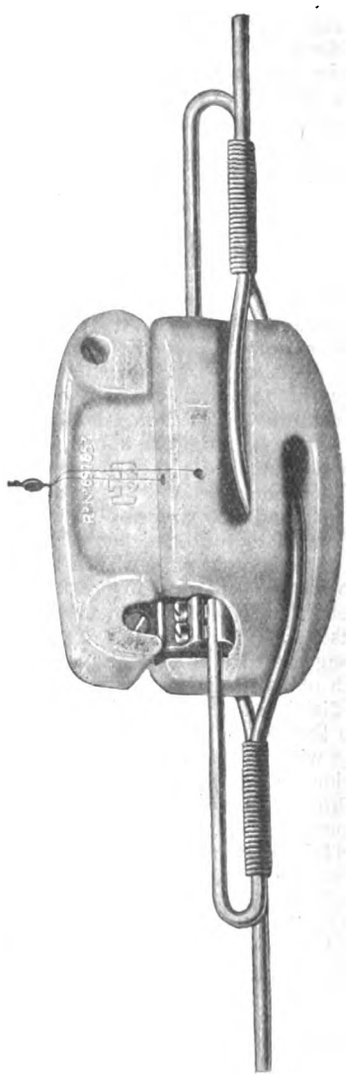
AERIAL FUSES.

Details of Henley's New Design for Overhead Distribution Lines.

ONE of the chief objections to the aerial fuses which are used for protecting services tapped from overhead distribution lines is, it is claimed, overcome by the introduction by W. T. Henley's Telegraph Works Co. of 9 609 aerial fuses (for 30 A 250 V circuits) which are fitted with a withdrawable fuse carrier. In the maker's opinion this is an ideal arrangement for the protection of circuits. As will be seen in the illustration, in the event of the porcelain getting broken, there is no possibility of a line wire falling to the ground as the wires are interlocked.

To prevent interference by unauthorised persons provision is made for sealing the fuse—holes being drilled in the porcelain through which a sealing wire can be threaded and led over the fuse carrier.

Finger grips in the fuse base not only give protection when operating the fuse, but make the withdrawal a very much easier proposition for the linesman.



View of Henley's new design of aerial fuse for overhead distribution lines.

A good point, we notice, too, is that the fuse carriers are the same pattern as those used in the 30/60A range of Isco cut-outs, which readers should be familiar with. A copy of this pamphlet is worth getting hold of.

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CONTACTOR STARTING PANELS.

Some Recent G.E.C. Designs for Increasing Safety and Reliability—Some Exhaustive Experimental Work—Time Limit Devices.

As a result of the growing demand for uninterrupted service with motor-driven machinery, considerable improvements have been effected during recent years in the design of industrial control apparatus, all greatly increasing the safety, efficiency and reliability of the electric motor. The flexibility of modern control gear is undoubtedly due to the introduction of

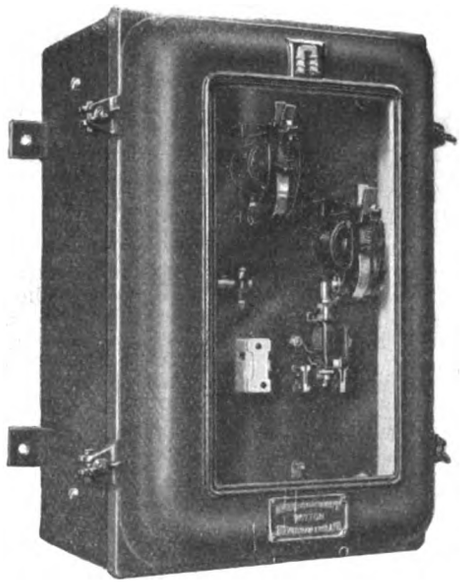

Fig. 1.—D.C. contactor starting panel for wall mounting (General Electric Co.).

the contactor or magnet-switch; and in conjunction with various automatic features, such as current limit, time limit, overload and voltage relays, contactor control has considerably extended the industrial application of electric motors.

In connection with the design of contactor starting equipments, the General Electric Co. has carried out exhaustive experimental work at its switchgear works in Birmingham, and many refinements have been embodied in the construction of all types of contactor gear, which, it is claimed, enable the most intricate functions to be efficiently performed by unskilled labour.

The G.E.C. direct current contactor starting panels for use with series, shunt, or compound wound motors are made in the wall mounting pattern (Fig. 1) for motors having a maximum output of 20 H.P. on 100/125 V, 35 H.P. on 200/250 V, and 70 H.P. on 460/650 V. The floor mounting pattern (Fig. 2) is suitable for motors having a maximum output of 70 H.P. on 100/125 V, 150 H.P. on 200/250 V, and 300 H.P. on 460/650 V. Panels of higher capacity can be supplied to suit individual requirements.

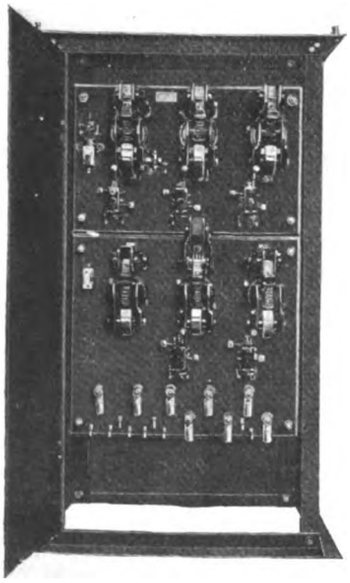

Fig. 2.—D.C. contactor starting panel for floor mounting.

In addition to the ordinary floor mounting contactor panel, the G.E.C. manufactures a pillar type panel complete with glazed inspection windows and front opening doors; the resistance is mounted behind the slate panel and the unit is entirely self-contained. These panels can be operated from push buttons, float, diaphragm, limit or tappet switches, time switches, master controllers and thermostats.

Panels of this kind are suitable for starting motors up to 40 times per hour against a starting torque of either 60 per cent. or 100 per cent. of full load torque, providing the aggregate starting time does not exceed 2 min. in 15. The rating and number of resistance steps comply with the British Engineering Standards Association specification. These starting equipments are usually provided with current limit relays, attached to the main and accelerating contactors, excepting the contactor cutting out the last step of resistance.

With current limit control the time of starting is automatically gauged by the load conditions, the motor starting up quickly on light and slowly on heavy loads. Where the load conditions permit or a constant starting period is required, time limit relays are provided, the time of starting being "set" for a definite number of seconds. This is effected by means of a solenoid plunger controlled by an oil dash-pot, so that the time required for cutting out the starting resistance can be varied from 5 to 60 seconds, by means of a small milled head screw mounted in front of the dash-pot.

When required, overload relays can be supplied with trip contacts arranged for electrical, hand or self-resetting, and fitted with or without adjustable time lag attachments. Such contactor starting panels can be supplied for use with reversible motors, by the addition of extra contactors which are mechanically interlocked to prevent more than one pair closing at the same time. These panels can also be utilised for variable speed motors, but when the speed range exceeds 15 per cent. it is necessary to interlock the rheostat with the "start" push button or fit a field relay, to ensure the motor starting up on full field.

G.E.C. alternating current contactor starting equipments are made in three types, viz., star-delta and auto-transformer starting panels for use with squirrel cage motors, and rotor starting panels for slipring machines.

These panels are made for wall fixing up to 45 H.P., and above this capacity they are designed for floor mounting (Fig. 3). They can be used with reversible motors and operated from push buttons, etc., in a similar manner to the direct current contactor equipments.

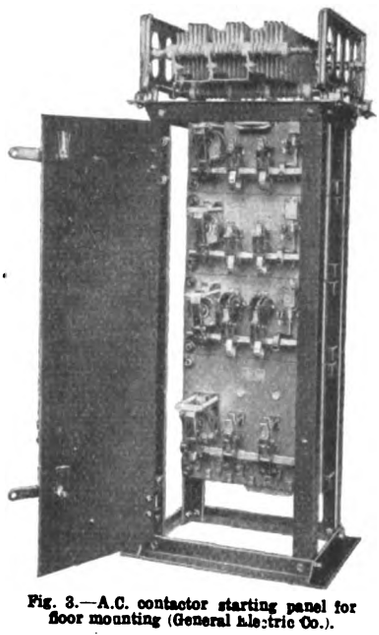

Fig. 3.—A.C. contactor starting panel for floor mounting (General Electric Co.).

As regards the rating of these panels the star-delta type is suitable for starting squirrel cage motors against 33 per cent. of full load torque. The auto-transformer type is for use when a torque greater than 33 per cent. of full load torque is required, with a normal period between successive starts of approximately 15 min. The rotor starting panels will start motors up to 40 times per hour against either 60 or 100 per cent. of full load torque, provided the aggregate starting time does not exceed 2 min. in 15.

G.E.C. rotor starting equipments are usually provided with current limit control, but time limit relays can be fitted, if desired.

For star-delta and auto-transformer starting panels time limit relays are provided, the time of starting being set for a definite number of seconds by an oil dash-pot.

"Whitaker."

Whitaker's Almanac for 1927 appears in two forms. One is the well-known complete edition (6s. net as before) and the other an abridged edition (1s. 6d. net). This replaces the former paper covered edition, which only contained a part of the complete edition. The new book is an abridgment of the whole. The whole itself is as useful as ever, even to electrical engineers, the data being well set out and up to date. Application to the publishers at 12, Warwick Lane, London, E.C.4, will confirm the truth of these.

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OIL FIELD ELECTRIFICATION.

An Efficient Method of Dealing with a Vital Fuel Problem—Some Interesting Drives—The Three-Phase Motor Pre-eminent.

THE current issue of "A.E.G. Progress," which is a magazine issued monthly by the A.E.G. Machinery and Apparatus Co., of 76, Victoria Street, London, is devoted to the important question of the electrification of oil fields. As the preface remarks, during recent years petroleum has become both an economic and political factor in the relationship of nations, a state of things which has been accentuated by the increase in motor-car traffic and the growing employment of oil engines and oil firing for various purposes. This is shown by the fact that whereas in 1914 only 3 per cent. of the world's mechanical marine employed oil engines or oil firing, in 1925 this percentage had risen to 32. It is not surprising, therefore, that, as in other spheres of human activity, electricity is to be found playing a leading rôle in the production of oil.

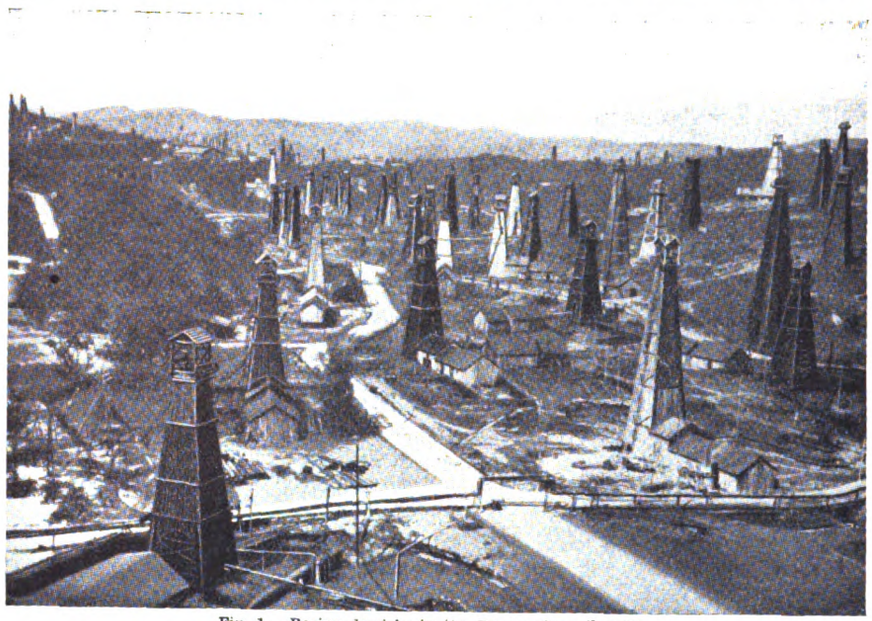
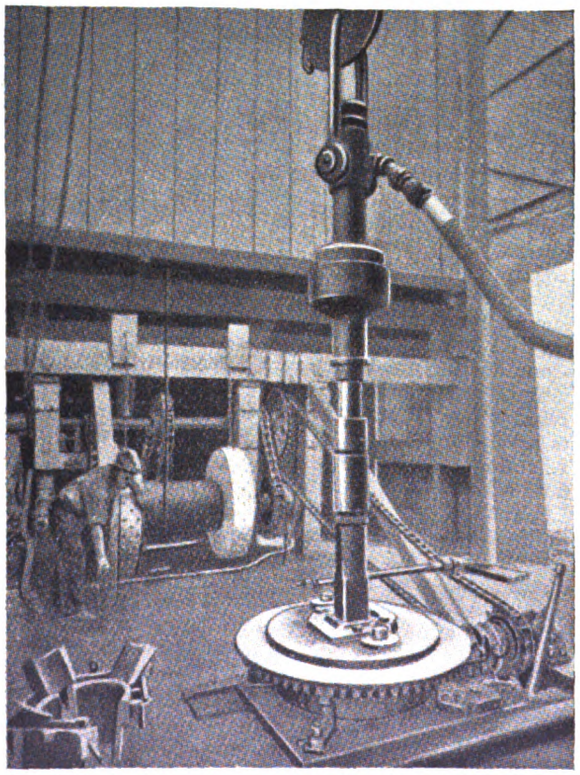


Fig. 1.—Boring derricks in the Roumanian oil fields.

The winning of oil from its natural deposits is a problem with many interesting problems on the mechanical side—problems which have been solved with much ingenuity in more than one way. These are discussed in a lengthy article by Mr. W. Kobs, who gives us details of the various methods of well-driving, boring, scouring, bailing, raising, pumping and oil transport, and discusses not only the best form of electrical equipment to use for this purpose, but details of the apparatus which has been actually used. This article, from the amount of novel technical information that it gives, is a real *vade mecum* for the electrical engineer.



Fig, 2.—Boring equipment for the rotary system.

The conditions in oil fields render the three-phase motor the most suitable to use in conjunction with flame-proof switchgear, and reasons of economy render it desirable that these motors should be arranged so that they can be run both in star or mesh. These must be combined with an unusual form of mechanical gearing so that drill or sludge bucket may be operated in the most efficient way. These general questions are elucidated by means of numerous illustrations and by reference to the Comodoro Rivadavia oil field in the Argentine, which has recently been completely electrified by the A.E.G. The equipment used in Baku and Roumanian oil fields, which are extensively electrified, are also dealt with.

A not uninteresting technical question in this connection is that of the best method to use in the generating stations which supply the current necessary for operating the well equipment. At first sight it would seem that with a cheap and abundant supply of oil available it would be most economical to use internal combustion engines. Extensive calculations on the Comodoro Rivadavia scheme and actual experience at Baku have shown, however, that it is better to use oil firing in conjunction with steam turbine plant than to employ oil engines. An article by Mr. Robert Schallhart on how this can be done should provide some useful data for power engineers even in this country. Some interesting information about distribution is also given, conditions in this case rendering special precautions necessary.

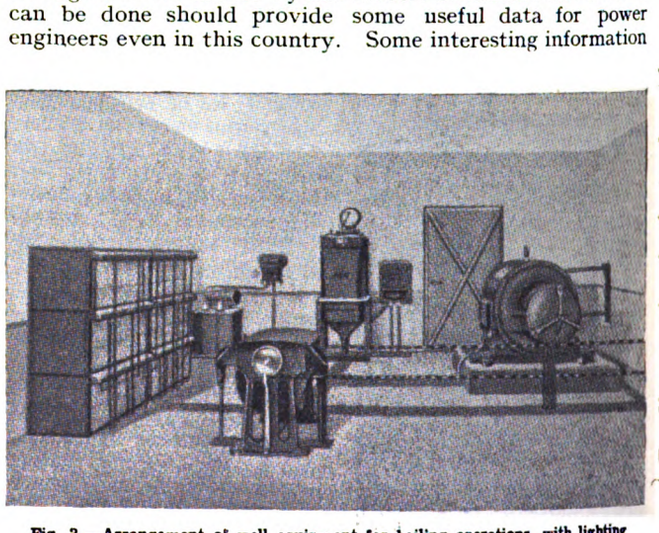


Fig. 3.—Arrangement of well equipment for bailing operations, with lighting installation.

Statistical articles give some valuable data regarding the position in a number of the world's important oil fields, including South America, Roumania, Baku and Galicia.

The publishers are to be congratulated on the excellent appearance of the issue no less than on the value of the information contained therein.

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NEWS IN BRIEF.

New Electrolytic Rubber Process—Insulating Material Discovery—Electric Heart for a Dog—Irish Electrical Trade.

PENMAENMAWR U.D.C. has approved a proposal to light the Golf Club House electrically.

Mr. E. E. Hoadley presided at the annual dinner of the Kent Section of the E.P.E.A. at Maidstone.

The annual meeting of the Birmingham Electric Club will be held at the Grand Hotel, Birmingham, this (Friday) evening.

At the annual dinner of Preston Corporation electricity staff, it was announced that Mr. J. A. Robertson would present a trophy for competition for the work's sports club.

The British rights in a new process of rubber manufacture depending upon the electrolytic deposition of rubber from the latex are said to have been acquired by the Dunlop Rubber Co.

A party of students at Faraday House recently visited the Stratford, London, works of the Hart Accumulator Co., Ltd., and inspected the various processes of accumulator manufacture.

From Germany is reported the discovery of a new insulating material intended to replace fibre, hard rubber and other materials. It is said to have a high electrical resistance and to keep its shape up to 200 deg. C.

Members of the Manchester Branch of the Electrical Association for Women visited the Manchester Corporation's electricity showrooms on December 9th, where an interesting talk was given by Mr. C. H. Rayner, sales manager.

Members of the Diesel Engine Users' Association recently visited King's College Hospital, London, where the hospital's Diesel installation, giving an annual output of 500 000 kWh for lighting, power and electrical treatment, was inspected.

Mr. T. B. Johnson, superintending engineer of Post Office and Telephones in the North Eastern district, stated at a meeting of the Leeds Municipal Officers' Club, that the Harrogate and Halifax automatic exchanges would be opened early in the new year.

From Moscow comes a story of the removal of a dog's heart and lungs by Russian surgeons and their replacement by a ½ H.P. electric motor operating apparatus for purifying the blood. The dog is said to have carried on for over two hours under these conditions before expiring.

Electrical goods imported into the Irish Free State in October were worth £45 967, a decrease of £13 016 on the corresponding month last year. The grand total for the first ten months of the year, at £373 654, however, shows an increase of £65 639 on last year's comparable figures.

Negotiations are proceeding between the Telegraph Union and the Governments concerned with a view to ensuring that in the event of war being threatened telegrams to and from the League of Nations shall have priority over other messages, whether by Government or private cables or wireless.

To mark the opening of the third extension of their main London factory in Falmouth Road, Great Dover Street, Waygood-Otis Ltd., invited over 900 of their London staff and employees to an inspection of the premises. During the evening an entertainment was given by the Morris-Ashton Concert Party.

At the annual dinner of the South Wales Section (Western Division) of the Electrical Power Engineers' Association at Cardiff, Mr. W. A. Chamen, proposing "The President and Association," said that although the term "trade union" had acquired an unpleasant flavour, a trade union like that Association had nothing wrong about it.

The L. and N.E. Railway saves £33 000 a year as the result of the abolition of 79 signal boxes during the last three years, which has been made possible by the adoption of electrical operation of points and signals. The system of three-colour electric light signals now in use on the sections of line between Marylebone and Rickmansworth, and between Leicester and Nottingham, is proving very satisfactory.

The Western Union Telegraph Co. and the Indo-European Telegraph Co. announce facilities at specially cheap rates for the sending of Christmas and New Year greetings by cable. The former company has prepared 20 types of greetings from which a selection can be made, and the minimum charges (for ten words) vary from 5s. 8d. to 7s. 6d. In the case of Mexico the minimum is 7s. 6d. for 15 words.

An electric "hare" coursing track is to be opened at Celtic Park, Belfast, next Easter.

Coal consumption of American power stations in 1925 averaged 2·1 lb. coal per kilowatt-hour.

Construction work has been commenced on the Perak Hydro-Electric Co.'s power station on the Perak River.

A standard specification for small transformers for domestic use has been issued by the Japanese Department of Communications.

A British patent has been granted to a Berlin firm for modifications in an electric suction cleaner permitting its use as a fly trap.

Considerable damage was done by fire on December 10th at the premises of the Electrical Equipment Co., Ltd., Railway Street, North Shields.

It is reported that charges for electricity supplied by the Witbank (South Africa) power station, at present 0·442d. per kWh will be further reduced to industrial consumers. The proposed reduction is intended to give the cheapest steam plant supply in the world.

The Commercial Cable Co. announces special rates for Christmas and New Year greetings by cable. The minimum charges range from 4s. 2d. or 9s. 7d. for 10 words, according to destination, except in the cases of Mexico and Cuba, for which the minimum charge is for 15 words.

Registered Contractors.

Fourteen More Firms Admitted to the National Register in December.

AT a meeting of the Executive Committee of the National Register of Electrical Installation Contractors on December 10th, consideration was given to 22 applications from electrical contractors for inclusion on the Register. Of these, eight were rejected, leaving the following fourteen new members:—Condy and Harris, 43, Bell Barn Road, Edgbaston, Birmingham; Greenwood Thomson and Co., 19, Blythswood Square, Glasgow, C.2; Holdsworth and Co., 75, Upper Bridge Street, Walsall; Hunt, R. and Co., Ltd., 39, Victoria Street, London, S.W.1; Jefferson, T. W., Whetstone Lane, Charing Cross, Birkenhead; Kinsey, John Harwood, 62, Cheetwood Lane, Cheetham, Manchester; Kydd, Robert Hill, Pratt's Buildings, 4, Dean Road, Westoe, South Shields; Leppingwell, Alfred Ernest, 39, Fenkle Street, Alnwick, Northumberland; Lockett, Frank, 56, Crofton Street, Rusholme, Manchester; Miller, Henry, 39, Paradise Street, Liverpool; Palmer, Robert F., 19, Church Street, Burnley, Lancs; Stanton, William, 39, Longshut Lane West, Stockport; The Thames Electric Co., Ltd., 11, St. James Road, Kingston-on-Thames, Surrey; Wood, Ernest, Ltd., Station Buildings, Altrincham, Cheshire.

Discounts for Contractors.

Birkenhead Corporation to Consider Action on E.C.A. Letter.

BIRKENHEAD Electricity Committee has had under consideration a letter from the Liverpool branch of the Electrical Contractors' Association relative to the electricity showrooms and the granting of discount to electrical contractors. The committee recommended that a discount equivalent to 10 per cent. of the retail price of the article sold be allowed to contractors introducing purchasers on the Corporation hire system.

Opposition was raised at a meeting to discuss the proposal on the ground that the Department did not give discount for other articles sold. Mr. Toosey said such concessions were granted to contractors by other municipalities, and in the case of Liverpool the discount was much greater than that proposed in Birkenhead.

Mr. Milne, deputy chairman of the committee, said concessions were granted to contractors in Liverpool, Manchester and Glasgow, and the contractors in Birkenhead thought it was only right that they should enjoy the same privilege. It was only fair that any application made by contractors should be considered. He was quite willing to take the report back. This course was adopted.

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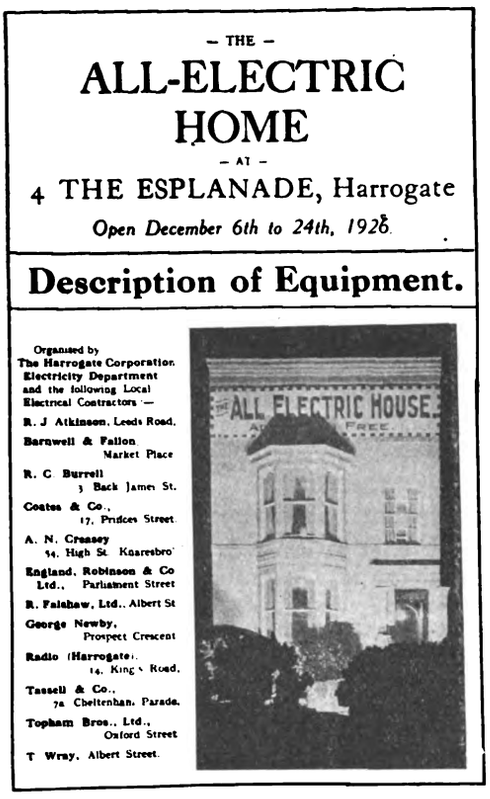
W.O.B. PROGRESS.

Enthusiasm at Harrogate—Ninety-three Electrical Circles Now Formed—Thirty-two Demonstration Homes Actually Opened.

ELECTRICAL circles that have not succeeded in obtaining much local newspaper publicity for their demonstration electric homes would do well to study the achievements of Harrogate in this direction. For the opening of its electric house at The Esplanade there was a preliminary opening ceremony performed by the Mayor in the Winter Gardens which produced nearly two columns of interesting matter for the local paper, which also published a picture of the house floodlighted at night. The Mayor was particularly enthusiastic in his remarks about the convenience and labour-saving nature of the electrical devices installed, but complained of the lack of an electrical digester. For this remark he is, we gather from a reliable source, liable to be made a M.M.C.


— THE —
ALL-ELECTRIC HOME
— AT —
4 THE ESPLANADE, Harrogate
Open December 6th to 24th, 1926.
Description of Equipment.
Organised by
The Harrogate Corporation Electricity Department and the following Local Electrical Contractors :—
R. J Atkinson, Leeds Road.
Barnwell & Fallon, Market Place
R. C Burrell, 3 Back James St.
Coates & Co., 17, Princes Street
A. N. Creasey, 54, High St. Knaresbro'
England, Robinson & Co Ltd., Parliament Street
R. Fairhaw, Ltd., Albert St
George Newby, Prospect Crescent
Radio (Harrogate), 14, King's Road.
Tassell & Co., 7a Cheltenham Parade.
Topham Bros., Ltd., Oxford Street
T Wray, Albert Street.
ALL ELECTRIC HOUSE
FREE

The cover design of the pamphlet distributed at the Harrogate W.O.B. house.

Above we reproduce in miniature the cover of a four-page folder prepared by the Electrical Circle for the information of visitors to the Harrogate house. Useful information is given inside of the cost of operating the various items of electrical equipment in each room of the house. For the kitchen, for instance, the following details are furnished : ceiling fitting, ½d. per hour ; sewing machine, 1/10d. per hour ; cooking stove, 1d. per person per day ; vacuum cleaner, 1/10d. per hour ; iron, ½d. per hour ; kettle, ½d. per hour ; floor polisher, 1/10d. per hour ; washer, ½d. per hour ; electric fire, 2d. per hour. During the time the house is open (until December 24th) cooking demonstrations are being given daily by the British Electric Transformer Co., Ltd., the General Electric Co., Ltd., and the Jackson Electric Stove Co., Ltd. ; while vacuum cleaner demonstrations are given by the Hoover Co., the British Vacuum Cleaner Co. and the G.E.C.

In the London district progress is now becoming more rapid. The Hampstead Electrical Circle has organised an electrical exhibition to be held in a building lent by the Hampstead Borough Council at Lithos Road, Finchley Road, N.W.3, from January 22nd to 29th. The B.E.A.M.A. rules and regulations will be strictly adhered to, and manufacturers and wholesalers wishing to be represented should apply at once to Mr. M. Watson (of Watson, Marsh and Co., Brondesbury, Ltd.), the hon. secretary, at 346, High Road, Brondesbury, N.W.6.

The special W.O.B. window display for December, described and illustrated in the fifth edition of the campaign newspaper, "Home Lighting News," is appropriately devoted to Electrical Christmas Presents, and while the suggested display is quite cheap and easy to arrange, it is remarkably effective ; and, like the previous special campaign windows, represents generally the kind of display that should be made in any case during the month for which it is designed.

There is a distinct improvement in the interest shown in the North Western area and the District Officer, Mr. R. C. Hawkins informed an ELECTRICIAN representative that, following a recent meeting of the area committee, plans have been developed for a great revival of interest in the New Year. The Manchester district is taking up a very much keener attitude, and the chief engineer, Mr. H. C. Lamb, is using all the influence possible to further the campaign. The demonstration house to be opened at Denton on December 28th is now almost completed.

At a recent meeting of the Manchester Branch of the E.C.A., several references were made to the W.O.B. Campaign, and at the dinner following the meeting, the tone of the speeches was favourable to active participation in the campaign.

Despite the improvement recorded above, our correspondent says there is still much room for improvement in this area, and that a little more enterprise might well be shown by individual contractors and others. In some cases, there are still some misunderstandings about the campaign arrangements. One example was the case of a firm which recently ordered 2 000 competition booklets, and gave, as the reason for not having done so before, the statement that they "did not know that non-members of the E.D.A. were entitled to the books." It is hoped that no others are hesitating for this reason.

The first of Nottingham's two demonstration houses had not been open many minutes before the reward of keen advertising began to reveal itself, and within about two hours approximately 400 people had put in an appearance, writes a representative of THE ELECTRICIAN, and in order to prevent overcrowding, it was necessary to engage commissionaires to regulate the number of admissions. Local contractors have already reported inquiries and orders as a direct result of the demonstrations.

It is now definitely arranged that the postponed opening of Walsall's two demonstration houses will be on January 1st. These will be systematically and thoroughly advertised, in the following way :—Personal invitations, in envelopes, will be delivered by hand at all residences in first-class roads. Similar, but open, cards of invitation will be sent to houses in second class roads, and invitations to householders in the outlying districts will be sent through the post. In addition, the contractors have undertaken to send personal invitations to all their trade acquaintances, and the houses will be extensively advertised in the Press, on the hoardings, and in the trams.

The Wolverhampton local committee is arranging an electrical exhibition to be held in the Wolverhampton Baths Assembly Hall, and extending over three days, from January 27th to 29th.

THE ELECTRICIAN understands that the Birmingham Committee is planning a new advertising "stunt" in connection with the campaign which will arouse a good deal of interest in the Midlands. It is not permissible to give details yet, but the plans will shortly mature, and more may be said then.

Electricity Bill Critics.

Mr. R. P. Sloan Expresses Willingness to Promote Objects of the Bill.

"ALTHOUGH I have been one of the greatest critics of the measure, I will do all I can to achieve the ends which the promoters have set before them." So said Mr. R. P. Sloan, chairman and managing director of the Newcastle Electric Supply Co., in a speech at the annual dinner of the North Eastern Division of the E.P.E.A. at Newcastle, on Saturday.

As it was the most important measure that had been devised affecting the electrical industry, he thought the industry's views should have been considered and embodied in the Bill, but unfortunately, that was not done. He also complained that more importance was attached by the Weir Committee to witnesses from across the Atlantic.

His own criticisms, and those of the majority of the objectors, had been made with the object of bringing about improvements, but now, whatever might be the individual's view of the merits of the Bill, once it was placed on the Statute Book, all concerned must do their best to make it as great a success as possible.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

ALD. Sir Harry Hatt has been re-elected chairman of the Bath Electric Lighting Committee.

Coun. J. George has been appointed convener of Aberdeen Tramways Committee.

Capt. H. P. Chick has been elected chairman of Marylebone (London) Electric Supply Committee.

Mr. A. Higson has been appointed electrician and engineer in charge of the Reading sewage pumping station.

Dover T.C. has appointed Mr. R. Spencer as charge engineer at the electricity works, in place of Mr. E. Sayer.

Mr. J. C. Hodson, lately sales manager of the Electron Co., Ltd., has joined the sales staff of the Mullard Wireless Service Co., Ltd.

Lichfield City Council has decided to appoint Mr. W. C. C. Hawtayne as consulting electrical engineer for five years, at 50 guineas per year.

Miss Hilda Bartlett (of Sheffield Corporation Electricity Department) has been appointed demonstrator in the Rotherham Electricity Department.

Ald. E. Huntsman and Coun. G. H. James, respectively, have been re-elected chairman and vice-chairman of the Nottingham Electricity Committee.

Mr. William Greenfield has been appointed by the Northern Electrical Co. as resident engineer and manager of the company's new electricity supply undertaking at Whitehead.

Mr. A. B. Cleworth has entered the service of the Premier Cooler and Engineering Co., Ltd., Shalford, near Guildford, to take charge of the sales of humidifying and ventilating plant.

Mr. James McMahon has been elected a director of the Dublin United Tramways Co. and Mr. Wm. Stewart has been appointed chairman in succession to the late Mr. Joseph Mooney.

Mr. John Cecil Ward, electrical engineer to Messrs. H. H. Timberlake, of Wigan, was married recently at St. Thomas' Church, Ashton-in-Makerfield, to Miss Margaret Evelyn Pardey, elder daughter of Mr. Pardey, of Park House, Ashton-in-Makerfield.

The staff of the Leafield, Oxon, wireless station have presented Mr. J. J. Macqueen, inspector, with an oak mantel clock, on his leaving to take up an appointment at the new beam station at Grimsby. Mr. Macqueen has been at Leafield since its inception in 1921.

Mr. T. Sutcliffe, of Sunderland, who has been appointed chief clerk at the Rotherham Electricity Works, was involved in a railway accident when proceeding to interview the sub-committee dealing with the appointment. Fortunately he escaped without injury.

Mr. F. H. Francis has been presented with a gold watch and chain to mark the occasion of his completion of 25 years as chief engineer of the Oxford Electric Light Co., with whom he has been for 36 years altogether. The presentation was made by Col. C. I. Phillips, chairman and managing director of the company.

The Nobel Prize for Physics for 1926 has been awarded to Prof. Jean Perrin. Prof. Perrin, who is a professor at the Sorbonne and a member of the Academy of Sciences, was born at Lille in 1870. In 1897 he wrote a valuable thesis on cathodic rays and X-rays, and he has devoted himself to the study of fluorescence, radioactivity, and colloidal phenomena, molecular theories and electricity.

Obituary.

MR. W. C. Owen has died at Bath, aged 62 years. He spent 40 years in the telephone service, beginning in 1882 with the United Telephone Co. Three years later he was appointed local superintendent for the Gloucestershire centre of the Western Counties Telephone Co., and later became district superintendent. On the amalgamation of the telephone companies in 1892, he held various telephone appointments. In 1902 he commenced business as an electrical contractor, but in 1904 he rejoined the National Telephone Co. and became manager for the Bath, Radstock and Wiltshire areas. On the system being acquired by the State he was appointed local manager for the Bath centre, a position he retained until February, 28th, 1922. He was the author of a book, dealing with telephone lines and methods of construction, published in 1903.

AN ELECTRICAL ZOO.

Novel Electrical Heating Installations for Reptile and Monkey Houses.

ELECTRICAL men taking their youngsters to the Zoo in the near future will find their indulgence well repaid when they come to the new crocodile beach, the inhabitants of which will be able to crawl over electrically heated sand, rest on electrically heated rocks and bask in electric light having affinity to tropical sunlight.

But this is not all. For some time past the heating department of the G.E.C. has been devising a comprehensive scheme of electric heating in various parts of the London Zoo. The work has involved considerable research into automatic thermal control, and though the installation has presented many difficulties, the completed results will undoubtedly be unique.

Special types of electric heaters, comprising conduction and radiation patterns, have been placed in the new reptile house, where every electric heater or cage will be under automatic control. The monkey house is another section to which attention is being directed, the idea of providing cosy corners for the monkeys on cold days having inspired a novel and comprehensive scheme, the full effect of which can only be judged when the work is completed.

Business Items.

Changes of Address, Representatives, and Other Developments.

THE Cheam Motor Co., Ltd., Ewell Road, Cheam, Surrey have opened a separate radio department.

Mr. Sidney Perry, electrical contractor and radio engineer, of 88, St. Dunstan's Street, Canterbury, has opened branch premises at 139, High Street, Herne Bay.

British makers of electric ovens, radiators, irons, etc., are offered representation in the whole of New Zealand by a Dunedin firm. Inquiries to the Department of Overseas Trade. (Reference No. 604.)

The registered offices of A. C. Scott and Co., Ltd., have been transferred to 99, St. James' Street, Manchester. The telephone number is City 9235 and telegrams should be addressed to "Cromaloy, Manchester."

On January 1st Weldric's (1922), Ltd., electric welding specialists, of Kingston Road, Raynes Park, London, are moving to larger premises at Station Road, Beeston, Notts. The new telephone number will be Beeston 245, and the telegraphic address, "Weldrines, Beeston, Notts."

Forty Years Ago.

Brief News Extracts from "The Electrician" of December 17th, 1886.

A GLANCE through our issue of December 17th, 1886—exactly forty years ago—recalls that:—

Electric lamps were used for lighting a Christmas tree at a Bradford bazaar.

* * *

Mr. Bernard Drake was appointed electrical engineer to the Bank of England.

* * *

In Boston (U.S.A.) the Telephone Co. was voluntarily laying its lines underground.

* * *

Sir Charles Tilson Bright, M.P., was elected President of the Society of Telegraph Engineers.

* * *

"Listening-in" by telephone to the opera was a service provided for telephone subscribers in Lisbon.

* * *

An American submarine was electrically lighted throughout, and employed an electrical device for making torpedoes adhere to the keel of their target before being exploded.

* * *

The hearing was begun of the appeal by Woodhouse and Rawson from a judgment in favour of the Edison and Swan United Electric Light Co., regarding the Edison and Swan lamp patents.

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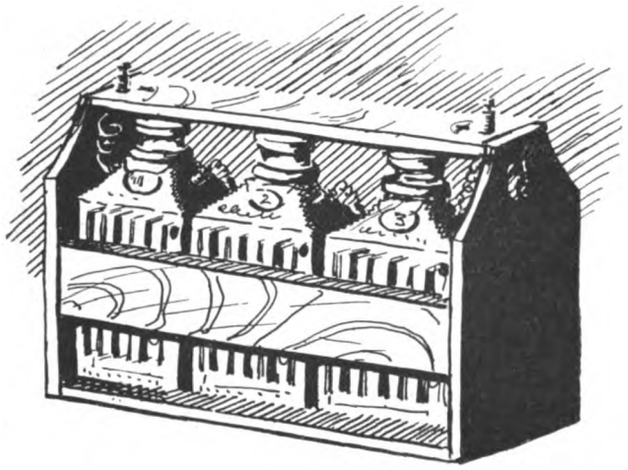
IN LIGHTER VEIN.

Further Suggestions for Electrical Christmas Presents.

THE selection of Christmas presents shown in this column last week were all suitable for electrical engineers only, but we illustrate this week one with a much wider range of usefulness, which should have a ready sale amongst wireless enthusiasts.

The modern trend appears to be that any equipment must " look like what it ain't " ; it must be disguised—camouflaged



The Tantulator.

—made to look like anything but what it is. Cardiff covers the kiosks ; we have loud-speakers looking like pictures, proving the truth of the old saying " Every picture tells a story," and telephones masquerading as mummies, dolls, or anything as much unlike a telephone as possible, so that without inside information looking for the 'phone is like playing hunt the slipper.

Abreast with this movement is the sideboard set, a radio reception cabinet, with an interesting apparatus called the Tantulator.

The Tantulator is a disguised low-tension battery (a three cell unit is shown in the illustration). The accumulator electrodes are fitted in a beautiful cut glass container in the form of a decanter. The stopper is fitted with a non-spilling device, and can easily be removed for topping up.

To give local colour a little of the correct " raw material " is added to the electrolyte. The complete unit is fitted into an oak or a mahogany case, making an excellent sideboard decoration. It gives complete reception and deception. So complete, in fact, is the deception that several people have taken a " nip " which has produced sulphurous language, due no doubt to the sulphur content of the electrolyte. An American was so completely deceived that he is still unaware of his mistake.

In each of the containers are three coloured beads to indicate the state of charge, and these have been responsible for a number of amusing incidents, and have actually been responsible for several people signing the pledge. The sight of the red, white and green beads in what was taken to be a decanter has been taken as an indication that the investigators themselves were " over-charged."

The high-tension battery used in conjunction with the set is made up to resemble a box of cigars, and the units are fitted in test tubes shaped and coloured like cigars, with the maker's name on the band.

The complete equipment is as unlike a wireless set as it is possible to be, and no higher recommendation than that could possibly be given.

Points of View.

Interesting Pronouncements on a Variety of Electrical and Allied Subjects.

ELECTRICITY is my maid, and it saves me time and money.—*Ald. Mrs. S. E. Hammer.*

* * *

The Electricity Bill should mean less work for women.—*Mr. J. S. Wardlaw Milne, M.P.*

* * *

If I were to begin my career over again I would turn to electric light, heat and chemical reactions.—*Mr. T. A. Edison.*

LEGAL INTELLIGENCE.

Failure to Report Accident to an Employee.

EDGAR Martin Fawcett, electrical engineer, New Street, Paignton, was summoned on December 9th for having failed to report an accident to one of his employees.

Mr. Fawcett said he was unaware of the obligation to report the accident which, he added, was caused by sheer carelessness on the part of the man.

The magistrates said they did not think there was any wilful neglect in the case, which they dismissed on payment of costs.

Electric Lamp Patents in Ireland.

In the Dublin High Court last week, in the case of British Thomson-Houston Co., Ltd., *v.* Litton and Co., Ltd., relating to alleged infringements of electric lamp patent rights, Mr. G. Gavan Duffy applied *ex parte* on behalf of defendants for liberty to add Grammont's, lamp manufacturers, of Rue d'Uzes, Paris, as joint defendants in the action, on the ground that Litton and Co., Ltd., had a right of indemnity against them, as their sole agents for the sale of their electric lamps.

The action, which formed the subject of an appeal to the Supreme Court some time ago, was brought by plaintiffs against Litton and Co., Ltd., a Dublin firm, for an injunction to restrain them from infringing certain letters patent or a monopoly purporting to be granted to plaintiffs under the seal of the Patent Office, which letters patent the defendants are alleged to have infringed by dealing in certain electric lamps in the Irish Free State. Damages were claimed for the alleged infringement.

In an affidavit in support of the application Mr. Francis Henry Litton, managing director of defendant company, explained the subject matter of the cause of action and the relations that existed between his firm and Grammont's, and stated that the latter were members of a certain international trust for the plaintiffs in the action, and that the lamps referred to were supplied by Litton and Co. after Grammont's had joined the trust. The defendant company sought leave to join them as third parties in the proceedings on the ground that they were bound to indemnify them against the claim of the plaintiffs.

The Master granted the application, directing that notice should be served on Grammont's.

Trade Mark Infringement.

On Tuesday Mr. Justice Tomlin granted a motion of the British Broadcasting Co. to restrain Britain's Best Crystal, Ltd., from using a device containing the letters B.B.C., on the ground that it was an infringement of the plaintiffs' trade mark.

IN PARLIAMENT.

Third Reading of Electricity (Supply) Bill in the Lords.

ON Friday last in the House of Lords, Viscount Peel moved the third reading of the Electricity (Supply) Bill.

Lord Montagu of Beaulieu said scientific opinion outside the House was entirely against the Bill. Means of power would be available in the near future which might render the use of electricity on long transmission lines uneconomic. This country could never hope to produce electricity at anything like the low cost at which it was produced in some other countries. He deprecated Government interference with the electrical industry, and believed that it could only lead to trouble and waste of public money.

Viscount Peel said the general experience was that, as new forms of power became available, they did not entirely displace old forms of power. He believed that developments in gas and electricity would be complementary. This country was compact and highly industrialised, and should be able to produce electricity usefully and cheaply. The Bill was read the third time and passed.

Electricity Special Orders.

The House of Lords has approved the Fife Electricity, etc., Special Order.

The House of Commons has approved Special Orders in respect to (1) Isle of Wight rural district ; (2) Uphill parish, in Axbridge rural district ; (3) Barkisland, Midgley, Rishworth,

(*Concluded on page* 716.)

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THE NATIONAL REGISTER.

Conclusion of Latest List of Registered Electrical Contractors.

BELOW we conclude the latest list of contractors whose names were on the National Register on October 31st, 1926 :—

Weston-Super-Mare.—H. S. Phillips.

West Ryton.—Hodgson and Colely.

Weybridge.—Urban Elec. Supply Co., Ltd.

Weymouth.—V. H. Bennett and Co.; W. Smith and Son.

Whitley Bay.—A. P. Adamson; Fred L. Gray; Robert Norie; Robson and Coleman; J. W. F. Sherriff.

Wigan.—Corlett Electrical Engineering Co., Ltd.

Willington Quay-on-Tyne.—J. Bonham and Co.

Winchester.—Dicks, Ltd.

Windsor.—H. Fenemore.

Wolverhampton.—Midland Electric Power Installation Co.; Smith and Bellhouse; Wolverhampton Corporation (Electricity Dept.).

Worcester.—Abell and Smith's Elec. Co., Ltd.; Jas. Ward (Worcester), Ltd.

Worksop.—Frederick Kirk.

Worthing.—H. J. Galliers, Page and Miles, Ltd.; Phillips and Dart.

Yeovil.—Western Counties Electrical and Engineering Co., Ltd.; Yeovil Elec. Light and Power Co.

York.—H. Etherington; John Naylor and Sons; York Corporation Electricity Dept.

Scotland.

Aberdeen.—Aberdeen Electrical Engineering Co., Ltd.; Bell and Robertson, Ltd.; John Jackson; J. C. Laing; A. B. Robertson and Son, Ltd.; T. C. Smith and Co., Ltd.; James Thomson.

Airdrie.—Brown and Jepson.

Ayr.—W. G. Dodd, Ltd.

Brechin.—North of Scotland Electric Light and Power Co., Ltd.

Coatbridge.—E. J. Snell and Co.

Crieff.—Crieff Electric Supply Co.

Dalbeattie.—Dalbeattie Electric Light and Power Co., Ltd.

Dumfries.—Anderson and Munro, Ltd.

Dundee.—Mackersie and Co.; Maxwells (Dundee), Ltd.

Dunfermline.—James Scott and Co.

Edinburgh.—William Barton and Sons; F. C. Bucher (Stewart and Bucher); Cole and Co.; William Douglas, Ltd.; Edinburgh Electrical Engineering Co., Ltd.; John Foggo and Sons; David Pringle Gilchrist; Hamilton and Grinton; Mackenzie and Moncur, Ltd.; D. S. Munro; Andrew J. Shand and Co.; J. Sibbald and Sons; Spencers (Scotland), Ltd.; J. Ross Stevenson and Co.

Elgin.—Elgin Electricity Supply Co., Ltd.

Galashiels.—A. Kellock.

Glasgow.—Arthur Allan and Ure; Anderson and Munro, Ltd.; Walter Bennett, Ltd.; Chalmers, Ltd.; P. H. Cossar; J. Cunningham; Drake and Gorham, Ltd.; Edmiston, Brown and Co., Ltd.; Hugh M. Fulton; Grindley, Ross and Co., Ltd.; Claud Hamilton, Ltd.; Haddow and Co., Ltd.; A. Hutcheson, Ltd.; William B. Hutchison; Johnston, Park and Co.; William Jones; Kennedy, Stark and Co.; Archd. Low and Sons, Ltd.; Alexander Lindsay; James H. McMorrine; Malcolm and Allan, Ltd.; W. C. Martin and Co.; T. B. and J. A. Mathieson, Ltd.; James Meighan and Son; Osborne and Hunter; Primrose and Primrose; R. M. Russell; Robert J. Sinclair; Steel and Wilson; Underhill and Ritchie, Ltd.; Archibald and Dundas Watson.

Greenock.—Brodie and Hall; Hurry Brothers.

Hawick.—Urban Electric Supply Co., Ltd.

Inverness.—Edmundson's Electricity Corporation, Ltd.

Johnstone.—James Sweeney.

Kilmarnock.—Aird, Walker and Ralston; J. C. Baillie.

Montrose.—North of Scotland Elec. Light and Power Co., Ltd.

Paisley.—Joseph Bell; James Kilpatrick and Son, Ltd.

Perth.—Anderson and Munro, Ltd.

Port Glasgow.—D. A. Brown.

Portobello.—Cole and Co.

Stirling.—Lockhart and McNab.

Troon.—Anderson and Munro, Ltd.

Northern Ireland.

Belfast.—Birch and Workman, Ltd.; William Coates and Son, Ltd.; Curran Brothers; William Curran and Son, Ltd.; John Dowling and Sons, Ltd.; D. Gamble and Co.; Gilmore and Co.; C. V. Hill; Hynds and Co.; Oswald and H. Jamison; Stanley Johnston, Ltd.; Jas. Lowden and Co., Ltd.; John McMaster and Sons; McKeown and Martin, Ltd.; J. J. Milliken; Riddels, Ltd.; John Somerville; Andrew Stevenson.

Londonderry.—T. Caffrey; William John Williams.

Irish Free State.

Dublin.—Ampere Electrical Co.; H. A. Andrews; F. Barrett; Thomas Brooks and Co., Ltd.; A. G. Bruty; R. J. Clarke; Christopher J. Cummins; Thos. Dockrell, Sons and Co., Ltd.; Robert H. Farmer; Featherstone and Davey, Ltd.; Handley and Robinson, Ltd.; Chas. Jones, Junr.; Maguire and Gatchell, Ltd.; Meldons, Ltd.; Mulligan Bros.; Roche and McConnell; F. G. Sherwood; F. E. Smith; A. Blackburn Wright.

Limerick.—D. Thompson and Son, Ltd.

Tipperary.—M. F. Kent.

Isle of Man and Channel Islands.

Douglas.—V. A. F. Bellamy; Lawton and Co.

Guernsey.—Guernsey Elec. Light and Power Co., Ltd.

Newcastle Contractors' Dinner.

Exceptionally Bright Prospects Predicted for the Electrical Industry.

THAT nothing can prevent a tremendous boom in electricity during the next ten or twenty years was the prediction of Mr. J. Y. Fletcher, a director of the General Electric Co., Ltd., in a speech at the annual dinner of the Newcastle Branch of the E.C.A. on December 9th.

The contractors, Mr. Fletcher said, constituted a very good trade barometer for the whole of the electrical industry. One of the results of the Electricity Bill would be a development of standardisation which would inevitably be accompanied by really large-scale mass production. The economies that these developments would render possible in production and distribution would result in greatly increased work all round. Whatever might be the effect of the Electricity Bill, however, he did urge that they should not allow the co-operation recently established between electrical manufacturers, wholesalers, contractors and supply undertakings to break down.

All were now familiar with the "approved clause" finally adopted for inclusion in the Bill, but not so well acquainted with the fact that there was a committee provided to settle what are the established retail prices, and with the declared policy of the I.M.E.A., which was as follows :—

"The I.M.E.A. have satisfied the E.C.A. that they have no desire to interfere with the legitimate business of electrical contracting, but rather to assist it in every possible way."

In the discussions on the clause, the handling of the contractors' case by Mr. T. E. Alger, and, later, by Mr. H. J. Miles, had raised the dignity and status of the E.C.A in the eyes of all sections of the industry, but in none more than in the eyes of the I.M.E.A.

Mr. R. E. Robson, referred to the part the electrical industry had played in the promotion of the projected North East Coast Exhibition of 1928, and pointed out that the idea originated at an E.D.A. meeting in Newcastle.

The E.T.B.I. Watch.

Benevolent Fund Gains Over £120 as Result of Competition.

A FEATURE of the eighth annual Newcastle ball in aid of the Electrical Trades Benevolent Institution, last Friday, was the announcement of the result of the "stop watch" competition organised by Mr. R. E. Robson.

Curiously enough, this announcement brought to light two remarkable coincidences. In the first place the prize gold watch actually stopped at 9 hours 54 minutes, and was taken out of the box in which it had been sealed at 9.55 p.m.

The prize was awarded to Mrs. M. Sheriff, of 39, Queen's Drive, Monkseaton, and the watch was removed from the box —before the name of the winner was known—by the Lady Sheriff of Newcastle! The amount realised by the competition was £121 5s.

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MUNICIPAL FINANCE.

Leading Points from Accounts of Municipal Electricity Departments for the Year ended March 31st, 1926.

THE total revenue for the year 1925-6, of the 28 undertakings included in the following table, plus the 48 dealt with in the tables published in our issues of September 24th and November 5th, was £16 674 364, the gross profit on the year's working of the 76 undertakings was £7 490 880; and their aggregate sales of electricity amounted to 2 604 459 310 kWh, while 35 undertakings out of the total number have contributed an aggregate of £455 463 to the relief of rates out of the year's profits. The figure given in our November 5th issue as the aggregate of the sales of electricity by the 48 undertakings dealt with up to that date should have been 1 960 733 518 kWh, which figure is included in the aggregate above-mentioned. As it is desired to make this series of tables as useful as possible, the Editor will be pleased to receive from the engineers or managers of other municipal electricity undertakings particulars, if available, for each of the columns.

Supply Authority.	Total Revenue.	Gross Profit.	Net Profit (+) or deficit (−)	(a) Working Costs per kWh sold.	Total Cost per kWh sold, (inc. capital charges).	Electricity sold (kWh)	Increase (+) or Decrease (−) in kWh sold.	Maximum Load on Station. kW.	Load Factor.	Radiators and Cookers Connected (total in kW except where otherwise stated).	Other Domestic Appliances connected (total) in kW).	Contributed in Aid of Rates.
	£	£	£									£
(b) Aberdeen C.C. ..	196 108	91 012	+10 985	0·524d.	1·605d.	26 779 912	+320 953	13 033	28·96	(1) 9 294	See footnote (1)	—
(d) Atherton U.D.C. ..	23 209	3 124	+931	0·164d.	0·967d.	5 550 876	+374 246	2 900	26·00	—	—	—
Bath C.C.	65 247	31 400	+2 261	1·380d.	2·600d.	5 640 490	+1 249 539	3 910	22·21	See footnote (3)	See footnote (3)	1 100
Battersea (London) B.C...	145 819	63 817	+22 672	0·858d.	1·280d.	22 915 755	+2 390 124	9 605	27·23	(1) 3 015	See footnote (1)	—
Blackburn T.C.	172 491	101 622	−22 509	0·698d.	2·017d.	23 200 170	+1 357 129	12 255	26·80	See footnote (4)	See footnote (4)	—
Blackpool T.C.	172 200	71 968	+34 855	1·180d.	1·650d.	18 661 564	+5 250 000	8 807	31·00	—	—	16 000
Bradford C.C.	494 388	220 635	+21 210	0·849d.	1·508d.	73 448 196	+4 100 505	38 300	21·96	(2) 20 352	See footnote (3)	18 000
Bury T.C.	100 747	43 311	+7 837	0·538d.	1·009d.	21 091 253	—	—	26·30	(No.) 30	—	1 000
Croydon T.C.	223 273	74 500	+9 250	0·986d.	2·330d.	22 033 211	+3 308 893	11 300	27·82	(6) 4 816	—	—
Darwen T.C.	32 755	11 895	+4 769	1·254d.	1·682d.	3 993 104	+409 699	2 120	25·22	—	—	2 000
Derby T.C.	178 645	98 033	+25 654	0·670d.	1·290d.	28 905 976	+3 779 976	12 000	34·26	(5) 11 000	(5) 500	10 024
Doncaster T.C.	57 541	31 267	+6 574	0·840d.	1·980d.	5 932 246	+972 000	3 200	21·16	See footnote (3)	See footnote (3)	—
Dundee C.C.	203 573	86 388	+19 788	0·470d.	1·310d.	33 634 478	+1 534 478	17 979	25·00	See footnote (3)	See footnote (3)	—
(c) Edinburgh C.C. ..	490 347	210 880	−3 836	0·841d.	1·487d.	79 776 110	+14 137 517	40 700	27·10	—	—	—
Exeter C.C.	54 231	25 249	+6 936	1·800d.	3·500d.	3 863 459	+444 739	2 500	23·40	(1) 1 200	See footnote (1)	1 250
Gloucester C.C.	52 209	21 411	+5 392	1·180d.	1·890d.	5 397 277	+144 279	2 830	24·31	See footnote (3)	See footnote (3)	—
(c) Greenock T.C. ..	144 520	59 979	−9 832	1·108d.	2·045d.	18 111 817	−2 534 374	12 182	21·22	See footnote (3)	See footnote (3)	—
Halifax T.C.	182 467	84 175	+23 854	0·929d.	1·499d.	25 385 352	+1 717 103	13 800	26·58	See footnote (3)	—	7 466
Hastings T.C.	66 734	31 071	+3 542	1·590d.	—	5 395 157	+2 020 452	3 700	20·24	—	—	6 000
(f) Huddersfield T.C. ..	174 330	53 059	+259	0·910d.	1·580d.	26 389 860	−352 250	14 090	28·23	See footnote (3)	See footnote (3)	—
Kettering U.D.C. ..	56 598	24 682	+3 960	1·209d.	2·014d.	5 327 484	+825 084	3 375	23·70	(1) 3 056	See footnote (1)	—
Leyton T.C.	104 230	30 372	+16 142	1·810d.	2·160d.	9 174 328	+826 839	3 924	32·10	(1) 1 332	See footnote (1)	16 142
Nottingham C.C... ..	304 747	129 282	+21 580	1·514d.	2·459d.	27 795 880	+3 565 906	16 031	19·79	—	—	20 000
Rotherham T.C.	232 935	132 291	+37 433	0·411d.	0·810d.	58 730 931	+4 623 356	26 000	25·90	See footnote (3)	See footnote (3)	—
St. Helens T.C.	119 672	40 195	+175	—	—	33 213 518	—	7 800	—	—	—	—
Stepney (London) B.C...	259 286	116 232	+29 447	0·729d.	1·194d.	45 037 107	+516 354	24 770	25·80	(1) 3895	See footnote (1)	—
Taunton T.C.	28 290	14 190	+4 461	—	—	1 740 281	+309 124	(e) 1 142	21·70	—	—	—
Torquay T.C.	71 066	36 211	+15 536	1·190d.	1·950d.	6 600 000	+1 815 000	3 829	19·65	(5) 7 000	(5) 3 000	—

(a) Including management, repairs and maintenance, and, usually, rates and taxes and special charges. (b) For year ended July 31st, 1926. (c) For year ended May, 1926. (d) Bulk supply from South Lancashire Tramways Co. (e) On Feeders. (f) For year ended December, 1925. (1) Including other domestic appliances. (2) Including welders. (3) No record. (4) Record not kept hitherto, but being commenced in current year. (5) Approximate. (6) On hire, including kettles and other water heaters and wash coppers.

Trade Publications.

The London Electric Wire Co. and Smiths, Ltd., Playhouse Yard, Golden Lane, London, E.C.1, has issued a general list of "Lewcos" radio products (the prices in which are net to the public, but subject to the usual discount to dealers); a leaflet on "Lewcos" screened coils and transformers, and a large sheet illustrating a collection of the company's propaganda literature from which retailers may make a selection.

Several publications issued by Metro-Vick Supplies, Ltd., Metro-Vick House, 155, Charing Cross Road, London, W.C.2, are to hand. These include a new edition of the Cosmos Radio Catalogue, Section R (M.S. 4098), which contains details, prices and excellent illustrations of crystal and valve sets, amplifiers, valves, aerials, accumulators, condensers, resistances, head telephones, loud speakers, etc.; Supply List (102/8) of Cosmos Lamps, section A, which is also well illustrated and comprises information regarding all types of "Cosmos" lamps; and a wall sheet, which brings the prices of Cosmos lamps to the notice of prospective customers without the necessity for referring to the book-form catalogues; and a series of small folders on Cosmos radio valves and valve sets, Cosmos resistance, coupling units and Cosmos wireless components and accessories in general.

Books Received.

"Electric Trains." By R. E. Dickinson. (London: Edward Arnold.) Pp. xii+292. 16s. net.

Pitman's Radio Year Book, 1927. (London: Sir Isaac Pitman and Sons). Pp. viii+176. 1s. 6d. net.

"Wireless Pictures and Television." By T. Thorne Baker. (London: Constable and Co.) Pp. x+188. 6s. 6d. net.

"Journal of the Institution of Electrical Engineers," Vol. 64. No. 359. (London: E. and F. N. Spon.) 10s. 6d. net.

"Garcke's Manual of Electrical Undertakings," 1925-1926. Vol. 29. (London Electrical Press). Pp. 2 000. 35s. net.

Pitman's Electrical Educator. Part 32. Edited by J. A. Fleming, F.R.S. (London: Sir Isaac Pitman and Sons). 1s. 3d. net.

"Home Fires Without Smoke." By C. Elliott and Marion Fitzgerald. (London: Ernest Benn, Ltd.) Pp. xvi+58. 3s. 6d. net.

The "Practical Engineer" Electrical Pocket Book and Diary, 1927. Edited by Conrad Arnold. (London: Humphrey Milford). 2s. 6d. net.

"The Whitworth Book." Prepared by the Whitworth Society. Hon. Editor, Prof. D. A. Low. (London: Longmans, Green and Co.) Pp. 316. 10s. 6d. net.

"The Anodic Oxidation of Aluminium and Its Alloys as a Protection Against Corrosion." Issued by the Department of Scientific and Industrial Research. (London: H.M. Stationery Office). Pp. 40. 1s. 3d. net.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited, with the closing date, if available.

SOUTHMEAD HOSPITAL, WESTBURY-ON-TRYM, December 17th.—Supply and installation of X-ray apparatus. Tenders to Mr. T. S. Lamb, St. Peter's Hospital, Bristol.

GLASGOW CORPORATION, December 18th.—Electric lighting installation on the Tenement Section of the Possil Housing scheme. Specifications from Mr. R. B. Mitchell, 75, Waterloo Street, Glasgow.

LOANHEAD (MIDLOTHIAN) CORPORATION, December 20th.—Electric lighting installation for 16 houses at Kennington Avenue, Loanhead. Specifications from Mr. Geo. B. Deas, Central Chambers, Kirkcaldy.

RADCLIFFE URBAN DISTRICT COUNCIL, December 20th.—Two centrifugal pumps, with motors, for sewage works. Particulars from the Engineer, Council Offices, Radcliffe.

SOUTHEND CORPORATION, December 20th.—Supply of 1 300 house service electricity meters. Particulars from Mr. R. Birkett, Electricity Works, London Road, Southend-on-Sea.

CARDIFF GUARDIANS, December 21st.—Cables, wiring, etc., for electric lighting of Ely Lodge Institution, Cardiff. Specifications from the Clerk, 11, Park Place, Cardiff; deposit £5 5s.

DUBLIN PORT AND DOCKS BOARD, December 21st.—Electric light installation in transit shed on Great Britain Quay. Specification from the Engineer, East Wall, Dublin.

INDIA STORE DEPARTMENT.—December 23rd.—Supply of electric inert cells, sizes O, Q and S. Specifications (5s.) from the Director-General, Branch No. 11, Belvedere Road, London, S.E.1.

NORTHERN CO-OPERATIVE SOCIETY, December 23rd.—Supply of 20 cwt. electric goods hoist, in connection with the erection of a dairy at Berryden, Aberdeen. Specification from Tawse and Allan, 10, Bon Accord Square, Aberdeen.

DEVON MENTAL HOSPITAL, EXMINSTER, December 24th.—Three months' supply of electric lamps. Particulars from the Clerk at the Hospital.

DUNDEE CORPORATION, December 24th.—Supply of 4-core, 3-core and 2-core l.t. cable. Specifications, etc., from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

HASTINGS CORPORATION, December 24th.—Electric lighting installation (including complete re-wiring) and heating installation, at the Town Hall, Hastings. Specification from Mr. R. F. Ferguson, borough electrical engineer, 20, South Terrace, Hastings.

DOWN COUNTY REGIONAL EDUCATION COMMITTEE, December 30th.—Electric light installation, etc., at Banbridge Technical and Secondary Schools. Specifications can be seen at the Committee's offices, or with Mr. W. W. Larmor, architect, Banbridge.

MELTHAM PARISH CHURCH, HUDDERSFIELD, December 31st.—Electric light installation. Particulars from Mr. W. R. Carter, secretary of the Church Council, Birchfield.

NOTTINGHAM CORPORATION, December 31st.—Two 30-inch electrically driven centrifugal pumps (section F.F.); one motor-driven twin booster; each for an output of 10 kW (section K.K.); and one storage battery of 256 cells, capacity 275 Ah at one-hour discharge rate (section M.3). for North Wilford power station. Specifications, etc., from Preece, Cardew and Rider, 8, Queen Anne's Gate, Westminster, S.W.1; deposit £2 for each section.

ROYAL WELSH NATIONAL EISTEDDFOD, HOLYHEAD, December 31st.—Electric light wiring of pavilion. Plan can be inspected at the office of Mr. T. E. Thomas, Central Chambers, Holyhead.

EAST HAM CORPORATION, January 1st.—Supply of 10 double-deck bogie tramcars, complete, or for supply of: (*a*) bodies and top covers; (*b*) motor equipment; (*c*) controller equipment; and (*d*) bogie trucks and brake equipment. Specifications, etc., from Mr. W. R. Elliott, Tramway Offices, Nelson Street, East Ham, London, E.6.

MANCHESTER CORPORATION, January 3rd.—Supply and erection, at Barton power station, of 33 000 V, 420 V, and 240 V switchgear. Specification (B.52) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

INDIA STORE DEPARTMENT, January 4th.—Supply of about 264 650 copper bonds for track rails. Specifications (5s.) from the Director-General, Branch No. 36, Belvedere Road, London, S.E.1.

HUDDERSFIELD CORPORATION, January 5th.—Electric light installation at open-air school, Woodhouse Hall. Particulars from the Borough Architect, 26, Ramsden Street, Huddersfield.

CAMBERWELL (LONDON) BOROUGH COUNCIL.—January 10th.—Maintenance of electric lighting, heating and power installations, telephones, etc. (section H.); supply of electric lamps (section S.). Forms of tender from the Borough Engineer and Surveyor, Town Hall, Camberwell, S.E.5.

PORT OF BRISTOL AUTHORITY, January 10th.—Grain-handling machinery at Royal Edward Dock, Avonmouth, including motors and switchgear. Specifications from Mr. T. A. Peace, engineer, Avonmouth Docks; deposit £5.

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY CO., January 11th.—Crude oil engine generator sets. Specification (10s.) from the Secretary, 91, Petty France, Westminster, S.W.1.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 21st.—One year's supply of cables, electricity meters, oil circuit-breaker switches, transformers, etc. Specification, etc., from the Town Clerk, Municipal Offices, Upper Street, N.1.

NORTH BRITISH ALUMINIUM CO., LTD., February 1st.—Construction, delivery and erection at the company's power house, near Fort William, Inverness-shire, of (1) water turbines (impulse type) (specification No. 100); and (2) direct-current generators (specification No. 101). Specifications, etc., from the company's offices, Adelaide House, King William Street, London, E.C. Preference will be given to contractors on the King's Roll.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

INDIA STORE DEPARTMENT, December 21st.—Supply and erection of overhead transmission line, 110 000 V, about 280 miles in length. Specification (5s.) from the Director-General, Branch 14, Belvedere Road, London, S.E.1.

INDIA STORE DEPARTMENT, December 21st.—Supply of 55 electrically operated mild steel sluice gates (25 ft. span, three-tier) for irrigation feeder canals.

VICTORIAN RAILWAY COMMISSIONERS, December 22nd.—Supply of a wheel lathe, with electrical and other equipment. (Reference A.X. 3 735.)

VICTORIAN GOVERNMENT RAILWAYS, December 29th.—Electric rivet heaters. (Reference B.X. 3 014.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 30th.—Switchgear, cables and transformers. (Reference B.X. 3 040.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 1st.—Supply and erection at site of Seru pumping and power station of four Diesel engine alternator groups, three pumps and accessories. Specification (10s. 6d.) from Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1.

INDIA STORE DEPARTMENT, January 4th.—Supply and erection of overhead equipment (1 500 V) and steel structures for about 140 miles of railway route, in connection with the Great Indian Peninsula Railway electrification. Specification (£2) from the Director-General, Branch No. 10, Belvedere Road, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 4th.—Supply of switchgear and transformers for Waikaremoana electric power scheme. (Reference B.X. 2 872.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 4th.—Bells and buzzers (schedule C.147). (Reference B.X. 2 984.)

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EGYPTIAN MINISTRY OF PUBLIC WORKS, January 10th.—Electrical generating plant, for the Survey Department, Giza, Cairo. (Reference B.X. 3 079.)

SYDNEY CITY COUNCIL, January 10th (extended date).—High and low tension cables (contract 1 057). (Reference B.X. 2 959.)

JOHANNESBURG MUNICIPALITY, January 13th.—Supply of 10 miles of 4/0 s.w.g. round section h.d. copper trolley wire. (Reference A.X. 3 938.)

CHINA, January 15th.—Turbo-generators, condensers, boilers, switchgear, transformers, etc. Tenders are invited by a Chinese company holding a concession for water and electricity supply. (Reference B.X. 2 998.)

NEW ZEALAND GOVERNMENT RAILWAYS, January 17th.—Switchgear, cables, motor-generators, lamps, etc. (Specification E.14.) (Reference B.X. 3 020.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 18th.—Transmission line steel towers for Waikaremoana electric power scheme (section 31). (Reference A.X. 3 732.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 18th.—Switchboard cable (schedule C.151). (Reference B.X. 3 013.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, January 19th.—Electric bells and tumbler switches. (Reference B.X. 3 011.)

STATE ELECTRICITY WORKS, MONTEVIDEO, January 19th.—Supply of 100 500 metres of 250 V wires and cables. (Reference B.X. 3 042.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, January 20th.—Electric railway car equipments, including motors, control equipment, air compressors, etc. Specification (No. 1 065) from the Chief Mechanical Engineer, Wilson Street, Redfern, N.S.W.

STATE ELECTRICITY WORKS, MONTEVIDEO, January 24th.—Supply of 220 V cables, telephone cables (20-pair) and branch and terminal boxes.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 25th.—Telephone transmitters and parts. (Reference B.X. 3 012.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, January 25th.—Telephone receivers and associated parts (schedule No. C.153). (Reference B.X. 3 041.)

NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMWAYS, January 26th.—Manufacture and supply of electric train equipment for 105 motor cars and 100 trailer cars. (Reference A.X. 3 810.)

STATE ELECTRICITY WORKS, MONTEVIDEO, January 28th.—Supply of 923 000 metres of special wires and cables for outdoor use.

NEW ZEALAND GOVERNMENT RAILWAYS, January 31st.—Electrical equipment for Otahuhu car and wagon workshops. (Reference B.X. 3 038.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 1st.—Storage battery and booster for Waikaremoana Electric Power Board (section 28). (Reference B.X. 2 937.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, February 2nd.—One 30-ton five-motor electric overhead travelling crane.

PRETORIA MUNICIPALITY, February 3rd.—Cable and accessories, switches and cut-outs. (Reference B.X. 3 097.)

NEW ZEALAND GOVERNMENT RAILWAYS, February 14th.—Switchgear, armoured cable and accessories, motor-generator sets, incandescent lamps and reflectors. (Reference B.X. 3 078.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 15th.—Transformers, for Waikato (section 207). (Reference B.X. 2 985.)

DUNEDIN (N.Z.) MUNICIPALITY, February 19th.—Motor-generator, with control board and accessories, for the Gas Department. (Reference B.X. 3 095.)

Tenders Accepted.

GRIMSBY CORPORATION.—M. Jennison, Ltd., electric motor for laundry of Scartho Hospital, £134.

STAFFORD CORPORATION.—Callender's Cable and Construction Co., Ltd., 880 yards of cable, £251 3s. 4d.

WIMBLEDON CORPORATION.—Holden and Brooke, feed-water heater, at the electricity works, £170 (recommended).

PORTSMOUTH GUARDIANS.—H. Eaton, electric fittings. £32 15s.; General Electric Co., Ltd., electrical stores, £5 0s. 5d.

ADMIRALTY.—Metro-Vick Supplies, Ltd., part contract for Cosmos vacuum ordinary and traction type, and gasfilled ordinary lamps.

READING CORPORATION.—Worthington, Simpson and Co., Ltd., supply and installation of an electrical pump for the waterworks, £549.

GREAT WESTERN RAILWAY.—Metropolitan-Vickers Electrical Co., Ltd., six 100 kVA single phase transformers for Park Royal generating station; Stothert and Pitt, Ltd., two 5-ton and two 6-ton electric cranes for South Quay, Newport Docks.

SPALDING URBAN DISTRICT COUNCIL.—Pirelli-General Cable Works, Ltd., main transmission cable, £20 806 3s. 1d.; distributors and feeders, £9 827; Foster Engineering Co., Ltd., transformers and kiosks, £47 10s. each; Metropolitan-Vickers Electrical Co., Ltd., meters, £31 3s. 9d. per dozen.

MANCHESTER CORPORATION.—Thos. Bolton and Sons, Ltd., tramway rail bonds; Clyde Crane and Engineering Co., Ltd., one 100-ton electrically operated turbine house crane; British Mannesmann Tube Co., Ltd., weldless lamp columns and fittings; Fuller Electrical Manufacturing Co., Ltd., one 1 250 kVA static transformer; Metropolitan-Vickers Electrical Co., Ltd., two 25 000 kVA. static transformers. A. E. Sudlow and Co., rearrangement of electric lighting, Webster Street Municipal School; Hanchett, Barratt and Currie, electric light installation, New Mostyn Municipal School.

BIGGLESWADE URBAN DISTRICT COUNCIL.—H. Knight and Sons, wiring Council houses (contract No. 4), £675; Christy Bros., Ltd., ditto (contract No. 2), £378 6s. The following is a full list of the tenders received:—Alpha Manufacturing and Electrical Co., contract No. 1, £660; No. 3, £448; J. W. Russell, £663 15s., £455; E. E. Childs, £731, £611; H. Knight and Sons, £675, £471; Suttles Garages, £882 15s., £564 16s.; Weston Electrical Co.; £1 122, £728; Christy Bros., Ltd., £796 16s., £378 6s.; T. Haigh, £1 250, £616; C. Bysouth, £678 12s.; D. Robinson and Co., £483 10s., £360 3s.; Letchworth Garden City, £760 12s., £514 16s.; Hewson, £651 19s., £411 11s. 4d.; H. Shadbolt, £736, £481.

Metal and Chemical Prices.

TUESDAY, December 14th.

		Price.	Inc.	Dec.
***Copper*—**				
Best Selected	per ton	£63 5 0	5s. 0d.	—
Electro Wirebars	,,	£64 15 0	5s. 0d.	—
H.C. Wire, basis	per lb.	9¼d.	—	—
Sheet	,,	9⅞d.	—	—
***Phosphor Bronze*—**				
Wire (Telephone) basis	per lb.	1s. 0¼d.	—	—
***Brass* 60/40—**				
Rod, basis	per lb.	7¼d.	—	—
Sheet, basis	,,	10¼d.	—	
Wire, basis	,,	10¼d.	—	
***Pig Iron*—**				
Cleveland Warrants	per ton	£4 10 0	2s. 6d.	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 0 0	—	—
***Lead Pig*—**				
English	,,	£30 15 0	10s. 0d.	—
Foreign or Colonial	,,	£29 2 6	7s. 6d.	—
***Tin*—**				
Ingot	,,	£307 15 0	—	£6 5 0
Wire, basis	per lb.	3s. 10½d.	—	1d.
Aluminium Ingots	per ton	£112 0 0	—	—
Spelter	,,	£33 0 0	—	2s. 6d.
Mercury	per bottle	£17 12 6	—	2s. 6d.

***Sulphur* (Flowers)—Ton** £11 15 0 ***Sodium Chlorate*—Per lb. 2½d.**
,, (Roll-Brimstone)—,, £10 10 0 ***Sulphuric Acid* (Pyrites, 168°)**
***Copper Sulphate*— ,,** £25 to £25 10s. **per ton, £6 15 0**
***Boric Acid* (Crystals) ,,** £37 ***Sodium Bichromate*—Per lb. 3½d.**
***Rubber*—Para fine, 1s. 4¼d.; plantation 1st latex, 1s. 6¼d.** to 1s. 6½d.

The metal prices are supplied by British Insulated Cables Ltd.

The Lead Market.

IN their lead market report dated December 11th James Forster and Co. state that there is very little change in the position. Demand from consumers, as is usual at this period of the year, is extremely slow, but surplus arrivals of lead are going into strong hands. Plentiful supplies of lead exist both in this country and on the Continent, and until these stocks are worked off no firmness can be expected. Arrivals, however, in the early months of next year are expected to be on the light side, and if at the same time there is a better demand from consumers, the necessary conditions would be created for a firmer market.

The market last week was mainly professional, and after slight fluctuations, closed with a steady tone at £28 17s. 6d. for December, £29 1s. 3d. for January, £29 3s. 9d. for February, and £29 5s. for March.

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E.T.B.I. SUBSCRIBERS.

Further List of Contributions to Fund by Electrical Firms.

WE continue below the publication of the list of subscribers in connection with the annual festival dinner of the Electrical Trades Benevolent Institution. This list is only a preliminary one, and additional donations made since it was compiled will be published when the final list is completed :—

R. M. F. Robertson, £5 5s. ; Record Electrical Co., Ltd., £2 2s. ; Ramsbottom, Lyons and Co., Ltd., 10s. 6d. ; Chas. Rowley, £5 ; W. Robb, Ltd., £2 2s. ; Roberts, Adlard and Co., £1 1s. ; J. and H. Rosenheim and Co., £1 ; Robt. M. Russell, £2 2s. ; H. Ralph and Co., £1 1s. ; W. H. Reynolds, 10s. 6d. ; Rickett Motor Corporation £1 1s. ; H. Roland and Co., £2 ; J. Richardson, £2 2s. ; J. Reed Coombs, £1 1s. ; A. L. Reinan, 7s. 6d. ; J. T. Randell, 7s. 6d. ; R. Le Rossignol, £1 ; L. Ryland, Ltd., £1 ; Ross, Courtenay and Co., Ltd., £1 1s. ; J. A. Reynolds and Co., Ltd., £1 1s. ; Rashleigh, Phipps and Co., Ltd., £1 1s. ; E. S. and A. Robinson, Ltd., £25 ; Roe Brothers and Co., £2 12s. 6d. ; J. H. Roscoe, £1 1s. ; Rubber Stamp Co., £1 1s. ; H. G. Richardson, and Sons £5 5s. ; Rudders and Paynes, Ltd., £1 1s. ; F. G. Ride and Co., £2 2s. ; Royal Exchange Assurance, £5 5s. ; C. B. H. Robson, £1 1s. ; Sir Harry Renwick, K.B.E., £5 5s. ; H. W. Roberts, £3 3s. ; W. R. Riches, 10s. 6d. ; Rego Clothiers, Ltd., £1 1s. ; F. Ridout, £1 1s. ; Robson and Coleman, £5 5s. ; ; A. B. Rayworth, £1 1s.

Skinner (1917), Ltd, £1 ; G. J. Smith and Co., £5 5s. ; Samuels and Sons, 10s. 6d. ; Sun Engraving Co., £2 2s. ; R. W. Smith, Drake and Gorham. Ltd., £1 11s. 6d. ; J. Swain and Son, Ltd., £3 3s. ; Slick Bands, Ltd., 10s. 6d. ; W. Skelton, £1 1s. ; W. O. Smith, £5 5s. ; H. Shillitoe, £3 3s. ; A. C. Scott and Co., Ltd., £1 1s. ; T. Smith, 10s. 6d. ; H. S. Stevens, £1 1s. ; Shott's Iron Co., Ltd., £2 ; W. Spencer and Co., Ltd., £2 2s. ; Shaw, Son and Greenhalgh, Ltd., £1 1s. ; M. Solomon, £10 10s. ; Swift, Levick and Sons, Ltd., £1 1s. ; Saxonia Electric Wire Co., Ltd., £1 1s. ; E. W. Saville, 10s. ; Miss E. Smith, 5s. ; Siemens Bros. and Co., £21 ; J. A. Seiffert, £1 ; Frederick Smith and Co., £2 2s. ; South Western Tar Distilleries, £5 5s. ; J. Schnurmann, £1 1s. ; R. H. Symonds, Ltd., £2 2s. ; Stewart, Peter and Co., £1 1s. ; G. Smalley and Co., £5 ; Shoolbred, Ltd., £10 10s. ; Sturtevant Engineering Co., Ltd., £2 2s. ; J. Sankey and Co., Ltd., £5 5s. ; H. Swingler, £1 1s. ; Siluminite Insulator Co., Ltd., £2 2s. ; S. Simins, 5s. ; H. Sykes, 1s. ; Siebe, Gorman and Co., Ltd., £1 1s. ; Stora Kopparbergs Berslags A.Kt., £5 5s. ; Spicer, Ltd., £2 2s. ; Salisbury and Taylor, 2s. 6d. ; Chas. Selz, £10 10s. ; Oscar Selinger, £1 1s. ; Wm. J. Smith, £1 1s. ; Sloan Electrical Co., Ltd., £2 2s. ; Sanitas Co., Ltd., £1 1s. ; G. Shrimpton and Sons, Ltd., £1 1s. ; Shaws Glazed Brick Co., Ltd., £1 1s. ; Snell and Prideaux, 10s. 6d. ; Sterling Varnish Co., £5 5s. ; A. Stern, Ltd., £2 2s. ; Swedish General Electric Co., Ltd., £15 15s. ; Standard Insulator Co., Ltd., £1 1s. ; Spaldings, Ltd., £2 2s. ; Fred Samuelson, Esq., £1 1s. ; J. Shelbourne and Co., Ltd., £2 2s. ; Halfield K. J. Stacey, £2 2s. ; W. S. Sprague, £1 1s. ; A. H. Shaw, £2 2s. ; T. W. Senier and Co., 10s. 6d. ; Stewarts and Lloyds, Ltd., 10s. 6d. ; Standard Telephones and Cables, Ltd., £52 10s. ; T. H. Solomon, £1 1s. ; Smith and Barnes, Ltd., £1 1s. ; A. J. Stocker, 10s. 6d. ; R. C. Skinner, 10s. 6d. ; Steel Nut and Joseph Hampton, Ltd., £1 1s. ; C. W. Sully, £2 2s. ; Shannon, Ltd., £1 1s. ; R. L. Shirley and Co., Ltd., £1 1s. ; Scupham and Wood, Ltd., £2 2s. ; Spears and Co., £2 2s. ; H. H. Sims, 15s. ; Services Window Cleaning Co., Ltd., £3 3s. ; T. Strelton, 10s. 6d. ; Leo C. Steinle, Ltd., £2 2s. ; St. James' and Pall Mall E. L. Co., Ltd., £5 5s. ; H. C. Slingsby, £5 5s. ; Stephenson, Clarke and Co., Ltd., £3 3s. ; Southampton Brass Foundry, Ltd., £2 2s. ; J. Silbermann, £1 ; Spencer, Abbott and Co., Ltd., £1 1s. ; I. Shoenberg, £2 2s. ; Spencer and White, £3 3s. ; C. W. Saunders, £1 1s. ; W. H. Smith and Son, £5 5s. ; Alex. Shaw and Son, 10s. ; T. H. Sutcliffe, 10s. ; Sanderson Bros. and Newbould, Ltd., £5 5s. ; W. Somers, Ltd., £5 5s. ; Sir Geo. Sutton, £10 10s. ; Smith and Croft, £2 2s. ; T. Settle, £1 1s. ; F. Schwabe, £5.

"Textile Argus," £3 3s. ; G. B. R. Tavener, £3 3s. ; Taylor and Shaw, £1 1s. ; Tungsten Manufacturing Co., £2 2s. ; Thermyl Syndicate, Ltd., £1 1s. ; P. Tomkins, 10s. 6d. ; H. G. Tumulty, £1 1s. ; W. L. Tinison, £1 ; J. Tate and Co., 10s. 6d. ; Thames Board Mills, Ltd., £10 ; G. A. Touche, £5 ; Taylor Bros. and Cox, Ltd., £2 2s. ; J. J. Thornycroft, Ltd., £1 ; Tags, Ltd., £1 ; Teesdale and Jones, 10s. 6d. ; Thompson Water Tube Boilers, Ltd., £5 5s. ; Terry and Co., Ltd., £3 3s. ; Taylor and Shaw, £1 1s. ; Tamplin and Makovski, Ltd., £1 1s. ; A. C. Tanner, £5 5s. ; C. T. Taylor and Co., Ltd., £2 2s. ; Tannahill and Co., Ltd., £2 2s. ; Taylor, Tunnicliffe and Co., £25 ; Talbot Stead Tube Co., Ltd., £2 2s. ; H. Terry and Sons, Ltd., £1 1s. ; Tudor Accumulator Co., Ltd., £10 10s. ; W. S. Thomas, 10s. 6d. ; J. F. Turner, 10s. 6d. ; J. T. Taylor, £1 1s. ; P. Tepler, 10s.

James Upton, Ltd., £10 10s. ; Urquhart, Lindsay and Co., £2 2s. ; J. R. Unwin, £1 1s. ; J. W. Utting and Co., £1 1s. ; Underwood Typewriter Co., Ltd., £2 2s. ; United Service Transport Co., Ltd., £4 4s. ; United Lamp Black Ltd., £10 10s. ; United Tools and Instrument Co., Ltd., £1 1s.

A. Viner, £10 ; E. Vahnisberg, 5s. ; The Vono Co., £5 ; Veritys, Ltd., £10 10s. ; E. Vaughan and Co., Ltd., £2 2s. ; Vacuum Oil Co., Ltd., £1 1s.

(To be continued.)

OVERSEAS TRADE.

British Electrical Exports Establish Further High Record.

ACCORDING to the latest Board of Trade Returns, imports of electrical goods into this country during November increased by £21 630, compared with November, 1925, but the total value of such goods imported during the past eleven months shows a decrease of £446 615.

Exports of similar goods in November, 1926, increased in value by £460 822, and the total for the eleven months was augmented by £568 084, compared with the corresponding months of last year. Compared with the preceding month (October) the November electrical imports increased by £47 162, and the exports by £40 179. The electrical exports show an excess over the imports of the same classes of £1 199 143 for November, 1926, and £12 076 195 for the past eleven months.

Imports of rubber insulated wires and cables dropped £26 403 in the eleven months, telegraph and telephone wires and cables, £31 923, telegraph and telephone instruments and apparatus, £327 953 ; glow lamps, £96 192 ; and electrical instruments, other than telegraph and telephone, £53 983.

Eleven Months' Imports Lower.

Imports.	Month of November. 1925. £	Month of November. 1926. £	Eleven Months. 1925. £	Eleven Months. 1926. £
Electrical Machinery	78 600	88 008	982 380	1 006 991
Electrical Wires and Cables, Insulated—				
Rubber insulated (not being Telegraph or Telephone Wires or Cables)	17 213	11 475	191 709	164 616
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	30 579	46 178	342 933	376 995
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	17 958	10 703	171 018	139 995
Submarine Telegraph and Telephone Cables	—	—	—	7 006
Telegraph and Telephone Instruments and Apparatus (except wireless valves)	71 744	65 603	764 808	436 855
Carbons, Electric	13 728	9 091	92 274	82 065
Electric Lamps and parts thereof—				
Electric Glow Lamps	33 210	45 335	389 358	293 166
Arc Lamps and Electric Searchlights	474	531	5 050	4 348
Parts thereof (except Carbon Rods)	1 563	737	9 457	13 306
Batteries and Accumulators (including parts)	101 314	102 003	587 601	585 540
Electrical Instruments (other than telegraphic and telephonic) : Commercial (including ammeters, voltmeters, etc.), House Service Meters, and Scientific	18 312	19 892	247 444	193 461
Switchboards, other than Telegraph and Telephone	376	323	1 559	1 327
Electrical Goods and Apparatus, all other Sorts	119 177	125 309	1 055 656	1 089 428
Total of Electrical Goods and Apparatus	504 248	525 878	4 841 517	4 395 102

Satisfactory Rise in Exports.

Exports.	Month of November. 1925. £	Month of November. 1926. £	Eleven Months. 1925. £	Eleven Months. 1926. £
Electrical Machinery—				
Railway and Tramway Motors	43 878	69 787	490 887	438 203
Other Motors and Generators	128 251	236 916	1 958 198	2 026 333
All other Sorts	223 205	287 834	2 759 424	2 840 843
Electric Wires and Cables, Insulated—				
Rubber Insulated (not being Telegraph or Telephone Wires or Cables)	147 963	157 252	1 298 902	1 431 626
Insulation other than Rubber (not being Telegraph or Telephone Wires or Cables)	99 698	180 294	1 112 117	1 619 359
Telegraph and Telephone Wires and Cables (not being Submarine Cables)	53 975	61 750	642 563	749 488
Submarine Telegraph and Telephone Cables	442	17 050	1 543 164	815 969
Telegraph and Telephone Instruments and Apparatus (except Wireless Valves)	225 083	320 081	2 614 207	2 867 027
Carbons, Electric	429	1 706	22 297	15 272
Electric Lamps and Parts—				
Electric Glow Lamps	61 552	60 822	470 215	454 045
Arc Lamps and Electric Searchlights	720	323	11 479	4 822
Parts thereof (except Carbon Rods)	443	341	3 830	4 087
Batteries and Accumulators (including Parts)	78 481	91 472	897 960	909 946
Electrical Instruments (other than Telegraphic and Telephonic) : Commercial (including Ammeters, Voltmeters, etc.), House Service Meters and Scientific	33 818	36 760	322 872	361 247
Switchboards, other than Telegraph and Telephone	6 062	7 643	79 054	77 395
Electrical Goods and Apparatus, all other Sorts	160 199	192 190	1 667 044	1 855 635
Total of Electrical Goods and Apparatus	1 264 199	1 725 021	15 903 213	16 471 297

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ELECTRICITY SUPPLY.

Projected Wolverhampton Extensions—Proposed Electrification of Weardale—Darlington's Powers to be Curtailed—Rural Progress

SPALDING U.D.C. has received sanction to a loan of £26 955 for carrying out its electricity scheme.

Reigate T.C. has received sanction to a loan of £12 000 for generating plant, on account of an application for £18 000.

In view of the altered coal position, Worcester Electricity Committee's proposal to increase electricity charges has been withdrawn.

Arrangements are almost complete for supplying the village of Carrog (Corwen) with electricity, energy being developed from a stream near Parkgate.

Spenborough U.D.C. has received sanction to loans of £12 500 for mains, £2 200 for sub-station equipment, and £300 for the construction of a sub-station.

Improvements are being made in the electric lighting of the village of Ballinemallard, co. Fermanagh. It is stated that Mr. T. J. Crozier is providing the street lighting free of charge.

Chelmsford Developments.

Chelmsford R.D.C. has decided to approve in principle, subject to the safeguarding of its interests, the promotion of an electricity scheme by the East Anglian Electric Supply Co., Ltd.

Sunderland T.C. has decided to build a sub-station in Fulwell Road at an estimated cost of £5 990 10s. Application is to be made to the Electricity Commissioners for sanction to borrow the amount.

At Monday's meeting of Wolverhampton T.C. the Electricity Committee submitted proposals for extensions of mains, cables, plant, etc., totalling over £12 000, and embracing new and extended supplies to the Codsall, Brewood and Coven areas.

Weardale R.D.C. has decided to proceed in conjunction with Stanhope U.D.C., with a £30 000 scheme for the electrification of Weardale from Wolsingham to Cowhill. Application is to be made to the Electricity Commissioners for the necessary Order.

A deputation of the Penmaenmawr U.D.C. is to wait on the directors of the Penmaenmawr Granite Co. to urge it to reconsider its decision to undertake the direct wiring of the quarry cottages, and to supply the energy direct from the quarry mains.

Eastbourne Electricity Department does not anticipate a profit on the electricity undertaking for the current year, owing to the expenditure of £10 000 extra on coal, due to the coal strike, but it is not proposed to increase electricity charges.

The installation for the electric lighting of the town of Clogher has now been completed. The Clogher Electric Light, Power and Supply Co. runs the undertaking and the chairman (Mr. John Johnston) was entertained at a complimentary supper last week.

It is stated that the Electricity Commissioners have decided to curtail the powers for electricity extensions sought by Darlington Corporation in its draft Special Order. It is understood that the extensions will be limited to the parishes of Croft, Blackwell and Hurworth.

No Direct Labour.

Birmingham Corporation has adopted the Electric Supply Committee's report recommending the expenditure of £400 000 on extensions of h.t. and l.t. mains. A proposal to employ direct labour on main laying, instead of entrusting the work to contractors, was rejected by 64 votes to 25.

It is calculated that, owing to the coal dispute, Brighton electricity undertaking will show a deficit of £20 000 on the current financial year's working compared with the profit of £25 000 last year. To meet the situation an increase of 25 per cent. in charges to consumers is proposed.

Mr. S. M'Henry, who presided at a recent meeting of Ballymoney Rural District Council, said the Bann electricity scheme was camouflaged as a draining scheme. A resolution was passed protesting against the ratepayers of the county of Antrim having to pay rates for "subsidising a private electricity company."

At a recent meeting of Lurgan U.D.C., the chairman (Mr. J. S. Carrick) said he could give no promise as to when the electric light would be available for use in the town. The Clerk said that the cause of the delay was that the coke required for the castings for the engines was not available, owing to the coal strike.

Hereford Electricity Committee recommends the T.C. to apply for a loan of £2 800 for extending the cable in order to supply electricity to the tile works of Godwin and Thynne, Ltd., Withington. The firm has offered a guarantee of 20 per cent. of the capital cost for five years, and the rate charged will be £6 per kVA. plus 0·6d. per k Wh.

It is stated that writs have been served upon seven directors of the Lisnaskea Electric Lighting Co. at the instance of three shareholders (Dr. Cassidy, Mr. T. A. O'Malley and Mr. Francis Dowler), who seek a declaration that the alloting of unpurchased shares by the defendants to themselves was made in breach of their fiduciary powers.

Electricity for Farms.

The city electrical engineer (Mr. S. E. Britton) has reported to Chester Electricity Committee that the Institution of Agricultural Engineering and the Development Commission has decided to proceed with the scheme for the supply of electricity to farms in the Corporation's area of supply, in accordance with the terms laid down by the Council.

At last week's meeting of Stafford T.C. it was reported that the North-Western Electricity and Power Gas Co. had not exercised, as regards the supply of electricity, any of the powers conferred by their Act of 1903 in any portion of their area of supply within the North-West Midlands electricity district, and it was resolved to apply to the Minister of Transport for an Order that the powers of the company under the said Act so far as they relate to the supply of electricity in the district.

City and Guilds Institute.

Increases in Candidates for Examinations in Electrical Subjects.

IN the report on the work of the Department of Technology of the City and Guilds of London Institute for the session 1925-26, just issued by Mr. John Murray (1s. net), increases are recorded in the number of candidates for examination in all electrical and allied subjects, the increases being: Telegraphy, 167; telephony, 416; magnetism and electricity, 169; electrical engineering, 93; and electrical installation work, 132. Candidates for the final examinations in electrical engineering increased from 240 to 288, and this figure is noteworthy as indicating that the syllabus meets the needs of many students engaged in one or other branch of electrical work. Coinciding with the greater interest in electrical subjects a falling off of 224 candidates in gas subjects is recorded.

In view of the increasing importance of telephony, the report states, the examination in this subject will, with Post Office approval, next year be taken in three, instead of two, grades; further, the final examination is to be divided into two separate sections, dealing respectively with transmission and automatic telephony.

The following table gives the results of the examinations in Great Britain and Ireland in 1926:—

Subject	Total No. of Candidates	Grade I, II or Final	No. of Candidates	Results 1st	Results 2nd	Results Pass	Results Fail	Percentage of Failures
Telegraphy ..	956	I	877	284	209	—	294	33·5
		F	79	28	22	—	29	36·7
Telephony ..	1 407	I	1 215	171	538	—	506	41·6
		F	192	17	86	—	86	44·8
Radio Communication	93	I	45	12	18	—	15	33·3
		F	48	10	29	—	9	18·7
Electrical Installation Work	308	I	255	56	62	—	137	53·7
		F	53	6	16	—	31	58·4
Electrical Engineering	565	I	151	—	—	80	71	47·0
		II (C.C.)	79	—	—	37	42	53·1
		II (A.C.)	47	—	—	18	29	61·7
		F	288	32	91	—	165	57·2
Magnetism and Electricity	1 466	—	1 466	451	482	—	533	36·4

The acting examiners for the year under review included Mr. E. H. Shaughnessy and Mr. Magnus Ramsay (telegraphy and telephony); Mr. E. Mallett (radio communication); Mr. H. J. Cash (electrical installation work); Prof. S. P. Smith (electrical engineering) and Mr. J. H. Simmance (magnetism and electricity).

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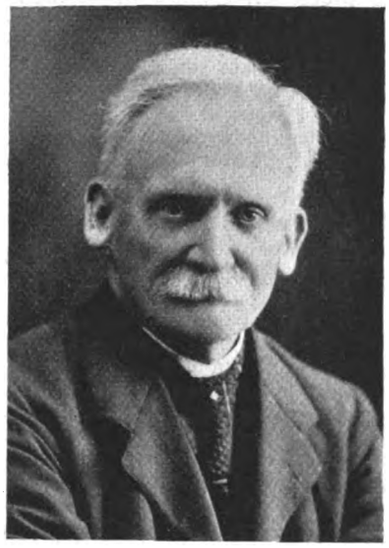
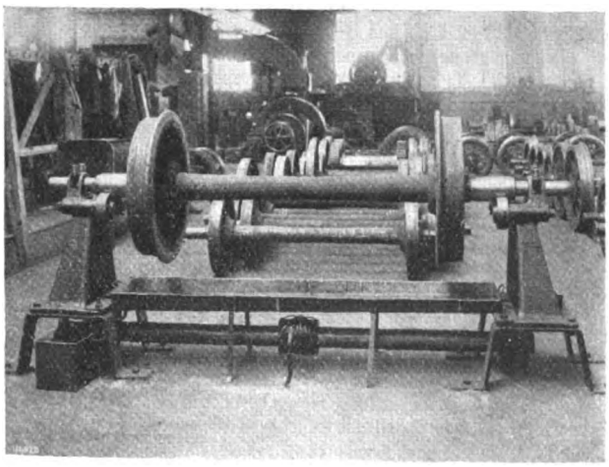
ELECTRICAL NEWS IN PICTURES



Mr. O. C. J. G. L. Overbeck, who told a London meeting that his researches "prove that electricity is the secret of the creation of the universe, and is the vital force governing all life."

An electrical device used by the American Electronic Research Association for measuring the vitality, and forecasting the growing power of unsprouted seeds.



To facilitate the detection of hair cracks in the axles of "Underground" rolling-stock this new magnetic axle-testing device has been installed at the Acton Overhaul Works.

The first six-wheeled double-decker trackless trolley 'bus ever built has recently undergone tests at Wolverhampton. It has a seating capacity for sixty-one passengers.

WORK IN PROSPECT.

Trade Possibilities for Electrical Installation Contractors.

CEFN COED (MERTHYR TYDFIL).—Conservative Hall. Particulars, the architects, Johnson and Richards.

COVENTRY.—Schools, Radford. Particulars, the architect, Mr. George A. Steane.—Extensions to Earlsdon Schools. Particulars, the architect, Mr. A. W. Hoare.

GOLCAR.—Child welfare centre. Particulars, the architects, Lunn and Kaye, Milnsbridge.

HASTINGS.—Orthopædic Department, Royal East Sussex Hospital. Particulars, the architect, Mr. P. H. Oxley.

MAIDSTONE.—Offices (£4 200), for Borough Education Committee. Particulars, the Clerk.—Houses (12), Buckland Road, for the Southern Railway Co.—Houses (22), Loose Road, for W. T. Burrows and Son.—Houses (26), Buckland Lane, for Cox Bros.

MALVERN.—Evening schools (£6 000). Particulars, Director of Education, Worcester.

MANSFIELD.—Additional housing scheme, Ravensdale Estate. Particulars, the Borough Surveyor.

MICKLEOVER.—Nurses' Home at Mental Hospital. Particulars, the architect, Mr. G. H. Widdows, St. Mary's Gate, Derby.

MYTHOLMROYD.—Extensions to Wesleyan Sunday school. Particulars, the architects, Sutcliffe and Sutcliffe, New Road, Hebden Bridge.

NESTON (CHESHIRE).—Parochial hall (£3 000). Particulars, the architect, Mr. H. F. Russell, Liverpool.

PARK PREWETT.—Nurses' Home, at Mental Hospital (£25 000), for Hants County Council. Particulars, the Clerk, The Castle, Winchester.

A Cheap Suction Cleaner.

An electric vacuum cleaner, which sells at £5 15s. 6d., complete with tubes, carpet nozzle, oval nozzle, carpet brush, oval brush, flexible, dustbag, etc., has just been introduced by Pratt, Owen and Co., Ltd., 21, Corn Exchange Chambers, Seething Lane, London, E.C.3. The machine, which is styled the "Climax," and which is made in aluminium or nickel brass, weighs only 4 lb., and is said to be economical in its consumption of energy, the loading being about 100 W. The motors, which are of German manufacture and of ⅛ to ¼ H.P., can be operated by either d.c. or a.c. at any periodicity, and are wound to suit the voltage of the supply in the dealers' or customers' districts. The apparatus is assembled at Pratt, Owen and Co.'s works at Ashenden Road, Clapham Park, London, E.5, and a showroom, at which dealers and others will be able to see it in operation, is being equipped at the company's offices at Corn Exchange Chambers.

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WIRELESS NEWS.

First Annual General Meeting of the New Radio Manufacturers' Association.

AS briefly announced in THE ELECTRICIAN last week, the first annual general meeting of the Radio Manufacturers' Association was held at the Old Colony Club, London, on December 8th, Mr. Bowyer-Lowe in the chair.

The register of members of the Association up to the date of the meeting—a total of 43 firms—was read as follows :—

E. J. Atkinson ; Automobile Accessories (Bristol) Ltd. ; Beard and Fitch, Ltd. ; Sydney Bird and Sons ; S. W. Bligh ; *Bowyer-Lowe Co., Ltd. ; Brandes, Ltd. ;* Britain's Best Crystal, Ltd. ; British Electrical Sales Organisation ; *Brownie Wireless Co. of Great Britain, Ltd.* ; A. F. Bulgin and Co. ; *Burndept Wireless, Ltd. ;* Celestion Radio Co. ; Chloride Electrical Storage Co., Ltd. ; H. Clarke and Co. (Manchester), Ltd. ; *Climax Radio Electric, Ltd. ;* Collinson's Precision Screw Co., Ltd. ; William Dibben and Sons ; *Dubilier Condenser Co.* (1925), *Ltd. ;* Eagle Engineering Co., Ltd. ; Edison Bell, Ltd. the Formo Co. ; Garnett, Whiteley and Co., Ltd. ; *Graham Amplion, Ltd. ;* Hart Collins, Ltd. ; *Igranic Electric Co., Ltd. ;* Langham (Diamond Clear) Radio ; *L. McMichael, Ltd. ;* the Marconiphone Co., Ltd. ; *Metro-Vick Supplies, Ltd. ;* M.P.A. Wireless ; *Mullard Radio Valve Co., Ltd. ;* The Oxford Wireless Telephony Co., Ltd. ; Portable Utilities Co., Ltd. ; Radio Communication Co., Ltd. ; *Radio Instruments, Ltd. ;* Skett and Co. ; A. J. Stevens and Co. (1914), Ltd. ; Stratton and Co., Ltd. ; C. A. Vandervell and Co., Ltd. ; Watmel Wireless Co., Ltd. ; Whittingham Smith and Co., and Wireless Apparatus, Ltd. The twelve firms whose names are printed in italics were elected to serve on the Executive Council of the Association. The full Council, however, will consist of fifteen members, the remaining three to be co-opted as and when required.

Interim Committee's Report.

In the report of the Interim Committee, submitted to the meeting, it was stated that the Committee had taken energetic steps to secure a strong membership roll, and it was confidently expected that there would be a big increase in members in the near future.

Negotiations with the trustees of the N.A.R.M.A.T., with a view to taking over the liabilities and assets of the Association, had been satisfactorily concluded. Loans for propaganda purposes amounting to £1 960, taken over by the N.A.R.M.A.T. from the old N.A.R.M., were, with one small exception, being transferred to the R.M.A., such advances to be repaid by five equal annual instalments.

Further (the report states), as the N.A.R.M.A.T. Retailers' Sectional Executive were considerably perturbed over the threatened disruption of their Section, it has been agreed to make to that body an *ex gratia* grant of £400 to enable it to form a new Retailers' Association ; £200 of this sum is payable at once, and the remainder at the close of the next London Radio Exhibition. In addition, the R.M.A. will provide office accommodation for the Retailers' Association for twelve months.

As the outcome of the negotiations the R.M.A. not only obtains possession of the office furniture and exhibition fittings of the N.A.R.M.A.T. (which cost, respectively, over £700 and £3 500), but is able to start its career in a favourable financial position.

With regard to offices and staff, the Interim Committee retained the N.A.R.M.A.T. offices and secretariat, pending transfer to the R.M.A., or the making of other arrangements. The appointment of paid officials will be one of the first duties of the Executive Committee. The election of a president and vice-president or vice-presidents was, by common consent, deferred to a later date.

Certified as Trade Union.

The application to the Registrar of Friendly Societies for the certification of the R.M.A. as a trade union has been accepted.

Application has also been made for trade representation on Advisory Committees which may shortly be set up by the British Broadcasting Corporation.

In the course of a discussion it was elicited that a "stop list" could, if desired, be put into immediate operation, and there was general support of a recommendation that the R.M.A. should assist in every way possible the proposed new Wireless Section of the London Chamber of Commerce when formed.

One member expressed the desire of many manufacturers to have some form of protection against the dumping of inferior foreign radio apparatus at cut prices, and several speakers deprecated the alleged widespread evasion by certain firms of the royalty fees on wireless sets ; a member from Bristol went so far as to say that about 50 per cent. of the sets sold in his district were not licensed. Reference was made to a suggested method for dealing with offenders, which, it was thought, would, if adopted, effect a considerable improvement in this direction.

Wireless News in Brief.

The Mexican Government is about to spend over $8 000 000 upon the improvement of its telegraph and wireless organisations.

Wireless telephones are to be introduced on Italian trains. The first experiments will be made on the expresses running between Milan and Bologna and Milan and Turin.

The John Fritz gold medal, the highest engineering award in the United States, was presented to Mr. Elmer A. Sperry on December 7th. The award is for Mr. Sperry's design of wireless control of aeroplanes—or air torpedoes.

The formation of Marconi's Radio Telegraph Co. of Egypt, has been sanctioned by a Royal Decree. The company will take over the Abu Zabal station, which has been operated by the British Government since May, 1922.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

PLYMOUTH T.C. has decided to purchase 15 new tramcars and ten 26-seater omnibuses at a total cost of £40 000.

Heywood T.C. has approved an arrangement with Middleton Corporation for the construction of a light railway between the two towns, in connection with the linking up of the local tramway services with Manchester.

As the construction of a new tramway in Brunshaw Road, Burnley, would involve an expenditure of over £2 000 to relay a water main which crosses the road at one point, the scheme has been deferred for the present.

Birmingham Extensions.

The Minister of Transport has announced that he has made the Birmingham Corporation Light Railway Order 1926, authorising the construction of light railways in the City of Birmingham in connection with the existing tramway undertaking. The Order refers to extensions on the Hall Green, Tyburn Road and Bordesley Green routes.

Wath U.D.C. last week confirmed its resolution to make further inquiries into the Provisional Order applied for by the Mexborough and Swinton Tramways Co. to run trolley 'buses over routes also covered by the Dearne District Light Railway cars. The Council is a highway authority and also a constituent authority associated with the light railway.

A correspondent of "The Times" states that 627 miles of the Swiss Federal Railways have now been electrified, another 33 miles will be added by the end of the present year, and the total of the electric lines will reach 980 miles by the end of 1928. Electrification has resulted in faster trains, and has thus made good the deficits arising from the introduction of the eight-hour day.

Southern Electrification.

The Southern Railway Co. has decided to extend its electrified suburban lines on the third-rail system, using d.c. at 600 V, to Tattenham Corner, Caterham, Epsom Downs, via Streatham and Mitcham and also via Norwood and West Croydon. Power will be transmitted to sub-stations at 11 000 V working pressure by means of some 78 miles of three-core paper insulated, lead covered and steel wire armoured cables manufactured and installed by Johnson and Phillips.

Automatic signalling and train control on the Pennsylvania Railroad are being extended at a cost of $8 000 000. By means of electrical mechanism, the signals on posts and bridges will be duplicated in the cabs of the engines, and a whistle will inform the drivers of changes of signals. On a portion of the road a device is already in use which causes the air brakes to be applied automatically if a train passes a signal showing any indication other than clear, unless the signal is acknowledged by the driver by means of a lever in the cab. The present programme provides for the equipment of about 1 150 engines and 1 530 miles of track.

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COMPANY NEWS.

Renewed Activity in Share Market—Rumours of Impending Cable Amalgamation—Weaker Tendency in Electricity Supply Co.'s Shares.

THERE has been more life this week than of late in the electrical share market, rumours of an impending amalgamation contributing to a renewed inquiry for telegraph construction shares. W. T. Henley's ordinary shares jumped 7s. 6d. and Callender's Cable ordinary 3s. 9d. Johnson and Phillips improved to the extent of half-a-crown, and British Insulateds put on 7½d. British Thomson-Houston 7 per cent. debentures also rose a point. Electricity supply shares have been inclined to weakness. County of London have lost last week's improvement of 1s. 3d., and City of London are down 3s. 9d. Charing Cross ordinary are quoted at 25s. without the bonus, and Westminster and St. James' are down 1s. and 6d. respectively.

Last Annl. Divd. %	Description.	This Week.	Last Week.	1912 to 1925. Highest.	Lowest.
	Electricity Supply.				
10	Brompton & Kensington Ord. ..	30/-	30/-	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	89	89	100	67
15	Charing Cross Elec. Ord. (£1) ..	25/-†	46/3	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	25/-	25/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	45/7½	49/4½	52/6	20/3
6	,, ,, 6% C.P. ..	23/-	23/-	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	62/6	63/9	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£1)	24/-	24/6	104/6	13/-
10	Lon. Elec. Sup. Ord. (£1) ..	34/-	35/-	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	39/4½	40/-	41/6	8/-
4½	,, ,, 4½% C.P. ..	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/-	22/6	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord. (£1) ..	24/-	24/6	62/-	22/-
15	W'minster Elec. Sup. Ord. (£1)	24/6	25/6	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
6	,, ,, 6% C.P. ..	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	141½	144½	123	24
6	,, ,, 6% Pf. Stk. ..	109	109	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69	69	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	77½	77½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	57½	57½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	76½	76½	89	65
4	Lon. Un. Trams. 1st Deb. ..	42½	42½	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	65½	65½	101½	49
5	,, ,, 5% Deb. ..	66½	66½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	63	61½	84½	19
3½	,, 3½ Pf. Stk.	63½	63½	88½	40½
3½	,, 3½% Deb.	70½	69½	92½	51
3½	Met. Dis. Rly. Ord. Stk. ..	56½	55½	58	12½
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb. ..	68	68	73½	48½
5½	Yorks. (W.R.) Trams. Ord. ..	12/6	12/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	66	72	87	52
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	67/6	66/10½	62/-	26/6
6	,, ,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	22/3*	22/9	23/4	19/7
7	,, ,, ,, 7% Deb.	105½	104½	107½	92
10	Brush Electrical Ord.	26/3	26/3	29/-	10/-
‡15	Callender's Cable Ord.	68/9	65/-	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref.	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)	12/9	12/9	28/9½	1/11
7½	,, ,, 1st Pref. ..	22/6	22/6	26/-	5/-
10	Elec. Construction Ord. ..	31/3	31/3	30/4	6/7
7	,, ,, 7% C.P. ..	22/6	22/6	25/3½	16/-
—	English Elec. Ord.	15/-	15/-	29/3	7/3
6	,, ,, 6% C.P. ..	17/6	17/6	21/3	10/6
—	Ericsson Telephones 7% Pref.	21/10½	21/10½	21/-	12/7
6	Ferranti 6% Pref.	19/3	19/3	18/6	16/9
7	,, 7% 2nd Pref. ..	18/9	18/9	19/-	13/9
7½	General Elec. Ord.	30/6	30/6	59/-	13/6
20	W. T. Henley's Ord.	87/6	80/-	86/6	23/3
17½	Johnson & Phillips Ord. ..	58/9	56/3	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	23/9	23/9	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	46/3	46/3	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	28/9	28/9	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	29½	29½	56/2/6	19
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	74	74½	87½	60
10	Eastern Ord. Stk.	180½	180½	213½	113/2/6
3½	,, 3½% Pref. Stk. ..	65½	65½	84/17/6	49
4	,, 4% Deb.	77½	77½	103½	60
10	Eastern Extension Ord. (£10) ..	18	18	21½	10/12/6
4	,, ,, 4% Deb. ..	77½	77½	97½	60
22	Gt. Northern Telegraph (£10) ..	27	27	42/12/6	19
10	Indo-European (£25)	47½	47½	59½	25
—	Marconi's Wireless T. Ord. ..	16/3	16/3	9/16/3	20/9
7½	,, Int. Mar.	22/6	22/6	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	17½*	17½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	77½	77½	10	60/2/6

* Ex dividend. † Ex share bonus. ‡ Plus share bonus.

GREAT NORTHERN TELEGRAPH CO., LTD.—Intm. div. 2½ p.c., making 5 p.c. to date.

MANX ELECTRIC RAILWAY CO. LTD.—Rev. for yr. to Sept. 30, £12 323, plus £1 826 brought in. Div. 2¾ p.c. on pref. shs.; fwd., £139.

BARCELONA TRACTION, LIGHT AND POWER CO., LTD.—Div. of 1¾ p.c. on 7 p.c. non-cum. participating pref. shs., payable December 31.

MANILA ELECTRIC CORPORATION.—Div. 50 cents p. sh. for quarter ending December 31 on common stk., payable in New York on December 31.

MELBOURNE ELECTRIC SUPPLY CO., LTD.—Fin. div. on con. ord. stk. 5 p.c. actual, making 10 p.c. for yr. ended Aug. 31, free of British tax in case of stk. reg. in London.

BOGOTA TELEPHONE CO., LTD.—Gross rev. for year ended June 30, 1926, £42 382, pft. £23 063, plus £8 153 brt. in. To depreciation £5 000; div. for year 12½ p.c.; fwd., £8 265.

W. T. HENLEY'S TELEGRAPH WORKS CO., LTD.—An extraordinary meeting will be held to-day (December 17th) for the purpose of passing a resolution altering the memorandum of association.

SOUTH LONDON ELECTRIC SUPPLY CORPORATION, LTD.—Directors propose to capitalise £234 000 out of reserves, and to distribute this amt. to ord. shareholders by allotting nine new fully paid ord. shs. of £1 each for every ten £1 ord. shs. held.

COUNTY OF LONDON ELECTRIC SUPPLY CO., LTD.—Directors propose to capitalise £1 773 334 out of reserves, and to distribute this amt. to ord. shareholders by allotting four new fully-paid ord. shs. of £1 each for every three £1 ord. shs. held.

SOUTH METROPOLITAN ELECTRIC LIGHT AND POWER CO., LTD.—Directors propose to capitalise £350 000 out of reserves, and to distribute this amt. to ord. shareholders by allotting seven new fully-paid ord. shs. of £1 each for every five £1 ord. shs. held.

TATA HYDRO-ELECTRIC POWER SUPPLY CO.—Income for year to June, 1926, Rs.5 046 511; working exes. Rs.2 108 001. After provision for depreciation, net pft. was Rs.1 892 934, plus Rs.377 718 brt. in. Total divs. 7 p.c. on pref. and 8 p.c. on ord. shs.; fwd. Rs.175 763.

BULLERS, LTD.—Pft. for the year ended July 31, £3 557, after provision for director's fees, deb. int. and depreciation. The effects of the coal strike severely handicapped the company's undertaking, but the works have never been closed down. It is proposed to transfer £5 000 from res., making, with the year's pft. and the amount brt. in from last year, £14 223. Pref. div. has been paid, and after transferring £5 808 to sinking fund for redemption of debs., £915 is carried fwd.

BURNDEPT WIRELESS, LTD.—The board has now been reconstituted as follows:—Mr. John McGregor, chairman and director (managing director of Johnson and Phillips, Ltd.); Mr. T. A. Barson, vice-chairman, co-opted at request of committee of shareholders; Mr. W. W. Burnham, managing director; Mr. C. F. Phillips, chief engineer; Mr. J. G. Scott, co-opted at request of shareholders' committee; Mr. C. Stewart (director of Johnson and Phillips, Ltd.); Mr. G. L. Wates.

BRITISH COLUMBIA TELEPHONE CO.—It is announced that the control of the British Columbia Telephone Co. is being purchased by the Associated Telephone and Telegraph Co., a holding company which includes Theodore Gary and Co.; the International Automatic Telephone Co., Ltd.; British Insulated Cables, Ltd.; the Cables, Telephones and General Trust; and Siemens Bros and Co., Ltd. It is understood that the British Columbia Telephone system is to be converted to automatic working.

PETTERS, LTD.—Circular issued to shareholders tates that arrangements concluded to acquire as from Dec. 8 the whole of interest of Vickers, Ltd. in Vickers-Petters, Ltd., Ipswich, including their holding of £145 000 first mtge. deb. stk. Name of co. will be changed to Petters (Ipswich), Ltd., as soon as necessary formalities are completed. Engines now produced by Vickers-Petters, Ltd., at Ipswich are a development of larger sizes of Petter oil engines, the manufacture of which was transferred from Yeovil in 1919.

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BROMPTON AND KENSINGTON ELECTRICITY SUPPLY CO., LTD.—An extraordinary meeting will be held on December 29th to consider resolutions to increase cap. to £400 000 by creation of 100 000 additional ord. £1 shs., to capitalise £58 456 of reserves and distribute same in form of fully paid ord. £1 shares to ord. shareholders in proportion of one new share for every five shares held, and to capitalise a further £23 553 of res. and allot this sum as fully paid ord. £1 shs. to be held on account of a superannuation fund.

UNITED ELECTRIC TRAMWAYS OF MONTEVIDEO, LTD.—It is announced that the directors have been able to make an agreement for the acquisition of the other electric tramway company operating in Montevideo, known as La Transatlantica, subject to a small outstanding issue of debentures (£67 500). The directors have arranged for the transfer to the Atlas Light and Power Co., Ltd. (formerly the Argentine Light and Power Co., Ltd.) of the United Co.'s present tramway holdings and those to be acquired under the agreement with La Transatlantica. In respect of these holdings the United Co. will receive shares of the Atlas Co. It is hoped, in time, to broaden the interests of the United Co. on the usual trust company basis. The agreement will be submitted to the shareholders for approval.

New Companies.

ADAM ENGINEERING CO. (ENGLAND), LTD.—Cap., £100. Electrical engineers, etc. Reg. office: 60, Strand, London, W.C.2.

LLANIDLOES ELECTRIC LIGHT CO. (1926), LTD.—Cap., £1 000. Reg. office: The Grange, Long Bridge Street, Llanidloes, Montgomeryshire.

J. W. SCOTT AND CO., LTD.—Cap., £2 000. Electrical, radio and general engineers. A first director: J. W. Scott, 50, Obelisk Road, Southampton.

FONDON, LTD.—Cap., £500. Manufacturers of and dealers in electrical fittings, etc. Reg. office: 63, Spencer Street, Clerkenwell, London, E.C.1.

S. KALISKY (ALDGATE), LTD.—Cap., £1 000. Wireless merchants, electricians, wireless and mechanical engineers, etc. Reg. office: 75, Aldgate High Street, London, E.1.

URIEL REES AND CO., LTD.—Cap., £1 000. Dealers in electrical apparatus and requisites, electricians, etc. Reg. office: 66 and 67, Woodfield Street, Morriston, Swansea.

GLADDEN AND DAVIES, LTD.—Cap., £2 000. To acquire the business of electrical engineers, etc., now carried on by W. Gladden and H. P. Davies at 13, Hooley Range, Heaton Moor, Lancs.

PIANISTE MANUFACTURING CO., LTD.—Cap., £1 000. Wireless telephone, telegraph and electric light, heat and power supply company, etc. Reg. office: 15, Margaret Street, London, W.1.

SELECTORS, LTD.—Cap., £1 000. Makers of and dealers in wireless sets, apparatus and component parts, etc. Solicitors: Robins, Hay, Waters and Hay, 9, Lincoln's Inn Fields, London, W.C.

WORLDECHO, LTD.—Cap., £25 000. To acquire, work and deal with a secret process applicable for the manufacture of wireless and electrical materials, etc. Reg. office: 116, Victoria Street, Westminster, London, S.W.1.

SOLAFLEX, LTD.—Cap., £1 000. To carry on the business of dealers in and manufacturers of apparatus, appliances and plant required for publicity and advertising, etc. Registered office: 12, Grosvenor Gardens, Westminster, S.W.1.

E. O. WALKER AND CO., LTD.—Cap., £3 000. To acquire the business of an electrical and mechanical engineer carried on at 26, Cannon Street, Manchester, and at 34, Henblas Street, Wrexham, by E. O. Walker as "E. O. Walker and Co."

LEICOL, LTD.—Cap., £250. To acquire property, assets and goodwill of F. Wilde and H. F. Kerley, trading as "Electrical Traders," at 64, Hanover Street, Liverpool, and to carry on the business of manufacturers of and dealers in electrical and other fittings, etc.

WOOLLDRIDGE RADIO CO., LTD.—Cap., £100. To acquire business of wireless apparatus and material manufacturers and dealers and dealers in electrical goods carried on by P. Parry and Mabel Woolldridge at 26 and 39, Lisle Street, London, W.C., as "Woolldridge Radio Co."

CONWAY WEST MOTORS, LTD.—Cap., £18 000. To acquire the business of general smith, etc., carried on by Conway West at Old Woking and Woking, Surrey, and to carry on the same and the business of manufacturers of and dealers in wireless apparatus and accessories, etc.

LUNAR ELECTRICAL CO., LTD.—Cap., £100. Electrical machine and accessory merchants, electricians, manufacturers and workers of and dealers in electricity, motive power and light, telephones, telegraphs (wireless or otherwise), etc. Reg. office: 3/7, New Street Square, London, E.C.4.

MAXLUME LIGHTING AND HEATING CO., LTD.—Cap., £25 000. To acquire that section of the business of Verity's, Ltd., set apart for the manufacture and sale of apparatus for use in connection with electric light, heating and cooking for industrial and domestic purposes, known as the "Maxlume Section," carried on at Plume Works, Aston, Birmingham.

STEEL TUBE AND CONDUIT CO. (MIDDLESBROUGH), LTD.—Cap., £5 000. To acquire business at Lower Commercial Street, Middlesbrough, recently carried on by Middlesbrough Steel Tube and Conduit Co., Ltd., and to carry on the business of manufacturers of and dealers in conduit, electrical and mechanical appliances, switches, switchboards, etc.

COMPAGNIE INTERNATIONALE D'ELECTRICITE.—Cap., 100 000 francs. Incorporated in France to manufacture and sell electric devices and lamps, etc. British address: Headland House, 308, Gray's Inn Road, London, W.C.1. I. Meller, of 72, Parkhill Road, Hampstead, London, N.W., is authorised to accept service of process and notices on behalf of the company.

W. D. MEAGHER, LTD.—Cap., £100. To acquire business of a manufacturer and repairer of and dealer in goods, parts and accessories appertaining to engines, magnetos, dynamos and starter motors for lighting, power, etc., carried on by W. G. Meagher, at 232, Deansgate, Manchester, at 85, Terminus Chambers, 6, Holborn Viaduct, E.C.1, and at 122, Bothwell Street, Glasgow.

REPRODUCTION, LTD.—Cap., £6 000. To acquire lands, buildings, etc., for the erection of manufactories and workshops with a view to manufacturing and dealing in loud speaking apparatus, wireless receivers and any article adapted for sound reproduction and amplifying, wireless or radio apparatus and accessories, etc. Solicitors: Braund and Hill, 6, Gray's Inn Square, London, W.C.1.

METROPOLITAN ELECTRIC CABLE AND CONSTRUCTION CO., LTD.—Cap., £75 000. To carry on the business of manufacturers of electrical wires and cables and all appliances and apparatus for the generation, supply, use and control of electric power, and in particular that of manufacturers of and dealers in the various types of wire and electrical cable hitherto manufactured by Fuller's United Electric Works, Ltd. Reg. office: Fullers Works, Chadwell Heath, Essex.

Municipal Trading

Objections to Electrical Fittings Clause in Bedford Corporation Bill.

BEDFORD Town Council, at a special meeting on December 7th, passed a clause in a Bill to be promoted to confer powers upon the Corporation in regard to the selling of electrical fittings and apparatus, and to make further provision with regard to the electricity undertaking.

There was some objection to the clause on the ground of municipal trading, but an amendment that the clause be deleted was rejected.

The matter has still to be considered by a public meeting of ratepayers.

In Parliament.

(*Concluded from page* 706.)

Scammorden and Soyland urban districts, part of Sowerby urban district, Todmorden rural district and parts of Halifax rural district; (4) parts of the counties of Gloucester and Warwick; (5) the burgh of Dingwall, the parishes of Dingwall, Fearn, Nigg and Tarbat and parts of the parishes of Roskeen, Alness, Kiltearn, Fodderby, Contin, Urquhart and Logie Western, Urray, Kilmuir Easter, Edderton and Tain, in the county of Ross and Cromarty; (6) parts of Maidstone, Malling and Hollingbourne rural districts; (7) Porthcawl urban district; (8) Cwmamman urban district and parts of Llandilofawr and Pontardawe rural districts; (9) Wrexham rural district; (10) parts of Reigate and East Grinstead rural districts; (11) part of Seisdon (Staffs) rural district; (12) Porthcawl rural district; (13) the parish of Chessington in Epsom rural district; (14) Bampton (Devon) urban district; (15) certain burghs and parishes in the county of Fife; (16) parts of Ulverston rural district; (17) parts of Nantwich rural district; (18) parts of Eton rural district; (19) part of Reigate rural district.

In the House of Lords the Norwich Electricity (Extension), the Bakewell and District Electricity and the London Electric Supply Corporation (Supply to Railways) Orders have been approved.

Replies to Questions.

The following are points from answers to questions in the House of Commons this week:—

The fact that some subscribers make little use of their telephone affords no opportunity for making a reduction of telephone rentals.

The agreement with the Marconi Co. provides for the erection in this country, on behalf of the Post Office, of beam stations with corresponding stations in Canada, Australia, South Africa and India. The stations for the Anglo-Canadian service are now operating, stations for the Anglo-Australian service are undergoing preliminary trials, and stations for the Anglo-South African and Anglo-Indian services will, it is hoped, be completed early in the new year.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts They may be for actions. But the Registry makes no distinction Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

COSH, Mr. P. G., 2, Sandrock Road, Lewisham, electrical contractor. £13 12s. 6d. November 2nd.

FARAD ELECTRICAL CO., LTD., 62, West Hill, Wandsworth, electricians. £17 11s. 8d. October 27th.

GAMBLE (A. R.) AND SONS, LTD., Chirk, electrical engineers. £20 5s. October 30th.

GREEN, Mr. G. S., 72, Cromartie Street, Longton, Stoke-on-Trent, electrical dealer. £10 5s. 5d. November 3rd.

JENKINS, G. H., AND CO., 11, Moira Buildings, Cardiff, electrical factors. £11 5s. November 1st.

PAVILION WIRELESS DEPOT, 132, Mitcham Road, Tooting, wireless dealers. £18 17s. 10d. November 4th.

WHITFIELD ELECTRICAL CO., LTD., Fitzroy Works, Whitfield Place, W. £10 15s. 2d. November 4th.

Bills of Sale.

MAYOR, Arnold Bennett, 3, Skipton Road, Anfield, Liverpool, electrican. Filed December 3rd. £55.

WATKINS, William James, 78, Brunswick Road, Leyton, electric wire salesman. Filed December 10th. £30.

Deeds of Arrangement.

GILL, **Frank**, late trading at 20, Skipton Road and now residing at 17, Alexandra Crescent, Ilkley, electrical engineer. Filed December 13th. Trustee, W. Rayner, 33 Ivegate, Bradford, C.A., Secured creditors, £5; liabilities unsecured, £689; assets, less secured claims, £217.

WALKER, Joseph, trading as JOSEPH WALKER AND SON, 2, Tangier Street, and residing at George Street, Whitehaven, electrician. Filed December 8th. Trustee, R. L. Wyllie, 134, Queen Street, Whitehaven, C.A. Liabilities unsecured, £2 368; assets, less secured claims, £992.

Receivership.

PLENO, LTD.—F. E. Bendall, of 26, Corporation Street, Birmingham, was appointed receiver and manager on December 3rd, 1926, under powers contained in debenture dated March 2nd, 1923.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Winding-up Petition.

NATIONAL WIRELESS CORPORATION, LTD. A creditor's petition for winding up has been presented and is to be heard at the Royal Courts of Justice, Strand, London, on December 21st.

Companies Winding-up Voluntarily.

E. I. C. MAGNETOS, LTD. By special resolution November 20th, confirmed December 6th. A. V. Jerome, 15, Newhall Street, Birmingham, appointed liquidator. Meeting of creditors at the offices of the liquidator, on Tuesday, December 21st, at 12 noon.

NOTE.—This notice is purely formal as the creditors have been, or will be, paid in full.

GATES (E. AND C.), LTD. S. B. Saunders, 26, Park Row, Nottingham, appointed liquidator, December 9th.

Bankruptcy Information.

BEBBINGTON, Harold, 14, Cestrian Street, Bolton, electrical engineer. First meeting, December 22nd, 2.30 p.m., Official Receiver's Offices, Byrom Street, Manchester. Public examination, January 18th, 1927, 10.45 a.m., Court House, Mawdsley Street, Bolton.

DICKSON, William Hay, and SOLOMAN, Alexander James, trading in partnership under the style of DICKSON AND SOLOMAN, 13 and 14, Tavistock Street, Devonport, electrical and wireless engineers. Receiving order, December 8th. Debtor's petition.

PAYNE, Norman Hele, 4, The Triangle, Teignmouth, and late 11, Queen Street, Dawlish, electrical and wireless engineer. Receiving order, December 7th. Debtor's petition. First meeting, December 23rd, 11 a.m., Official Receiver's Offices, Exeter Bank Chambers, 67, High Street, Exeter. Public examination, January 13th, 1927. 11 a.m., The Castle, Exeter.

PEET, James Robert, Earsdon, Linden Walk, Prestatyn, Flint, electrical engineer. Receiving order, December 8th. Debtor's petition.

Notice of Dividend.

THOMPKINS, Benjamin George, 65, Eden Terrace, Oxhill, trading at Armstrong's Buildings, Stanley, Durham, radio engineer. First and final dividend, 3s. per £, payable December 21st, Official Receiver's Office, 81, St. Mary's Place, Newcastle-upon-Tyne.

Notice of Intended Dividend.

DOLLITTLE, John Henry, Virginia House, Portsmouth Road, Guildford, and 17, Park Street, Guildford, wireless engineer, trading as the ZENITH RADIO MANUFACTURING CO. Last day for receiving proofs, December 28th. Trustee, T. Gourlay, Official Receiver, 29, Russell Square, London, W.C.1.

Application for Discharge.

ATKINSON, Herbert Henry, 33, Prince's Avenue, Old Trafford Manchester, electrical engineer. Hearing, January 11th, 1927, 10.45 a.m., Court House, Encombe Place, Salford.

Partnership Dissolved.

LEE and BUFTON (BUFTON, Harry, and MARPLES, William), electrical engineers, Fornham Street, Sheffield, by mutual consent as from November 30th, 1926, so far as concerns H. Bufton who retires from the firm. Debts received and paid by W. Marples, who will continue the business.

Bankruptcy Proceedings.

BROCK, Reginald Lewis, trading as R. L. BROCK AND CO., 5, Bedford Row, Tavistock Road, Plymouth, electrical engineer and wireless dealer. The receiving order in this matter was made recently on a creditor's petition. The statement of affairs shows liabilities of £1 723 and net assets estimated at £355, a deficiency of £1 368. The deficiency account shows a net trading loss since December 31st, 1923, of £263, bad debts £102, household and personal expenses £895, and amount paid out to late partner £310. Debtor states that he commenced trading at Christmas, 1919, as an electrical engineer with £120. At first he had no business premises, but in March, 1920, he rented part of a shop at 5, Bedford Row, Plymouth, and at the end of the year he took over the whole shop, and soon afterwards bought the premises for £1 075, of which £1 000 was raised on mortgage. He also borrowed £130, since repaid, and out of this sum the balance of the purchase money was paid. Debtor states that in 1921 he took premises and fitted them up as a garage to help a relative. This continued for 12 months, when it was closed and the machinery was moved to 5, Bedford Row. Debtor alleges that he lost over £300 in this venture. On March 25th, 1924, debtor entered into partnership with another person engaged in the wireless trade, the agreement providing that debtor's contribution to the capital should be £435, of which £155 was paid as a premium by the partner, and £433 was also contributed by the partner. The firm dealt in electrical and wireless goods, and from an account prepared at the end of December, 1924, debtor's share of the profit was £232, in addition to which he was credited with £138 for the three months to March 25th, 1924, based on the 1923 profits, and his drawings were £346. Debtor's share of the profits to September 30th, 1925, was £33, and his drawings during the same period £281. The firm dissolved partnership on September 30th, 1925, but accounts were not settled between them until March 22nd, 1926, on which date an agreement was entered into by which debtor's partner acquired the assets of the wireless department and agreed to meet the liabilities incurred in this department. Debtor received the remaining assets and undertook the remaining liabilities. He states that at this time his largest electrical creditor pressed him, and to meet this liability and to pay out his partner he further charged No. 5, Bedford Row, for £400. The property has been sold by the mortgagee for £1 625 and debtor has carried into his statement of affairs a sum of £133 estimated surplus from the security. Debtor states that he endeavoured to establish a country electrical round but found the expenses too heavy. He further alleges that work had been underestimated for or defectively executed by his employees with a consequential loss. On September 1st last he executed a deed of assignment and a statement was issued to the creditors showing his estimated unsecured liabilities to be £2 018, and assets £847. Debtor states that his books of account consist of cash books, debtors' and merchants' ledgers, day books and counter books. He has been aware of his financial position during the past year, but considered that by curtailing expenses he could set matters right. At the statutory first meeting of the creditors it was resolved to appoint Mr. J. S. B. Hole, of Monument House, Monument Street, London, E.C.3, to act as trustee, and a committee of inspection was nominated.

WATSON, Charles William, 33, Rainhall Road, Barnoldswick, Yorks, electrical and wireless engineer. The statement of affairs shows ranking liabilities of £834 and a deficiency of £775. Debtor attributes his failure to lack of capital, falling values of stock, bad trade and heavy court and execution costs. The case being a summary one was, at the first meeting of creditors, left with the Official Receiver as trustee.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

238 897 International General Electric Co., Inc. Dynamo-electric machines. (23/8/24.)
240 806 Dr. R. Matouch and Silectra Ges. Alternating-current mercury vapour lamps. (3/10/24.)
239 546 International General Electric Co. Inc. Electric measuring instruments. (8/9/24.)
245 388 M. Buchholz. Device for indicating sparking and other disturbances in, and for automatically cutting-out transformers, choke coils, and other electrical apparatus operating in an insulating medium (24/3/25) (Addition to 198 936. Divided application on 7 933/25.)
245 404 E. C. R. Marks (Morkrum Co.). Control systems for electric synchronous motors. (30/7/24.) (Divided application on 245 175.)
245 252 Dr. M. Wilderman. Diaphragms to be used in electric batteries. (12/9/24.)
245 364 J. R. C. August and E. K. Hunter. Electromagnetic control arrangements for automatic punching machines. (3/3/25.)
219 305 Electric Apparatus Co. Radio receiving systems. (18/7/23.)
245 484 A. E. White (Elevator Supplies Co., Inc.). Electric switches. (9/9/24.)
224 871 H. G. Andre. Apparatus for the rectification of alternating current. (13/11/23.)
233 292 H. G. Andre. Apparatus for the rectification of alternating current. (30/4/24.) (Addition to 224 871.)
245 502 J. Stone and Co., Ltd. (C. J. H. Bolton). Auxiliary lighting installations. (7/10/24.)
245 505 Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.) and B. B. Grace. Electric switching keys for high-frequency circuits. (7/10/24.)
245 512 P. Tracy. Double-pole electrical connection. (8/10/24.)
245 516 Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.). Modulating systems for electric signalling and the like. (9/10/24.)
245 518 Igranic Electric Co., Ltd., and G. F. Dandridge. Means for adjusting radio instruments or the like. (9/10/24.)
245 522 Westinghouse Brake and Saxby Signal Co., Ltd. (Union Switch and Signal Co.). Electrical translating apparatus. (10/10/24.) (Addition to 199 480.)
245 523 Westinghouse Brake and Saxby Signal Co., Ltd. (Union Switch and Signal Co.) Electric relay apparatus. (10/10/24.)
245 524 Westinghouse Brake and Saxby Signal Co., Ltd. (Union Switch and Signal Co.). Electrical thermo-sensitive apparatus. (10/10/24.)
245 529 A. Reyrolle and Co., Ltd. and J. Mirrey. Metal-clad electric switchgear. (11/10/24.)
228 855 T. G. Thornblad. High-speed telegraph systems. (7/2/24.)
245 532 Automatic Telephone Manufacturing Co., Ltd., and H. H. Harrison. Telegraph systems. (16/10/24.)
245 533 F. F. Sharp and R. R. Stell. Construction of aerial " wire " for wireless broadcast reception. (17/10/24.)
245 536 G. Wall and Metropolitan-Vickers Electrical Co., Ltd. Electric measuring instruments. (18/10/24.) (Cognate application 11 033/25.)
245 537 Lord Egerton of Tatton (M. Egerton). Air-spaced coil for use in wireless telegraphy and telephony and also for use for electrical purposes. (18/10/24.)
245 538 A. E. Alexander (United States Tool Co. Inc.). Variable electric condensers. (20/10/24.)
245 549 H. Stevens and A. J. Stevens and Co. (1914), Ltd. Inductance coil holders. (3/11/24.)
245 550 A. H. Sheppard and Ever-Ready Co. (Great Britain), Ltd. Battery terminals. (4/11/24.)
245 553 J. Y. Johnson (Badische Anilin und Soda Fabrik). Process and apparatus for carrying out circuit reactions under very high pressures. (12/11/24.)
245 554 Standard Telephones and Cables, Ltd. (formerly Western Electric Co., Ltd.). Telephone repeater circuits. (13/11/24.)
245 556 Fuller's United Electric Works, Ltd., and A. P. Welch. Electrically operated make-and-break devices for use in horns or warning devices for vehicles or for use in electric bells, interrupters for spark coils, and the like. (14/11/24.)
245 557 H. A. Hickson. Tuning-coil holder. (17/11/24.)
245 569 F. H. Alston. Plug-in fittings or attachments for inductance coils for wireless receiving or transmitting apparatus, or for other uses. (6/12/24.)
245 572 J. E. S. E. Honor and C. W. H. Honor. Electric switch plugs. (19/6/25.)
245 574 C. Pressland. Valve-holders for wireless receiving sets. (10/12/24.)
245 581 W. Hickel and O. Pletscher. Automatic excess-heat protector, especially for electric machines and apparatus. (22/12/24.)
245 586 E. M. Taunton. Electrical terminals. (5/1/25.)
245 598 Rheostatic Co., Ltd., and L. Satchwell. Grid resistance. (15/1/25.)
245 606 J. E. Pollak (Telephon Apparat, E. Fabrik Zwietusch and Co., Ges. Kommanditges). Automatic switches for use in telephone or like systems. (22/1/25.)
230 027 Maschinenfabrik Oerlikon. Protective device for limiting the supply of current to and automatically switching off electric current consuming apparatus. (25/2/24.)
245 615 J. E. Pollak, etc. Automatic switches for use in telephone or like systems. (3/2/25.)

Applications for Patents.

November 12th.

28 573 R. M. Balston and G. Gilliver. Electrical vibrating apparatus.
28 589 C. R. Belling and Belling and Lee, Ltd. Electric terminals.
28 484 R. P. Le Bensing. Electrolytic rectifiers.
28 543 J. Berthenod. Electric ignition. (18/11/25, France.)
28 496 British Insulated Cables, Ltd., and T. H. Falconer. Temporary connectors for stranded conductors.
28 575 Electro-Mechanical Brake Co., Ltd., and M. J. Pattison. Control of electric vehicles.
28 477 C. V. A. Eley. Distribution of electric power.
28 503 Federal Telegraph Co. Electron tube apparatus. (25/5/26, U.S.)
28 520 Graf Ges. für Elektro-Industrie. Incandescent lamps. (13/11/25, Germany.)
28 580 Graf Ges. für Elektro-Industrie. Incandescent lamps. (17/5/26, Germany.)
28 535 Igranic Electric Co., Ltd., and P. W. Willans. Thermionic valve circuits.
28 589 E. M. Lee. Electric terminals.
28 474 Soc. des Etab. Ducretet. Arrangements for composition of two variable electric currents.

November 13th.

28 636 A. W. Bailey. Electric terminals.
28 611 A. C. Bartleet, M. O. Valve Co., Ltd., and J. W. Ryde. Electric discharge tubes.
28 632 W. Haddon. Accumulator plates.
28 608 T. A. Hodgkiss and W. E. Smith. Batteries, etc.
28 640 International General Electric Co. Systems of electric braking. (14/11/25, Germany.)
28 641 W. M. Rolph and T. C. Smith. Wireless receiving apparatus.
28 595 Smith, Major and Stevens, Ltd., and P. H. Stevens. Controlling two-speed polyphase lift-motors.

November 15th.

28 793 W. H. Apthorpe. Electric regulating apparatus.
28 729 British Thomson-Houston Co., Ltd. Thermionic valve amplifying systems. (14/11/25, U.S.)
28 730 British Thomson-Houston Co., Ltd. Electric transmission systems. (27/11/25, Belgium.)
28 793 Cambridge Instrument Co., Ltd. Electrical regulating apparatus.
28 698 H. C. Davis. Telephone attachment.
28 707 M. Dewhurst. Electromagnetic brakes.
28 796 Felten und Guilleaume Carlswerk A.G. Production of insulating paper. (29/4/26, Germany.)
28 758 Forges et Ateliers de Constructions Electriques de Jeumont. Safety brakes for extraction machines. (16/11/25, France.)
28 699 V. Hope. Electrical fuses.
28 744 H. Mühlenbrock. Prevention of overheating of electric flatirons.
28 714 H. J. Sancto. Frame aerial for wireless signalling.

November 16th.

28 934 Ajax, Ltd., and G. M. Chalmers. Tungsten arc lamps.
28 890 H. Baron (F. Aldendorff). Automatic telephone exchanges.
28 872 S. C. Barton and R. G. E. Spawforth. Thermionic valve holders.
28 886 W. A. Benger. Dynamo-electric machines.
28 925 W. J. Brown, A. J. King and Metropolitan-Vickers Electrical Co, Ltd. Electrical circuits for thermionic valves.
28 911 E. G. Danielson. Variable electric condensers. (21/5/26, U.S.)
28 849 English Electric Co., Ltd., and F. N. Linstow. Enclosed electric fuses.
28 850 English Electric Co., Ltd. and F. N. Linstow. Enclosing arrangements for electrical apparatus.
28 820 A. V. Evans and T. E. and T. W. Wallis. Fire alarm.
28 941 Felton und Guilleaume Carlswerk A.G. Bridges for frequency measuring. (23/4/26, Germany.)
28 814 P. P. Fletcher. Flexible conductors.
28 887 International General Electric Co. Oil immersed electrical apparatus. (26/11/25, Germany.)
28 909 J. D. Marshall and H. Roberts. Telephone appliances.
28 813 J. E. Purser. Variable electrical condensers.
28 955 Soc. Anon. des Etablissements Tecalemit. Electric pump. (16/11/25 France.)

November 17th.

29 016 R. Ball and J. Sax and Co., Ltd. Electric couplings.
29 073 M. J. B. Earearou. Driving starting magnetos.
29 089 J. C. W. Drabble and C. E. Horton and J. K. Im Thurn. Directional wireless signalling.
29 054 P. Dunsheath and W. T. Henley's Telegraph Works Co., Ltd. Insulating cables.
29 043 International General Electric Co., Inc. Lighting and ignition machines. (17/11/25, Germany.)
29 079 L. D. Macgregor and E. P. Willdern. Oscillatory circuits for high frequency signalling.
29 055 Marconi's Wireless Telegraph Co., Ltd. Wireless telegraphy, etc. (18/11/25, U.S.)
28 965 A. W. Nicholas. Electric kettle.
29 064 S. P. Stokes. Thermionic valve circuits.
29 051 R. Thornhill. Separators for galvanic batteries.
29 044 A. L. Trickett. Delayed action switches.
29 080 E. P. Willdern. Variable coupling devices for inductances.

November 18th.

29 160 British Thomson-Houston Co., Ltd. Vapour-electric devices. (18/11/25, U.S.)
29 150 J. F. B. Carslake. Motor-control systems.
29 122 G. Currie and G. Hancheff. Electric heating apparatus for water cooled engines.
29 145 F. Downes, W. D. Rogers and Siemens and General Electric Railway Signal Co., Ltd. Electric switches.
29 178 Ferranti, Ltd., and S. Z. de Ferranti. Induction a.c. meters.
29 121 H. Humphreys. Magnetic chucks.
29 107 E. Schrach Radiowerk. Electric tubes. (6/8/26, Austria.)
29 108 E. Schrach Radiowerk. Electric discharge tubes. (17/6/26, Austria.)
29 140 F. H. Royce. Electrical turning gear for starting engines.

November 19th.

29 268 F. Aldendorff. Telephone systems.
29 271 British Thomson-Houston Co., Ltd. Vapour-electric devices. (19/11/25, U.S.)
29 272 British Thomson-Houston Co., Ltd., and A. G. Henton. Commutators for electrical machines.
29 269 A. G. Damm. Apparatus for transmitting and receiving telegraphic messages.
29 284 General Electric Co., Ltd. Filaments for incandescent lamps. (10/7/26, Germany.)
29 254 F. Lilienthal. Eye protector for electric welding. (21/11/25, Germany.)
29 265 D. E. Montague. Protective devices for coils, etc.

November 20th.

29 388 British Thomson-Houston Co., Ltd. Mercury rectifiers. (30/11/25, U.S.)
29 339 A. Chalmers. Globe fittings for electric lamps.
29 366 N. Drey. Electro-chemical reactions upon organic compounds.
29 362 L. C. Leech and E. Roberts. Electric switches, etc.
29 325 H. Longton. Direct current electric supply systems.
29 326 S. McClatchie. Electric vacuum cleaners. (20/11/25, U.S.)
29 363 H. C. Sanders and Santon, Ltd. Electric heating elements.
29 316 A. L. M. Sowerby. Thermionic ohmmeter for high resistances.

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Friday, December 17th (To-day).

Institution of Locomotive Engineers.—Hotel Metropole, Leeds. Paper by Mr. H. E. Geer on " Modern Locomotive Superheating." 7 *p.m.*

Birmingham Electric Club.—Grand Hotel, Colmore Row. Annual meeting. 7 *p.m.*

Electrical Development Association.—Royal Society of Arts, John Street, Adelphi, London. Third E.D.A. Conference, " Secrets of the Selling Art." Speaker, Mr. G. S. Francis. 7.30 *p.m.*

Saturday, December 18th.

Institution of Electrical Engineers (London Students' Section).—Visit to Barking Power Station. 2.15 *p.m.*

Monday, December 20th.

Institution of Electrical Engineers (Tees-Side Sub-Centre).—Cleveland Technical Institute, Middlesbrough. Informal meeting. Discussion on " Some Electrical Problems." (Opened by Mr. W. R. Cooper). 7 *p.m.*

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The Electrician.

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Christmas Holidays.

We wish all readers of and advertisers in "The Electrician" a Happy Christmas and Prosperous New Year.

The Editorial, Advertising and Publishing Offices will be closed from 4 p.m. on Friday, December 24th, until 9 a.m. on Tuesday, December 28th.

ELECTRICITY IN MINES.

BELIEVING as we do that much of the trouble which led up to the recent coal dispute could be alleviated by the greater use of electricity in the mines of this country, we turned to the report for 1925 of H.M. Electrical Inspector of Mines, Mr. J. A. B. HORSLEY, with a good deal of interest. That interest is likely to be shared by every electrical engineer. For the report is worth study not only for the statistical information which it gives, but for the descriptions of and comments on the accidents, which have occurred with the electrical apparatus used. These convey many useful lessons and should lead up to improvement in the future.

In 1924 the number of mines at work was 2 855. This had decreased to 2 721 in 1925, the number of mines using electricity falling from 1 630 to 1 589. On the other hand, the horse power of the motors installed above ground increased from 671 036 to 715 834 H.P. and below ground from 810 896 to 840 041 H.P.

It is interesting to find that, expressed as a percentage, the use of electricity below ground has decreased slightly since 1921. This is probably due to the fact that more advantage is taken of its benefits for purposes in which it has already proved itself in other industries; and that conservatism has prevented a similar advancement in its use for driving coal cutters. Below ground haulage and pumping between them account for nearly the entire load, though above ground there is greater evenness in the uses to which the electric drive is put. Since 1921, however, not only has the proportion of mines using some electricity increased from 51·8 to 58·4 per cent. but the average horse power of these motors installed per mine has risen from 731 to 979. There is, nevertheless, a good deal of ground to cover before saturation point reached. Incidentally it may be mentioned that all the mines in the Kent coalfield are electrified. The number of coal cutting machines in use was 3 134, compared with 3 046 in 1924, and for the first time the number of machines worked by compressed air is less than it was the year before. Approximately 30 million tons, or 62 per cent., of the whole output was cut electrically. This is again an advance on previous figures. In the metalliferous mines of the country 22 802 H.P. of motors were installed in 1925, compared with 23 514 H.P. in 1924. This was due to a decrease in the number used below ground, particularly for pumping.

The greater part of the report is devoted to an account of the accidents which can be attributed directly or indirectly to the use of electricity. These must not be taken too seriously, for, after all, dealing with them is Mr. HORSLEY'S work. There were eight fatal accidents during 1925, or 1 per 194 530 H.P. of electrical plant installed. Seven of these were cases of shock resulting in eight deaths. One was attributed to open sparking at the plug connector of an electrically driven coal cutter, which ignited the fire damp and resulted in the death of five persons. Two of the shock fatalities, in which three lives were lost, occurred above ground. Of the shock accidents, five were due to overhead lines and one each to switchgear and flexible cables.

As regards the majority of fatal accidents, the main cause was either carelessness on the part of the unfortunate men who met their death, or on the part of those who were in charge of the plant. Sometimes badly conceived layout was a secondary cause, but as regards design generally little improvement could be made. For instance, in one case some transformers were being reconnected and difficulty was experienced in obtaining the correct phasing. While the gear was being made dead in preparation for another attempt, one of the workmen, for some reason, entered the cubicle and received a fatal shock. There was nothing to show he did not know the terminals were alive. As Mr. HORSLEY points out, accidents of this kind can only be avoided by rigid adherence to an established routine, which should include the earthing of conductors before they are approached. Another accident shows the danger of allowing men to work upon overhead lines when there is a similar absence of routine, the result being that a line supposed to be dead was in reality live from one end.

The accident in which five men were killed and 28 injured started with an explosion which occurred while an electrically-driven chain coal cutter was being prepared for use near to a fast end. Electricity seemed to be the only reason for the ignition of the fire damp, as no defect was found in the apparatus. There was no mechanical interlock to prevent the trailing cable plug being withdrawn while the main

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switch was on and this had apparently often taken place. It is assumed that one of the men inserted the plug after the current had been switched on at the gate end without observing that the main switch was on and that gas was ignited by the flash. Tests for gas do not seem to have been properly made and Mr. HORSLEY remarks that the circumstances show the futility of enclosing the starting switch and motor in a flame-proof housing and neglecting the plug connector. For though it is accepted as a sound precaution that the plug should not be employed as a switch, it is far from universal practice to provide an interlock to prevent its misuse in that way. Matters have, of course, greatly improved in this direction recently and there is plenty of apparatus available which meets the conditions laid down. In this connection, Mr. HORSLEY suggests the use of remote controlled switchgear, using an electrically controlled starting switch at the gate end, which is operated from the machine by a pilot wire in the trailing cable, and a master switch at the machine. As a general comment on the fatal accidents, it may be pointed out that during the last three years, out of a total of 28 fatal electric shock accidents, the neutral point was insulated in nineteen cases, thus going to disprove that this system is safer than when the neutral is earthed.

There were 54 non-fatal electrical accidents during 1925, compared with 57 in 1924 and 70 in 1923; 34 of these occurred below ground and one in a slate mine. In all, 70 persons were injured. Inadequate maintenance and ignorant misuse were the most important contributory causes. Two accidents showed the grave risk of openings such as drain plugs in an enclosure that is intended to be flame proof. Another accident was caused by blind reliance on automatic safeguards, and as a result a winding engine was put out of action for 16 hours.

The figures show, however, that the use of electricity in mines is as safe as anywhere else, providing that properly designed apparatus, such as is now generally available, is employed and that sufficient care is taken with it by the workmen.

Current Topics.

Sir J. J. Thomson.

ON Saturday last Sir J. J. THOMSON, O.M., F.R.S., celebrated his seventieth birthday and as the occasion coincided with the annual dinner of the Cavendish Society of Cambridge the opportunity was taken to invite a number of distinguished British and foreign scientists to pay homage to one who is generally recognised as being a pre-eminent leader in scientific thought and prevision. The guests included Lord RAYLEIGH, Sir OLIVER LODGE, Sir RICHARD GLAZEBROOK and Sir NAPIER SHAW, all pupils or co-workers with Sir JOSEPH, as well as the following visitors from abroad: Prof. ZELENY (Yale University), Prof. VAN DER POL (Holland), and Prof. LANGEVIN (Paris). Sir ERNEST RUTHERFORD presided. Sir JOSEPH'S work is so well known to readers of THE ELECTRICIAN that it is unnecessary to state it in general terms. To particularise would require a volume. It is sufficient to say that in the course of some forty years he has revolutionised scientific thought and as those who listened to his Kelvin lecture before the Institution of Electrical Engineers must have realised that breaking down of barriers is still going on. Sir JOSEPH, however, has not only been a worker, but an inspirer. He has cleared the ground for others to open up and till, and good use has been made of the opportunity. We hope he will long be spared to wear the laurels he has so well earned.

High Tension Distribution.

FORTHCOMING events lent an added interest to the description given by Col. E. MERCIER at the Institution of Electrical Engineers last week of the 60 000 V network used for supplying Paris; and this interest was also evidenced in the discussion. The network forms a ring round the city of Paris and is tapped at a limited number of points to supply amounts of power ranging from 15 000 to 50 000 kVA. It has been in operation over three years and is now quite satisfactory. We, however, share the view expressed by Capt. DUNSHEATH that the Paper would have been more valuable had it contained an account of the failures as well as of the successes and we support his suggestion that an appendix should be added giving information as to how the cable has failed. The discussion mainly ranged round the interesting question of the relative merits of single core and three-core cables for this class of work. It was generally admitted that there was a voltage limit above which it would be inadvisable to use three-core cables, but opinions differed as to what that limit was. Mr. VERNIER said that the experience on the North East Coast was that three-core cable of the ordinary type could not be used for 66 000 V, though single core cable even in series with an overhead line had proved quite satisfactory. Mr. C. J. BEAVER remarked that the tendency nowadays was to reduce the voltage at which three-core cables could be used to 33 000 V, while on the other hand Mr. N. A. ALLEN put in a good word for three-core cable. Capt. P. DUNSHEATH was quite definite that a 66 000 V three-core cable was impossible for long service and Mr. G. H. NASH wished to remove that overworked adjective from the cablemakers' dictionary. This difference of opinion is, however, all to the good and will ensure that the whole question is thoroughly investigated.

Telegraph Finance.

THE second report of the Select Committee on Public Accounts, which was published by the Stationery Office last week, refers to the losses on the telegraph service during 1925. This amounted to £1 645 000, while in the two preceding years the loss was over £1 250 000. This is largely due to the competition of the telephone, but during 1922–23 there was a loss of £360 000 on Press telegrams, and the annual loss on this class of work is still estimated at £230 000. The comment on the position made by the Committee is that it "should not be allowed to continue." The Press generally would, of course, strenuously resist any attempts to increase the charge for Press telegrams, but as on this matter a weekly journal like our own can assume a more or less detached position, it may be pointed out that the result criticised is due not only to the fact that the Press rate does not pay, but that newspapers are finding the telephone an easier and more efficient means of communication. One way out of the difficulty seems to be to encourage the greater use of the telephone, and thus to make up on the swings what has been lost on the roundabouts. Another way would be to stimulate the wider employment of printing telegraphs for private work, say between offices in London and factories in the country, on the lines laid down by Mr. DONALD MURRAY in the Paper which he read before the Institution of Electrical Engineers last year.

Farewell to the B.B. Company.

LAST week the PRIME MINISTER pronounced a valedictory address over the expiring body of the British Broadcasting Co., a body which is to arise from its ashes on January 1st as a rejuvenated and, we hope, improved organisation in the form of the British Broadcasting Corporation. In doing so he paid a tribute, in which we may be allowed to join, to the "distinguished, anonymous, obscure people who have created broadcasting in these islands." He rightly called attention to the potential danger which followed from placing the powers of science into the hands of the million, and remarked that though in the case of the war, and in a less degree the cinematograph, these powers had been often unwisely and even disastrously used, in the case of broadcasting things had been very different, and that the wonderful development that had taken place had always been controlled by the highest motives. In four

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years wonderful (using the word in its almost forgotten literal sense) progress had been made, which if ever broadcasting was justified it was during the general strike, when a grave risk of nation-wide panic was dispersed by the news disseminated from 2LO. What has been done is, as the PRIME MINISTER rightly said, a testimonial to the youth of the country, for not only is broadcasting young in itself, but its progress has been largely due to the work of young men. We are glad therefore to learn from LORD CLARENDON that the new board fully realises the great responsibility that rests on their shoulders. If they never forget it, all will be well.

International Electrical Transmission.

WE have from time to time given details of the various schemes that have been propounded for supplying power from Sweden and Norway countries, where there are, of course, very large water resources, to Denmark, where, like Great Britain, water power is conspicuous by its absence. It may not, however, generally be known that for ten years the South Sweden Power Co. has supplied electricity to Copenhagen over a 25 000 V cable, which is laid in Oresund. This supply has recently been extended by laying a second cable, which operates at 50 000 V. On the other hand the scheme for supply of power on a large scale from Norway and Sweden to Denmark, has broken down, at least temporarily, though Mr. BORQUIST of the Swedish Royal Water Falls Commission, who was a member of the Joint Committee which investigated the question, informs us that the work of that body was not entirely wasted, as it has led to the complete reorganisation of the Danish power system. Danish engineers have, in fact, recognised the importance of regulating their internal distribution in a uniform and rational manner. This is an important preliminary to the economical import of power and will enable surplus power from Southern Sweden to be efficiently utilised. Mr. BORQUIST, dealing with the larger scheme, points out that one of the difficulties in exporting power to Denmark is that water must be traversed by either overhead lines or cables. For this purpose a pressure of 50 000 V is too low. But considering the rapid advances in the manufacture of high tension cables, it is not at all improbable that within a few years it will be possible to use 132 000 V cables across the Sound. He is therefore in disagreement with certain of the speakers in the Institution discussion last week. Already this voltage is being employed on the Swedish "grid." If this is a correct forecast, in time Sweden, Norway and Denmark will be linked in one power system.

The "Wilkinson" Thermal Storage Device.

ON another page of this issue we give some details of a thermal storage device comprising some interesting features. It is due to Mr. GEORGE WILKINSON, of Harrogate, and its purpose is not only to heat one of the living rooms but to provide a hot water supply for the house. This combination of duties, using a coal fire as the heating agent, has for long been adopted in many dwellings that have been built within recent years. The apparatus consists of a 50 gall. steel tank, the surface of the water being covered with oil to prevent evaporation and oxidisation. The temperature of the water is controlled by a thermostat, and the heater also provides hot air for warming the room with the assistance of a fan. Charging, when this equipment is used, is on the WILKINSON alternative system, so that demand is constant throughout the twenty-four hours. When cooking and heating apparatus is in use the thermal storage equipment is cut off so that it consumes no current except during bed-time hours. An interesting addition is a submerged copper cylinder which heats water for kitchen and bathroom purposes. The device merits close investigation with a view to its further employment. It seems to give an opportunity not only of providing the domestic hot water supply at a cheap rate, but of heating one at least of the rooms in a house on very economical lines.

Television Progress.

THE term television is used in two senses. One, wrongly, when it is applied to the wireless transmission of photographs and the other, rightly, when it is employed to describe the transmission of animate or inanimate images to a distance without the intervention of a photographic plate. In this latter field the outstanding worker is Mr. J. L. BAIRD, the details of whose apparatus has more than once been described in THE ELECTRICIAN. It has been improved in many ways since its inception, the principal change being to reduce the intensity of the illumination required on the object. In fact, so powerful was this light originally that it was dangerous to submit the head or face to its radiation for any length of time. Mr. BAIRD has now, however, made the surprising discovery that intensive light illumination is not necessary for television and indeed that good results can be obtained by employing non-luminous infra-red rays. In his latest apparatus, therefore, he interposes a non-translucent screen between the lamps and the object for transmission, leaving the latter bathed in the invisible rays passing through the screen. This acts as a filter and allows the passage of the infra-red end of the spectrum, but cuts off all the visible rays. That rays pass is proved by the reproduction of the image on the screen of the receiving apparatus, and so effective are they that good results are obtained when the subject is in complete darkness. Though the apparatus is still in the experimental stage the discovery opens up enormous possibilities the realisation of which we shall watch with interest.

City of London Arithmetic.

MR. J. B. BRAITHWAITE made some curious arithmetical calculations at the annual general meeting of the City of London Electric Lighting Co. last week. During the year under review the proceeds of the sale of current amounted to £750 271 as against £743 853 in the year before, but this small increase was due to a reduction in the price. If no reduction had been made the increased income would have been £87 000. In fact, in 1924 the Company had given £495 000 away to consumers and had added £87 000 to that sum in 1925. In other words, they would have been £582 000 better off if they had not reduced the price of current. We do not wish to teach Mr. BRAITHWAITE his business and it is quite possible that his deductions are correct. For it must be remembered that the City of London is a curious place, nor must it be not forgotten that in other places a reduction in price has been followed by an increase in revenue. In the City electricity is still mainly used for lighting and must be used for that purpose, but more attention should be paid to its other uses. There are still too many offices where gas is employed for making the harmless, if necessary, afternoon tea, and a number of restaurants where intensive propaganda, and a suitable propaganda, would lead to a greater use of electricity for cooking purposes.

Christmas Fiction.

FOR fifty-one weeks in the year the contents of this journal are mainly of a serious nature, but our decision last year to indulge in a little Christmas story-telling met with such general approbation, that we have been tempted to serve up another "Christmas Number" which will be found on pages 734 to 737 of this issue. The contents include two electrical stories, specially devised for the diversion of electrical men and women at Christmastide, though it should in fairness be pointed out that each of these offerings carries a sting in its tale. Then there is a short disquisition, with poetical trimmings, the purpose of which, in so far as it has any, is to show that, on Christmas Day at least, the shift engineer's lot is not a happy one. Possibly this sympathetic reference will do something to mitigate the hardships of Christmas not only in power stations, but also in houses, hotels, boarding houses, workhouses, and other places where electrical men congregate at this season. In any event we hope we may be for given, especially when it is remembered, that even Prime Ministers do not disdain paper caps at this season.

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DETERMINATION OF ROTATIONAL VELOCITIES.

Some Applications of the Chronograph in the Case of Variable Speeds—Details of Apparatus Used—Methods of Employment.

By PERRY A. BORDEN, A.M.E.I.C., Memb.A.I.E.E.*

LITTLE difficulty attends the determination of average speeds of rotating machinery over considerable periods of time; and in long-continued tests, such as heat runs, and water-rate tests on generators, the mean velocities may usually

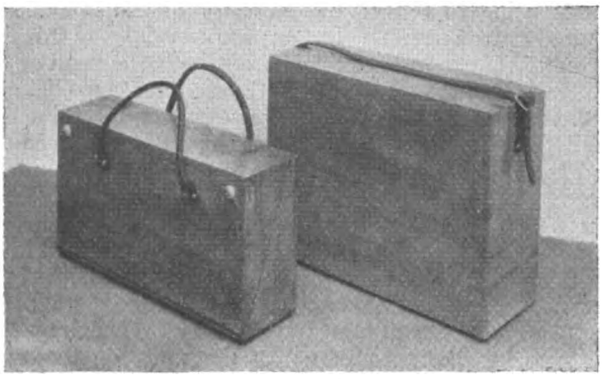

Fig. 1.—Apparatus packed for transportation.

be obtained to a sufficient degree of precision with comparative ease. There are, however, a number of tests which require that the speed of the unit under investigation be varying, and the important observations made while this variation is in progress, the law of change being a controlling factor in the final results. Among these may be mentioned hydraulic turbine studies, governor investigations, and the determination of no-load losses of electrical machinery by retardation tests. Various forms of centrifugal, fluid, magnetic and electrical tachometers have been developed; and they, when properly used, are capable of great precision; but when there arises the necessity of reading and recording rotational velocities while these are undergoing change, most of such devices suffer from various handicaps, the principal being perhaps the inertia of the instrument mechanism or of the recording apparatus.

With these difficulties in view, and with particular attention to conditions met in the field, there was undertaken the application of the chronograph to such measurements. The apparatus available (see Fig. 2) included a Cambridge three-pen strip chronograph, a set of tuning forks of various frequencies, together with the electrical accessories for their operation, a "phonic wheel" and a variable speed drive for the chrono-

Fig. 2.—Chronograph and tuning-fork apparatus set up for test.

graph. The latter instrument is of the type which makes its record upon a continuous strip of paper instead of a sheet such as is used in the larger and more precise astronomical and meteorological chronographs. Three pens trace their respective lines side by side on the tape, each being under control of an electromagnet, which, when energised, introduces an offset in its particular line. Since one pen may be used to record standard time impulses there is no need of precise speed regulation; and the paper may be driven by any convenient motor. In the outfit used, a small 110 V universal motor was mounted on a stand with a worm reducing gear; and, by the use of interchangeable pulleys of various groove radii, it was made possible to obtain a very wide range of tape speeds.

In the laboratory standard time intervals are usually obtainable from a clock with a seconds pendulum controlling an electrical circuit; but as the device described was designed primarily for power-house work, and as a variety of time values was desirable, the tuning fork was adopted, as the most convenient portable source of standard time spacings consistent with reasonable precision.† The type of fork employed vibrates in a vertical plane, action being maintained by a small solenoid between the prongs. The original contacting device consisted in a platinum-tipped wire dipping into mercury. While this was found sufficiently positive to maintain the fork in continuous action, it was not satisfactory for driving the phonic wheel; and a solid metal contact of great resiliency was developed to meet this more exacting demand.

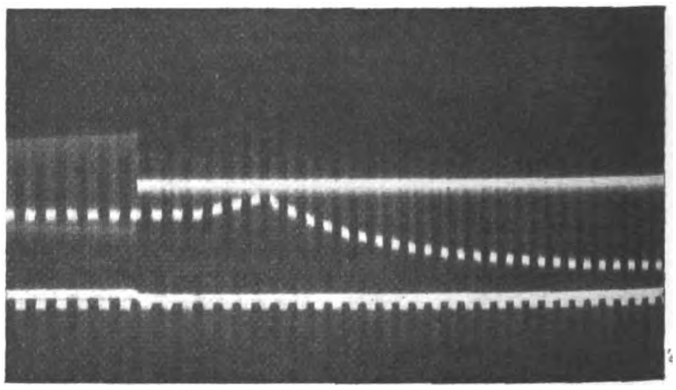

Fig. 3.—Oscillographic record of turbine speed and gate opening.

The phonic wheel is a small disc of soft iron, having a number of radial poles upon its periphery, free to revolve within the field of an electromagnet in series with the control magnet of the fork. With proper values of current, the wheel, once set in motion at the proper velocity, falls into step with the pulsating flux and runs as a synchronous motor. Geared to the phonic wheel is a contactor which closes a circuit at intervals determined by the velocity of the wheel, and therefore by the vibrational speed of the tuning fork, thus giving a simple means of reducing the rather high frequency of the fork to equally accurate time intervals, suitable for recording upon the chronograph. The standard arrangement provides for one contact per second, when a fork having a period of 50 vibrations per second is used. As the most important machines upon which this outfit was to be used had a standard velocity of 187½ revs. per min., a special pair of gears was cut, giving contacts at this frequency, when used in conjunction with the 100 vibration fork. When the apparatus was used on the machines referred to, these gears were employed, but with units having other standard velocities the original gearing was usually replaced.

The whole apparatus was made reasonably portable by being fitted into convenient carrying cases shown in Fig. 1. The larger case, provided with sliding covers, has two main compartments, one for the chronograph and the other for the motor and reducing gear. A small compartment is provided for ink, spare gears and other small accessories. In the other case are permanently mounted the tuning fork stand and the phonic wheel, as well as the four dry cells, which serve not only to drive the fork and the wheel but to supply current for

* Hydro-Electric Power Commission Laboratories, Toronto, Ontario.

† Dadourain, H. M.: On the Characteristics of Electrically Operated Tuning Forks. "Phys. Review." (2) xiii (1919), 327.

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operating the three pens of the chronograph. A complete wiring diagram of the fork and phonic wheel circuits is shown in Fig. 4.

The revolutions of the machine under test are counted on one of the pens of the chronograph by means of a contacting device attached directly to the shaft of the unit. While any simple form of contactor would serve to accomplish this purpose, the type shown in Fig. 2 (right) has given great satisfaction in service. This consists of a brass disc with alternate quadrants depressed, fitted with an arm which carries a steel brush contacting with the raised quadrants. The disc is secured to the end of the shaft of the machine by means of three set screws; and the arm, with its brush, is restrained from rotating by engagement with some fixed part of the machine, or, in the case of horizontal shaft units, by being permitted to hang freely without oscillating. This arrangement was found readily adaptable to a variety of types of generator units. With such a contact the circuit is opened and closed for alternate quarter-revolutions, giving a very distinct type of line on the tape, as will be seen from the records illustrated in Fig. 5.

The third pen of the chronograph is free to be used for signals transmitted by an observer at any desired time in the test—i.e., when the frequency meter or the voltmeter passes through certain predetermined values—thus tying the chronograph record in with other records made during the test. Or this pen may be electrically connected to certain relays or circuit breakers in the system, giving on the tape a positive record of the instant of their operation.

There are a number of ways of reading the chronograph tapes; and the choice among these must to some degree depend upon the type of test and upon the relative periodicity of the respective sets of contacts. Where the standard time is expressed in terms of standard revolutions, as where $187\frac{1}{2}$ contacts-per-minute gears are used in conjunction with a machine, of which that is the standard speed, the process becomes very simple; as it is necessary only to select suitable groups of "ticks" on the tape, and compare their spacing on the two lines, when the mean velocity for that interval may be read directly in per cent. of the normal speed. For instance, on such a tape we may select, say, a group of ten actual revolutions, as counted off from the ticks; and, by measurement on the time line, determine that these were accomplished in the time of 10·62 standard revolutions, from which it is immediately seen that the average velocity of the unit for that interval was 6·2 per cent. slow. The process to be followed where the gearing is arranged to beat seconds or half seconds is so similar as to need no further elucidation. Referring to Fig. 5, wherein are shown portions of actual records obtained in retardation tests, and reading from tape "A," we find that the unit under test made 59 revolutions in the time of 86 standard revolutions, showing that for the individual time interval chosen, the mean speed of the machine was 31·4 per cent. slow, or 128·7 revs. per min. Again, on tape "B," which is from a generator whose normal running speed is 500 revs. per min., we find that 202 complete revolutions were accomplished in a time of 31 secs., giving a mean velocity of 391 revs. per min. for that period. Other intervals, either overlapping or not, according to the degree of precision required, may then be selected, and the average speed during each period determined, from which may be plotted the complete velocity-time curve of the machine during the test. The closeness with which it is necessary to select the intervals of time will depend upon the amount of speed variation taking place during the period of observation; and as soon as the law governing the accelerations during a particular type of test becomes known, the number of determinations may be greatly lessened. In retardation tests, where the machine is simply allowed to die down from synchronous speed, a few observations are usually sufficient to establish the characteristics; but in turbine tests or studies of governor performance it often becomes desirable that the readings be made close together on the tape.

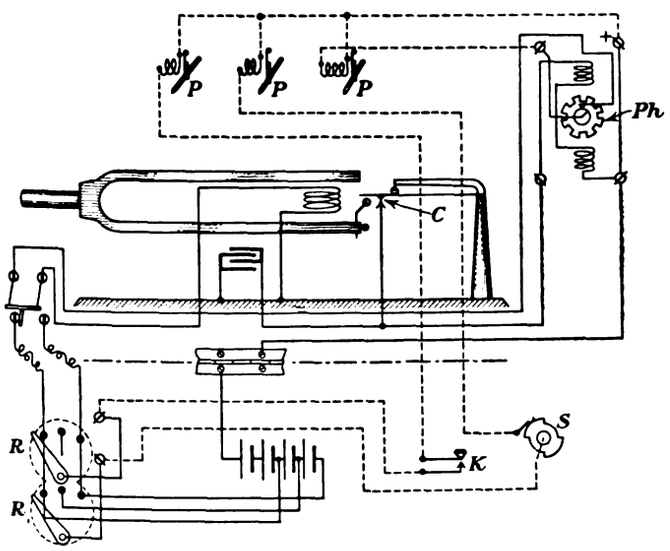

Fig. 4.—Wiring diagram, tuning fork and chronograph circuits.
(Lines to chronograph shown dotted.)

C.....Fork contacts.	K.....Signal key.
Ph.....Phonic wheel.	S.....Shaft contact.
P, P, P...Chronograph pens.	R, R.....Regulating switches.

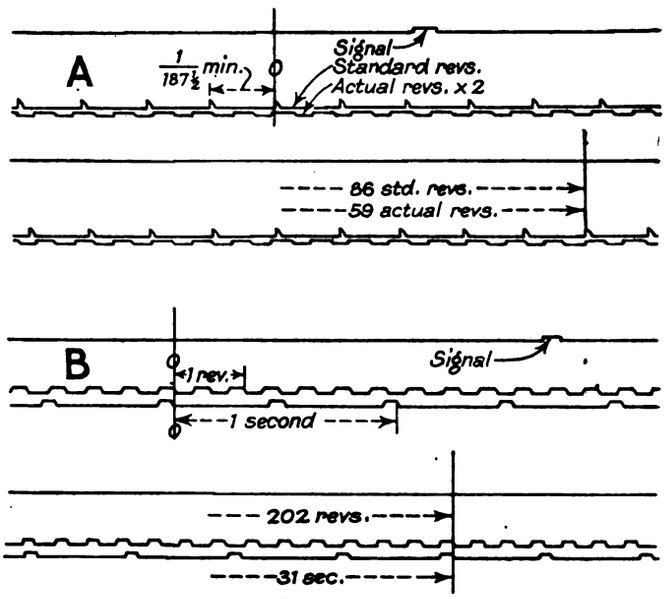

Fig. 5.—Typical tapes from retardation tests.

An interesting modification of the method of speed measurement described above is found in the following instance, where, in tests on the performance of an automatic hydro-electric station, there was available a complete oscillographic equipment, as well as the chronograph and tuning fork. On one vibrator of the oscillograph were recorded simultaneously gate-opening, revolutions and standard time intervals. A circuit was made up, energising the vibrator from a battery of a few dry cells through a rheostat mechanically connected to the gate of the turbine. Thus the deflection of the spot was made representative of the amount of gate-opening. In series with this circuit was placed the contacting device usually employed with the chronograph, thus interrupting the current twice for each revolution of the generator, and giving zero indications on the oscillograph. A voltage derived from a small transformer placed in series with the operating current of the tuning fork was applied to a resistance in the oscillograph circuit, thus superimposing upon the line a ripple of a standard frequency, and positively establishing the time duration of each element of the test. A typical oscillogram obtained with this arrangement is shown in Fig. 3. Here the gate-opening of the turbine is represented by the height of the broken line above its zero, while the half-revolutions of the machine are indicated by the breaks in the line. Fiftieths of a second, as derived from the tuning fork, are traceable as a ripple appearing throughout the line, and easily countable on the original film.

Conclusions.

1. The portable chronograph forms an ideal means of counting and recording machine revolutions and other occurrences of importance in the testing of moving machinery.

2. The electrically maintained tuning fork, when combined with a phonic wheel, furnishes an accurate measure of standard time intervals, which may be recorded upon the chronograph.

3. The accuracy of the timing device may be checked and permanently recorded against any standard timing circuit,

(*Concluded on page* 730).

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ELECTRICITY SUPPLY IN PARIS.*

The 60 000 V Underground Network of the Union d'Électricité—Details of Cables and Cable Fittings.

By Col. E. MERCIER.

THE distribution network of the Union d'Electricité which has been in operation since April, 1922, is at present supplied by the new steam-driven station of Gennevilliers (capacity 360 000 kVA) and the old steam-driven station of Vitry, now completely modernised (present capacity 80 000 kVA). These two stations will shortly be connected to the hydro-electric station, under construction at Eguzon on the River Creuse, in which 40 000 kW is being installed.

The network forms a ring round the city of Paris (see Fig. 1), and is designed to supply, at a limited number of points, amounts of power ranging from 15 000 to 50 000 kVA. The power stations being at distances of about 30 km. from the feeding points, it was necessary to adopt high-tension transmission. But as the Paris suburban districts traversed are entirely built over, the use of overhead lines was out of the question, and the highest voltage possible with underground cables, i.e., 60 000 V at 50 V, was adopted. At the time when this voltage was selected it was everywhere considered by engineers to be extremely high, and it was only employed after very careful laboratory researches extending over a period of two years.

The network has been in operation for over three years, and at present comprises 220 km. of three-phase feeders (equivalent to 660 km. of single cables) and more than 2 500 junction boxes. In winter, nearly 2 million kWh are transmitted daily under conditions which are now quite satisfactory from the point of view of reliability.

At the time when it was decided to lay the first feeders, three-core cables with equipotential surfaces were not available. The company had therefore to choose between armoured three-core cables of the ordinary type and lead-sheathed single cables. Ultimately the idea of using three-core cables was abandoned because they did not provide a sufficient margin of safety or an adequate overload capacity.

In the construction of three-core cables there is a heterogenous layer, from which it is almost impossible to eliminate all the air. This becomes a partial conductor when ionised. From the standpoint of temperature rise the ordinary three-core cable is also inferior to single cables of similar cross section.

Experience has shown that the current-carrying capacity of a 60 000 V three-core cable is much too low to justify its use in practice.

The principal dimensions of the single cables employed are as follows:

Sectional area of copper conductor	=	150 sq. mm.
Thickness of dielectric	=	14 mm.
Thickness of lead sheath	=	2·5 mm.

This cable cannot, of course, be protected by an iron tape as in the case of three-core cables, as the energy losses in the armouring would be excessive. The cable is made in 250 metre lengths, and the maximum potential gradient of the dielectric is about 4 250 V per mm. at the normal voltage.

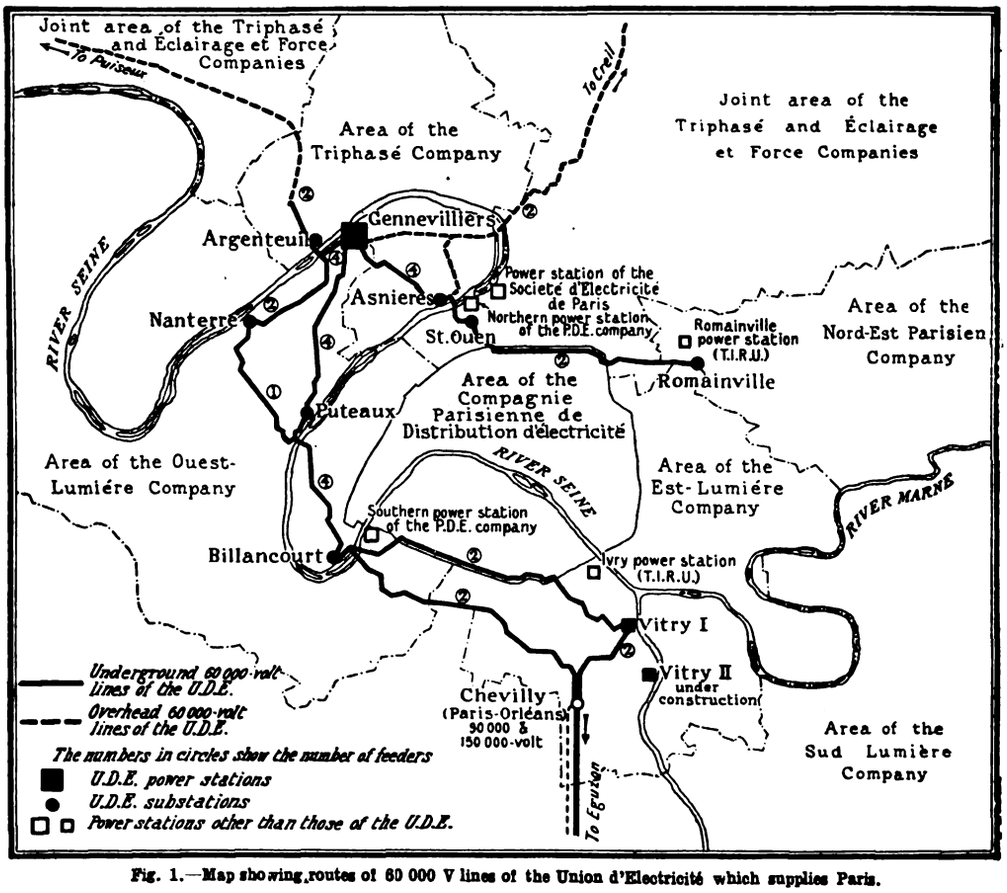
Joint area of the Triphasé and Éclairage et Force Companies
To Puiseux
To Creil
Area of the Triphasé Company
Joint area of the Triphasé and Éclairage et Force Companies
Gennevilliers
Argenteuil
Asnières
Power station of the Société d'Électricité de Paris
Northern power station of the P.D.E. company
Nanterre
St. Ouen
Romainville power station (T.I.R.U.)
Area of the Nord-Est Parisien Company
RIVER SEINE
Romainville
Area of the Compagnie Parisienne de Distribution d'électricité
Puteaux
Area of the Ouest-Lumière Company
RIVER SEINE
Area of the Est-Lumière Company
RIVER MARNE
Southern power station of the P.D.E. company
Billancourt
Ivry power station (T.I.R.U.)
Vitry I
Vitry II under construction
Chevilly (Paris-Orléans) 90 000 & 150 000-volt
Area of the Sud Lumière Company
To Eguzon
Underground 60 000-volt lines of the U.D.E.
Overhead 60 000-volt lines of the U.D.E.
The numbers in circles show the number of feeders
U.D.E. power stations
U.D.E. substations
Power stations other than those of the U.D.E.

Fig. 1.—Map showing routes of 60 000 V lines of the Union d'Electricité which supplies Paris.

Fig. 2 shows the dielectric losses for such a cable as a function of the potential difference between the copper and the lead. The curve connecting kilovolts and dielectric loss is very nearly a straight line up to the maximum voltage (about 20 000 V) used in the test, and indicates that the ionisation stage has not yet been reached.

The normal working voltage being $60\,000/\sqrt{3}$, i.e., 34 600 V, it is evident that, as far as the dielectric is concerned, the cable is operating under excellent conditions.

At the normal working temperature of the cable the dielectric losses are smaller than when the cable is cold. This result alone shows that the working temperature of the cable is below 45 deg. C. It is known that for a given voltage the dielectric losses at first decrease slowly as the temperature rises, are a minimum at 40 deg. C., and then rise rapidly with the temperature. At 45 deg. C. they have about the same value as at 15 deg. C.

In addition to the losses in the dielectric and the I^2R copper losses, there are in single cables energy losses due to currents induced in the lead sheath. These currents are of two kinds:

(1) Eddy currents induced circumferentially in the lead sheath by the magnetic field of the cable. The resistance of

* Abstract of a Paper read before the Institution of Electrical Engineers.

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the circuit in which these currents flow does not exceed 1 microhm per km. length of cable.

(2) Circulating currents which are induced by the magnetic field set up by the current in the conductor and which flow to earth at each junction box. In order to reduce appreciably the circulating currents it is necessary to decrease the resultant magnetic field of the currents in the three conductors and, for this purpose, to bring all the cables as close together as possible. The three single cables comprising a feeder should therefore be arranged at the corners of an equilateral triangle. Tests made on different feeders show that the increase in the line losses due to eddy currents and circulating currents is equivalent to about 10 per cent. of the copper losses. On the other hand, the loss due to wattless current is decreased in the same proportion.

Numerous tests have been made to ascertain the temperature rise of the copper conductor relatively to the soil, with the cables laid under normal conditions. Fig. 3 shows the working temperature of one cable as a function of the current. It will be seen that with 300 A, i.e., a current density of 2 A per sq. mm., the temperature-rise does not reach 26 deg. C., so that even if it is assumed that the temperature of the soil may be as high as 18 deg. C., the temperature of the cable will not reach 45 deg. C. From numerous investigations it would also appear that the temperature of the dielectric of these cables does not exceed 50 deg. C. in these conditions. We may therefore regard 300 A as the normal rating of these cables, so that their carrying capacity is 31 000 kVA.

Assuming the temperature of the soil to be 10 deg. C., it is found that a cable having a normal carrying capacity of 300 A can carry 600 A for 15 min. without its temperature exceeding 50 deg. C.

The junction boxes must of course be made of a metal having non-magnetic properties, and, for reasons of convenience and economy, lead has been chosen. Each box is soldered to the sheath of each cable entering it, thus ensuring not only complete watertightness but also continuity of the lead. They are filled with compound in the same way as ordinary joint boxes, but their dimensions are such that the potential gradient across the dielectric is lower than that required for ionisation. Each box is earthed to a copper tube 50 mm. in diameter and 1 metre in length driven into the soil.

In practice these boxes have been found to be the least reliable part of the circuit, although the number of breakdowns is really very small in comparison with the number of junction boxes installed. The company have nevertheless been experimenting for some time with a new type of box in which the joint is insulated with impregnated paper, the compound serving merely as a mechanical protection.

Before any cable is laid, the following pressure tests are carried out at the maker's works :—

(1) Twice the working pressure, i.e., 70 000 V between the copper conductor and the lead, for 1 hour.

(2) Three times the working pressure, i.e., approximately 110 000 V for 5 min.

The frequency of the supply pressure is 50 in each test.

Tests for dielectric losses are not specified, as although such tests are of value to the manufacturer for ensuring

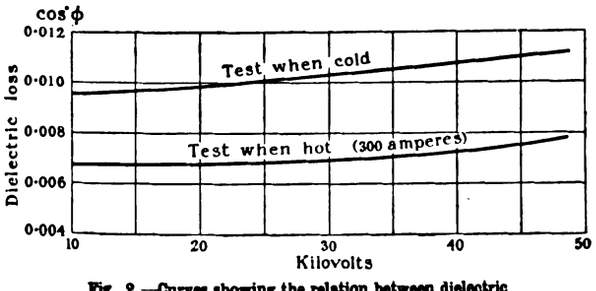

Fig. 2.—Curves showing the relation between dielectric loss and voltage.

uniformity in his cables, or for carrying out special researches, they are not yet a sufficient criterion to estimate the quality of a cable.

As it is not possible, for the reasons already indicated, to provide single cables with an iron sheath; they are rather liable to be damaged. For that reason, they must be placed in troughs to give them mechanical protection. These troughs, which are of reinforced concrete, are U-shaped. The cables automatically arrange themselves so that the lines joining their centres form an equilateral triangle, and they are covered with sand in order to dissipate the heat more effectively. In laying the cable, which is done manually in the majority of positions, it is necessary, in order to prevent the cable from being damaged, to take care that it is subjected to a steady pull. In awkward positions, however, recourse has to be had to mechanical means, the cable being suspended from a steel cable which is pulled by means of a winch.

Where the cable has to pass round a very sharp bend, steps are taken to ensure that the radius of curvature is not less than 1 metre and to strain as short a length of cable as possible, junction boxes being installed, if necessary, at the start and finish of the sharp bend. The junction boxes are protected by brickwork.

As an experiment, the Union d'Electricité is at present

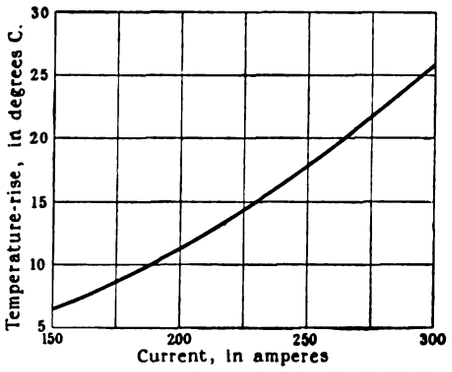

Fig. 3.—Curve showing the temperature rise of a 60 000 V cable as a function of the current.

laying a few lengths of 60 000 V three-core cable of a new type. The cable consists of three insulated cores, over which is wrapped a layer of metallic paper which constitutes an electrostatic screen throughout the whole length of the cable. A lead sheath encloses the whole and is itself protected by iron armouring in the usual way. The cross-section of each conductor is 150 sq. m., and the overall diameter of the cable is 108 mm.

From the electrical point of view the cable operates under the same conditions as single cables with a radial field and an equivalent potential gradient. Tests have shown that, from the thermal point of view, as a result of its high thermal conductivity, the metallic paper provides a sufficient path for dissipating the heat generated in the centre of the cable, and that with this new type of cable the same current densities can be employed as in single cables. It has, moreover, the advantage over single cables of being less liable to injury and of rendering it unnecessary to use special troughs. In addition, the extra losses due to currents in the lead sheath are completely eliminated.

On the other hand, this type of cable has several disadvantages. In the first place, even after allowing for the troughs and the laying, it is more expensive than single cables, and the interest on the extra capital outlay is greater than the cost of the additional losses with single cables.

Another serious drawback is the junction boxes, which are cumbersome, expensive and complicated. In particular, the repairing of a fault, which involves the dismantling and rebuilding of two junction boxes, puts the cable out of operation for a considerable time, a feature which is very inconvenient in the operation of a supply undertaking.

Several investigations of pressure-rises and surges affecting the working of the system have been carried out and the results have already been published.

The wave-form of the turbo-alternators at Gennevilliers and Vitry is almost sinusoidal, and any tendency of the harmonics to become serious would be taken care of by the magnetic saturation of the step-up and step-down transformers.

Apart from this, investigations have shown that the risk of pressure-rises due to resonance of the harmonics in the wave forms of the alternators can be entirely disregarded, notwithstanding the very unfavourable conditions which exist in the system.

Investigations have also been carried out on the surges which accompany the sudden switching in and out of cables. These investigations have proved that the sudden application of pressure causes a surge which in the most unfavourable case may reach twice the normal pressure, whilst the sudden disconnection of a cable may subject it to three times the working pressure.

The Gennevilliers station is provided with a special motor-

(Concluded on page 730.)

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WILKINSON THERMAL STORAGE DEVICE.

Interesting Equipment on View at Harrogate—Taking Advantage of Cheap Night Current.

THE "All-Electric House," which is now open at 4, The Esplanade, Harrogate, is well equipped with a representative display of the latest lighting, heating and cooking apparatus. The principal novelty is, however, the electric thermal storage system (invented by Mr. George Wilkinson) for automatically heating the dining room and providing the hot water supply for the house. The accompanying photograph is a view in this room, which shows a sort of sideboard on the right harmonising with the furniture but containing the thermal storage apparatus.

We also publish a sectional drawing of the apparatus, the panels of which are of brown cork. The left-hand panel contains a thermometer which shows the temperature of the water. The apparatus holds 50 gall. in a rectangular steel tank, the surface of the water being covered with oil to prevent evaporation and oxidisation of the tank. The water temperature in the tank is controlled by a metal thermostat located in the base which cuts off the heating current just below boiling point. The fan which propels the air through the heater is supplied with current from the lighting circuit and takes about 40 W. The fan is started and stopped automatically by a thermostat in the room which maintains equity of temperature and prevents waste of heat.

Under normal conditions the storage heater is on an alternative circuit to the ground floor heating and cooking circuit, and when the circuit is broken at night as indicated by the pilot light, the operation automatically puts on the thermal storage circuit.

Conversely when the maid gets up in a morning and puts on the heating and cooking circuit, the thermal storage circuit is broken. This ensures that no current is taken by the thermal storage apparatus except during bed-time hours.

In cases where an abnormal amount of water may be required a switch is provided so that the apparatus can at any time be supplied from the heating and cooking circuit at the cooking rate during the day.

Inasmuch as this apparatus normally takes current during bed-time hours only it can be supplied with electricity at coal cost only plus a reasonable profit. Thus the operation is quite competitive with coal or gas for heating, and much more convenient and safe. In addition there is a submerged copper cylinder which heats the water for kitchen and bathroom purposes.

This method of room heating and hot water supply should have wide application for flats, as it is cheaper and safer than the well-known fire back boiler and copper cylinder arrangement and has the outstanding advantage of being entirely automatic. Minus the submerged copper cylinder, the apparatus is exceedingly simple and a future is contemplated for the apparatus for the heating of churches, public halls and the like. The required heat will be accumulated in the night hours and quickly transferred therefrom by silent running fans to the building, say an hour or an hour and a half before the service or meeting is held. Thus the enormous radiation losses common to present-day methods are avoided with consequent substantial gain in economy.

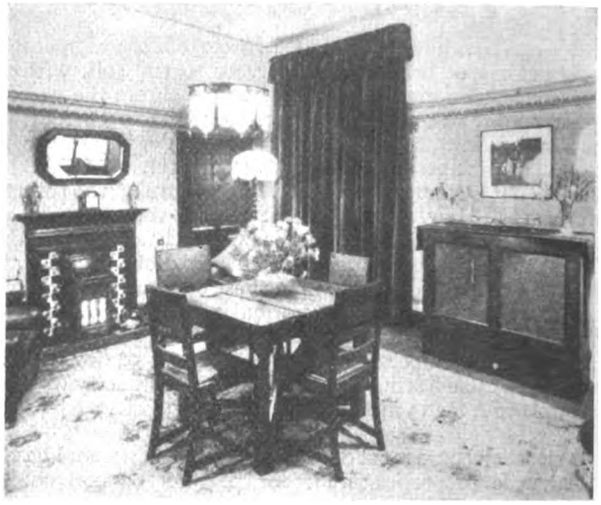

Fig. 2.—Harrogate all-electric house: Dining-room showing the electric thermal storage cabinet on the right.

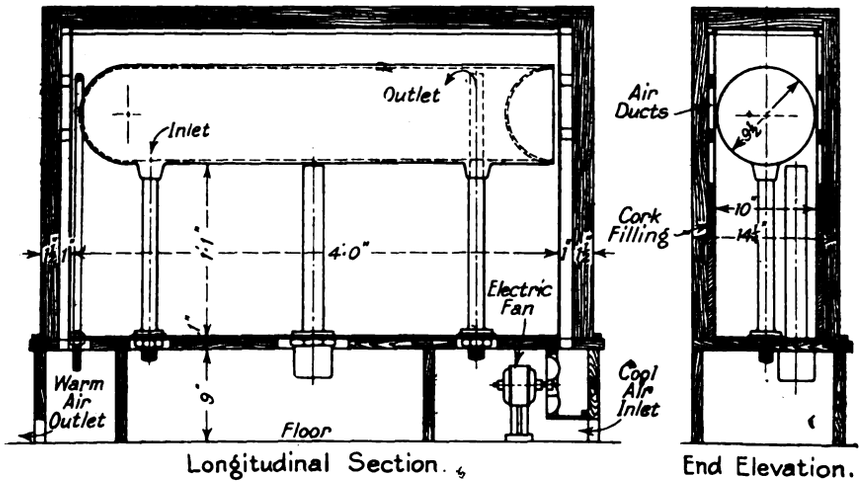

Fig. 1.—Diagram of Wilkinson thermal storage device.

Super Tension Cables.

Interesting Siemens Design.

THE policy of interconnection of which we have recently heard so much naturally predicates the increasing employment of cables suitable for high transmission pressures. The issue of a pamphlet by Siemens Brothers and Co. on their H type super-tension cables is therefore opportune. The ordinary three-phase cable, as is well known, consists of three paper insulated conductors which are twisted together and made up into a cylindrical shape by filling up the four wedged shaped cavities with impregnated jute or paper.

Over this cylinder is wound a belt of paper over which in turn is placed the lead sheath. In the H cable, on the other hand, the belt is omitted, its place being taken by an increased thickness of core insulation over which a thin metal foil is wound. This design obviates the tendency to carbonisation which, as pointed out by Höchstädter in THE ELECTRICIAN, occurs in the ordinary cables under high tensions and avoids both the overstressing of the core insulation owing to the breakdown of the belt, and ionisation phenomena. In the H cable the lines of force are everywhere radial to the conductors so that there are no tangential stresses and the equipotential lines are circles concentric to the conductors. Both sets of lines are confined to the paper and do not change their shape. There is no stress in the filling so that ionisation does not occur. The metal foil has the further effect of shortening the heat path so that the current carrying capacity of the cable is increased. The power factor is nearly independent of the voltage.

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SUB-STATION DEVELOPMENTS.

An Important Matter for the Future—Some Details of G.E.C. Designs—Reduction in Cost an Important Feature.

AT the present moment numerous extensions of electricity supply into rural districts are taking place, and their number may be expected to increase in the near future. They represent only a small proportion of the facilities required by consumers of electricity. The supply undertakings in their desire to meet their clients' requirements are faced with many serious difficulties, the principal of these being the high capital cost of enlarging their networks. One of the most important items of capital cost is that of the sub-stations, in which the high tension supply is transformed to low tension for local requirements. Until quite recently sub-stations were constructed almost entirely of brickwork, but in fairly remote and inaccessible districts the high cost of obtaining labour and transporting the material made this type of construction uneconomical.

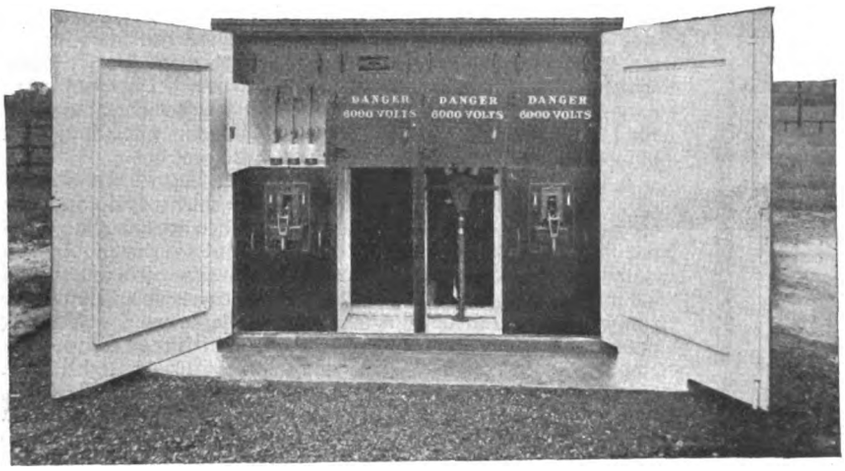

Fig. 1.—High-tension side of G.E.C. kiosk sub-station with door of isolating chamber open to show interior.

Steel plate kiosk sub-stations have been introduced to overcome the difficulty of high expenditure, and among the first to manufacture these sub-stations was the General Electric Co.

G.E.C. kiosk sub-stations have been supplied to a number of supply authorities and contain a number of outstanding features which ensures their efficient working in the most exposed positions. The equipment of such sub-stations generally consists of high tension switchgear, transformers and low tension switchgear, the maximum capacity being 200 kVA for voltages not exceeding 11 000 V. Their reduced cost is due both to a saving on the brickwork and the reduction in the superficial area which is possible. For a kiosk requires only half the space needed for a brickwork sub-station of similar output and a concrete slab is the only foundation required.

Owing to the reduction in cost, it is possible to install a larger number of sub-stations. This enables further economics to be effected, as high tension cables with smaller section of copper conductors can be laid to a larger number of points, and replace the heavier cables required by low tension transmission lines

Another important advantage of the steel plate kiosk sub-station is that it can be installed in a new area, where development is anticipated, but the ultimate load doubtful. It is only necessary to run a high tension cable to a single point in the middle of the area. If the scheme develops a larger sub-station can easily replace the one erected, the latter being then available for transportation to another area. Thus the capital expenditure for installing a supply in a district of this description is reduced to a minimum.

The G.E.C. transformer kiosk sub-station is constructed of heavy gauge steel plate with a welded steel roof. Cast iron mouldings and cornice pieces are provided, while the design of the sub-station ensures the structure being absolutely weather proof. These sub-stations are divided into three compartments, the step-down transformers being accommodated in the middle section with the high and low tension switchgear on either side. Steel plate doors are provided for each section.

As regards the equipment the high tension side (Fig. 1) consists of an oil circuit breaker with overload and leakage trip coils, and current transformers for use with the latter. The oil circuit breaker is isolated from the supply by means of isolating links.

On the low tension side the distribution circuits consist of unit type " handguard " fuses mounted on bakelite tubes, while ammeters and voltmeter can be supplied if required. Cable boxes with efficient sealing devices are provided for use with all cables.

Other interesting features in this type of sub-station are the high tension switchgear, and connections are enclosed by double doors. Thus when the outer doors are opened to operate the circuit breakers, no " live " metal is exposed. The inner doors enclosing the isolating links are fitted with padlocks, to prevent tampering by unauthorised persons. Another feature is that the low tension switchgear is mounted on bakelised metal tubes and not on slate slabs (see Fig. 2). Bakelised metal tubes, it is claimed, provide more efficient insulation and are an infinitely better proposition for this class of apparatus. The equipment of these sub-stations is mounted well inside the kiosk and it is not possible for rain to drip on any portion of the apparatus when the doors are opened. At the same time both the switchgear and transformer are readily accessible for adjustment or other purposes. These sub-stations are well ventilated and are quite vermin proof.

Fig. 2.—Interior view of l.t. side of G.E.C. kiosk.

They may be installed at the end of outgoing feeders or on a ring main system.

It is claimed that a saving in capital cost of 35 per cent. is obtained by purchasing the complete kiosk sub-station instead of one of brickwork construction. Sub-stations of this type have been supplied to the Belfast, Birmingham, Keighley and a number of other electricity undertakings.

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NEWARK'S ELECTRICITY SCHEME.

Bulk Supply for a Large Town—Complete Street Lighting System—Capital Costs a Minimum.

THE Mayor of Newark (Major L. C. B. Appleby) officially opened Newark's Electricity Supply on Thursday, December 16th. This is a distribution scheme, the energy required in the town being supplied in bulk by the Derbyshire and Nottinghamshire Electric Power Co. The company's line is brought into Newark from Kirkby-in-Ashfield, a distance o about 24 miles, the pressure being 33 000 V between phase

Fig. 1.—View in the main Newark sub-station.

as far as Farnsfield, where an outdoor switching station has been erected. From this point a three-phase supply is given at a pressure of 11 000 V by means of duplicate feeders terminating in the Newark Corporation's main sub-station at Newark.

The sub-station is a steel structure filled in with brick and concrete. The upper floor contains the 11 000 V switchgear and metering equipment, and the ground floor is occupied by the medium and low pressure switchgear as well as the step down transformers which reduce the incoming supply to 400 V between phases and 230 V between each phase and neutral.

The switchgear contract was entrusted to Ferguson Pailin, Ltd., and for the 11 000 V equipment their "CV" type metal clad drop down switchgear was installed. The metering of the power company's supply is by means of a two "Hill-Shotter" kVA demand indicators and on the Corporation's metering equipment two Landis and Gyr kVA demand indicators are fitted.

The low pressure switchboards consist of sheet steel panels on which ironclad control gear is mounted, and the circuits controlled therefrom include street lighting and other local circuits, which are equipped with Nathan and Allen automatic electrically operated time switches, which have astronomical dials fitted, thus reducing labour in regard to street lighting to a minimum.

The contract for the transformers was placed with the British Thomson-Houston Co. Each of the transformers has a normal output of 250 kVA at 0·8 power factor. The transformers are of oil immersed type, self cooling, and are provided with calcium chloride breathers, to exclude moisture. The high tension connections are made to a dividing box fitted to the case of the transformers, and each transformer is equipped with rollers having a universal motion so that they can be easily moved in any direction.

The contract for mains, street lighting and all other accessories was placed with the Macintosh Cable Co. and about 25 000 yd. of cable have been laid. Several novel features have been adopted in connection with the distribution scheme, the most interesting being the overground disconnecting boxes which have been fixed at strategic points in the system to enable disconnection to be made with ease and rapidity. No underground disconnecting boxes or pits have been used throughout the scheme. The street lighting is automatically switched on from several important junctions, thus saving labour.

The whole of the distribution network consists of four-core paper insulated, lead covered, double steel tape armoured cables laid direct in the ground with wood covering boards. The 11 000 V cables have a special feature, inasmuch as the outer covering over the armour consists of four Hessian tapes, the two inner being heavily impregnated with red lead, the purport of which is to give warning to the jointer in the event of connection being made to the wrong cable, although a further precaution has been taken whereby the 11 000 V cables are laid at a greater depth than the ordinary distribution cables.

The Wardle Engineering Co., of Manchester, as sub-contractors to Macintosh Cables, have supplied the whole of the street lighting equipment, and along the main North Road, which runs through the town, this firm's "Barrow" type suspension fitting has been adopted. By this means increased road illumination is possible than if lighting units had been placed at each side of the thoroughfares.

A further interesting feature is the lighting of the old spacious Market Square. Here a handsome centre lamp has been erected equipped with three fittings, each containing a 300 W gas filled lamp. The fittings have clear glass outer globes with domed refractors of Holophane Co.'s manufacture, and special attention has been given to the actual intensity to illuminate the wide area. Near by a feeder pillar is erected containing double-pole switches and fuses, together with meters, whereby connection can be made to removable stalls for lighting on market days.

The contract for meters was placed with Ferranti, Ltd. They consist of this firm's well-known single and polyphase service pattern meters. Prepayment shilling slot meters have also been installed.

The price for lighting fixed by the Corporation is 7d. per unit and for heating 2½d. for the first 50 kWh and 2d. for all over that figure. For transformed power the price is 3d. per kWh. Special arrangements are entered into for supplies at 11 000 V. The Corporation of Newark has agreed to pay

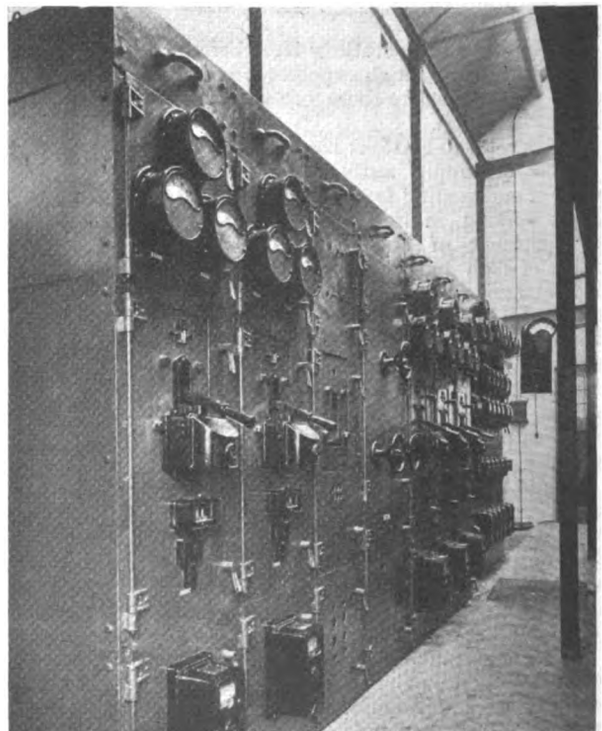

Fig. 2.—The high tension switchgear at Newark.

the Derbyshire and Nottinghamshire Power Co. 1¼d. per kWh supplied, but if the aggregate amount of the charges for actual units taken is less than £2 000 in either of the first or

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REVIEW.

The Atmospheric Nitrogen Industry. By Dr. Bruno Waeser. Translated by Dr. Ernest Fyleman, with a foreword by Dr. J. F. Crowley. 2 Vols. (London: J. and A. Churchill.) Pp. 746. 42s. net.

Dr. Crowley in his foreword to this valuable translation has condoned a union of a nature not common in pre-War German literature. Chemico-physical science and commercial economics in their relations to the atmospheric nitrogen problem have been welded by Dr. Waeser in two volumes. Essentially the resultant product is not and could not be homogeneous—even the reader who is not ultra-critical will be unable to ascribe equal merit to the two sections of Dr. Waeser's work.

Yet such unions are condonable. The reviewer does not wish to imply that Dr. Crowley deliberately wrote an apologia—his foreword is really a tract of the times. It reviews very ably the history of the industry in its scientific and economic aspects from the time that Sir William Crookes, prophet and herald that he was, delivered his epoch-making address at the British Association Meeting in 1898. Since then nearly a generation has elapsed, a generation which has seen strange happenings. On the technical side we have had the rise of the arc process, then the development of the cyanide process, and later the success of the synthetic ammonia processes. Throughout there has been an interweaving of physical phenomena and the utilisation of scientific research as beautiful as any blending of colours or grouping of figures in any artistic masterpiece of Renaissance Art. On the scientific side the artificial nitrate industry presents as beautiful a metamorphosis of what Mr. James Swinburne once called "raw" science as can be conceivable.

The Economic Aspect.

Then there is the economic aspect. From 1900 to the outbreak of the War in 1914 food prices rose steadily in Europe as the increases in population exceeded the increase in the yield of food. Between 1914 and the Armistice another factor was superimposed, *i.e.*, the pressing need of nitrates for explosives. Dr. Waeser gives us a succint account of what took place in Germany where "applied" science was neutralising the success of the British Navy in intercepting German vessels carrying Chile nitrates to Hamburg. Of these years it is always a temptation to speculate upon sundry suppositions beginning with the prefix "if." One of these might commence "*If* Dr. Robert le Rossignol, colleague and co-worker of Professor Haber, had only arrived in London say on July 30th, 1914, and had not been detained by the German authorities." No one blames them for the detention; regarded dispassionately, that detention becomes an example of an entirely legitimate action during war. But if Dr. le Rossignol had been in England it is more than conceivable that four or five years might have been saved in the development of the synthetic nitrogen industry in Great Britain. Speculative digressions are a vain amusement, and, what is worse, may divert attention from the future. That future is complex. In the lap of the gods there are both miseries and the alleviation of those miseries. The reviewer refers to the misery of a world scarcity of foodstuffs, tending to cause lower standards of living, tending to cause acute social unrest. With all these are we threatened. It is unnecessary to write at length beyond this point—civilisation may crash—at best there is all the potentiality of war, which, then, is seemingly as inevitable as it ever was when primitive peoples outgrew their food supplies and entered or endeavoured to enter by force of arms upon lands believed to be flowing with milk and honey. Yet there are alleviations of the possible miseries—if we double or treble the average yield of food per acre we can postpone the evil day. It is recorded that Jeshurun waxed fat and kicked—had Jeshurun starved and grown thin he would have fashioned a spear and been a more uncomfortable neighbour. Wherefore Dr. Crowley's condonation of the union of the scientific and commercial sides of Dr. Waeser's book is abundantly justified.

It is an interesting fact that in general the wheat importing countries grow more grain per acre than those countries which export their surplus to countries predominately food importing.

Except perhaps for Denmark, no food producing country has reached as high an efficiency in regard to wheat production as is to-day possible. When Sir William Crookes startled the world with his survey, the Danish yield was about 41·8 bushels per acre, or about 3·3 times the world average. To-day the Danish yield is about 9 per cent. greater than when Crookes wrote, whereas Dr. Crowley estimates the whole world yield per acre as 10 per cent. greater at 13·9 bushels per acre.

A Classic Work of Reference.

Dr. Fyleman may be regarded as having rendered good service to the English-speaking people in his faithful translation of Dr. Waeser's book. It gives us a classic work of reference. The reviewer's only complaint against Dr. Fyleman is that the translation has been too faithful. Dr. Waeser writing in 1921 used the present tense. Later German editions repeat this present tense. The present translation contains at the end of each chapter supplementary notes covering the years 1921–24. These supplementary notes use indiscriminately the present and past tenses. An occasional footnote of Dr. Fyleman's reminds the reader that the present tense applies to 1921, but in spite of this the recurrent abuse of the present tense is irritating. It would have been better if Dr. Fyleman had taken the liberty of substituting the past tense throughout, and still better if he had entirely re-written the book. The supplementary notes, which the reviewer understands were complied by Dr. Waeser, are in tabloid form and drive the student to the library for particulars of later processes. They are, therefore, merely the section headings for a succeeding volume. The statistics, too, in the supplementary section are scanty and not always satisfactory. This is not Dr. Fyleman's fault—if the present reviewer's mild strictures will serve to incline Dr. Fyleman to let us have a series of up-to-date monographs on the several scientific sections of nitrogen production, this review will have served some useful purpose.

Some Criticisms.

True we have the translation of a classic, and, so far as the reviewer'st ests go, of a well indexed classic. Yet that classic is of unequal merit. Dr. Waeser's commercial notes every now and then suggest the use of a pair of scissors and a paste pot. For instance, Dr. Waeser would have been well advised to have had more frequent recourse to the report of the Nitrogen Products Committee (issued by the Ministry of Munitions after the War and after the disposal of the site and partial equipment for their synthetic ammonia factory). Dr. Waeser does not catalogue this report in his bibliography, and his references to this and other British Government publications are the indirect ones of references to extracts in technical journals, both British and German. No authority is given by Dr. Waeser for his statement that the output of the sulphate of ammonia in Australia in 1920 was 6 000 tons (vol. 1, p. 323), or for the repetition of this figure in the statistical table on the succeeding page. It cannot be reconciled with the figures issued by the Commonwealth Government, from which it appears that the exports alone of this commodity in 1920 amounted to over 8 300 tons.

These and similar defects are outweighed by the other side of the work—the painstaking portrayal of the scientific field, the tracing of the evolution of the industry, the building up and co-relation of data afford to those directly interested an excellent and valuable reference work. Moreover, to those working in other fields of science a book of this kind is an inspiration.

There is no finality of any sphere of science so long as ordered conditions of society which we call civilisation continue to exist. Apart from its specific interest this book will extend the recognition of the fact that the continuance of civilisation depends in the main upon our ability to produce more food.

The Trunking Problem—A Correction.

We regret that in our account of the discussion on Mr. G. F. O'dell's Paper at the Institution of Electrical Engineers, Mr. W. H. Grinsted was wrongly reported as saying that "grading was an unnecessary refinement." His remark was "that the two-fold grade of service appeared to be an unnecessary refinement."

The third of the series of Individualist Luncheons will be held at the Hotel Cecil, London, on January 26th, when the speaker will be Mr. Henry Vivian. Tickets (5s. each) can be had from the Individualist Bookshop, Ltd., 40, Marsham Street, Westminster.

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ELECTRICITY IN PARIS.

Practicability of Network of Single Cables at 60 000 V.

(*Concluded from page 725*).

generator set for the testing of, and the gradual application of pressure to, the 60 000 V cables.

The set consists of a synchronised asynchronous motor of 600 H.P. coupled to a 6 000 kVA three-phase generator, and a 6 000 kVA 6 000/60 000 step-up transformer. The generator is so designed as to give with perfect stability its maximum power with a leading power factor of $\cos \varphi = 0$. Its rotor is provided with a strong amortisseur which enables it to work as a single phase machine. By means of this set it is possible gradually to raise the pressure to 60 000 V on a three-phase feeder 30 km long, and also to apply between phases, and between each phase and earth, a single phase pressure of 70 000 V.

Conclusion.

Four years' experience enables the Union d'Electricité to state definitely that a network of single cables working at 60 000 V between phases is quite satisfactory from the point of view of reliability, provided that suitable precautions are taken in installing and, especially, in designing the junction boxes.

After carefully examining the construction of three-core cables manufactured for the same voltage by the best-known firms of various countries and the junction boxes required for such cables, the Union d'Electricité considers that no advantage would result if in the extension of its supply network it were to give up the use of single cables in favour of three-core cables of any make. In the opinion of the company, single cables involve not only a smaller initial outlay but also greater reliability and better facilities for effecting repairs; and compared with these advantages such a disadvantage as, for instance, the increase in the losses in the lead sheath, appears to be negligible.

Determination of Rotation Velocities.

(*Concluded from page 723*).

or by means of a simple radio system, against the broadcast time signals.

4. By the use of suitable gearing on the phonic wheel, the standard time intervals may be recorded as "standard revolutions."

5. Where desirable, from a standpoint of either convenience or safety, the timing and recording apparatus may be placed at a point remote from the unit under test.

6. The tapes from the chronograph furnish permanent records of the test.

7. The precision of the results is directly dependent upon the length of tape which may be read, and is therefore to some extent governed by the law of speed change.

8. One vibrator of an oscillograph may be made to replace the chronograph, thus enabling close interlinking of the mechanical and electrical occurrences, under rapidly changing conditions.

Newark's Electricity Scheme.

(*Concluded from page 728*).

second year of the supply or £3 000 in the third or any subsequent year, the Corporation is called upon to pay the difference.

The efficiency of the scheme has been considered in connection with a desire to keep down the capital commitments to a minimum, therefore it is interesting to note there has been no endeavour to elaborate even the sub-station building or any of the apparatus therein, and from a utility point of view it is evident the engineer has kept this point uppermost in mind in designing the scheme.

On the death of Mr. C. H. Wordingham, who was Newark's consulting engineer, Mr. R. W. Willis, of Manchester, was appointed his successor, and he is responsible for the whole scheme and for the supervision and erection of the entire equipment.

The R.A. Lister Recreation and Social Club, Ltd., has been registered as a public company, and its object is to promote sports and social recreation for the employees of R. A. Lister and Co., Ltd., and its associated companies.

EXPORT TRADE.

Present Day Problems and the Electrical Industry.

In his address before the South Midland Centre of the Institution of Electrical Engineers, Col. L. F. Lister emphasised the importance of our export trade, because on this depends our power to pay for imported raw material and food. The Colonies are becoming independent of us for certain goods: therefore new opportunities must be sought. Success depends primarily on reduction of cost, which is rendered difficult by the many heavy burdens such as Compensation Acts, Health and Unemployment Insurance, National Debt service, etc.—some of which are, no doubt, inevitable, but only add to the burden on industry.

Utilising Our Resources.

We should also consider whether we are making the best of the resources of the country. There has been much discussion on the use of water power, and especially tidal rivers such as the Severn. In most cases, however, initial outlay of capital renders such schemes impracticable in this country. Consistency in quality of fuel supply is very important. Foreign colliery owners have rendered much coal marketable by a scientific system of grading, washing and classification so that buyers know what quality to expect. Much has been expected from the Electricity Supply Bill. But the advantages of centralisation are greatest in countries where coal is dear; in our country it is relatively cheap. Improvement in power factor represents an important source of economy.

Apart from coal, this country is rich in other minerals. Much capital has been spent in endeavouring to trade outlodes and veins. Electrical and electro-magnetic prospecting may simplify the process. Two methods known as the "potential" and "electromagnetic" exist, the former being the older, the latter comparatively recent.

A Vital Problem.

Some people regard cheap electricity as the salvation of this country and believe that the substitution of State for private or municipal enterprise will have this effect. The author disagrees. In his opinion the most vital problem is the solution of the endless labour disputes, or better still preventing their occurrence. In this connection the author traces the circumstances leading to the formation of organised bodies of labour. The chief cause of unrest to-day is undoubtedly unemployment. Profit-sharing schemes have had beneficial effects in some cases, but do not offer a general solution. Yet the promotion of schemes encouraging workers to save and invest their savings in industries would do much to prevent industrial unrest. Equally important are opportunities for the discussion of grievances before they become acute. Production is the only means of acquiring wealth and well being, but assurance that increased production will find a market is necessary. All these considerations apply to the electrical industry which, it is satisfactory to note, has very favourable prospects. The saturation point is far from having been reached, and its applications are extremely varied and continually extending.

Heavy Oil Engine Costs.

The report of the Diesel Engine Users' Association on the working costs of Diesel and other heavy oil engine installations during 1925–26 contains some interesting figures. The number of home stations reviewed was 37, and the number of overseas stations 0, this in each case being an increase of one over the 1924–25 figures. The number of engines increased from 121 to 127 and from 41 to 50 respectively, the total capacity being 29 141 kW and 13 550 kW. The average price paid for fuel at home was 98s. 10d. per ton and 105s. abroad. The average oil consumption per kilowatt hour generated was 0·731 lb. at home and 0·718 lb. abroad, this in each case being a reduction over the figures of the previous year. The average cost per kilowatt hour generated was 0·799d. and 0·753d. respectively. It is pointed out that the average figures of working costs are obtained from the results of the working of undertakings in the majority of which the conditions of working are by no means favourable to securing the best results, and that these average figures do not represent the results obtainable from heavy oil engine installations operating under reasonably favourable conditions. In some of these undertakings the heavy oil engine plant is only used as a stand-by plant, and in a large number of cases the annual plant load factor is less than 15 per cent.

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INSTITUTION OF ELECTRICAL ENGINEERS.

Discussion on Paris Electricity Supply—Three-core Cables *v.* Single Core Cables—Mr. Vernier on N.E. Coast Experiences.

DR. W. H. ECCLES, F.R.S., presided at the meeting of the Institution of Electrical Engineers on Thursday, December 16th, when a paper by Col. E. Mercier on "Notes on the 60 000 V Underground Network of the Union D'Electricité" was read by M. J. Fallou. An abstract of the paper will be found on p. 725 and we give an account of the discussion below.

Discussion.

Mr. P. V. Hunter remarked that at the conclusion of the war the position of electricity supply in Paris was very much what it was in London to-day. Col. Mercier set himself to change this and in a few months had substantially consolidated the whole of the electricity supply of Paris and the surrounding districts. It was that scheme which was dealt with in the paper. Most engineers would agree with the advantages claimed for three single cables as against one three-core cable, but he did not think there was very much to support the criticisms levelled by Col. Mercier at three-core cables. The heterogeneous region in the dielectric of three-core cables, if it existed, was not dangerous. A great deal had been made of sheath losses in single core cables, but under the Paris conditions there was obviously nothing to worry about.

Mr. J. S. Highfield pointed out that whilst the ordinary reason for supplying electricity over long distances at high voltages existed, there was another and far more important reason for using high pressures: the physical difficulty of finding space for the cables from a 500 000 kW station underground. A 22 000 V cable would carry about 12 000 kW, so that 42 cables would be required for 500 000 kW. At 33 000 V 31 cables would be required and at 60 000 V only 17 were necessary. For this reason alone the paper was of immense value. No reference was made to the capacity currents difficulty, which was very often overlooked. For instance, an overhead line 300 miles long delivering current at 104 000 V 60 cycles with a current of 95 A would absorb the whole of the 95 A when no load was passing, the pressure then being 82 000 V at the sending end and 104 000 V at the receiving end, rising to 122 000 V at full load. Complicated means were necessary to make a line of that sort work at all.

An Appropriate Paper.

Mr. C. J. Beaver said the paper came at a time when the problem, concerning which a good many pernicious statements had been made, of single versus three-core cables was very much to the fore. This was an opportunity to clear some of them up. There was a risk at the present time of our being stampeded from the ordinary three-core cable to single-core cables before the actual necessity arose. Some 12 years ago he had put the limit of voltage of three-core cables at 75 000 V. Col. Mercier had put it at 60 000 V, but nowadays there was a tendency to reduce it to 33 000 V. The paper made it clear that the root of the whole trouble in the high pressure cable question was the ionisation of occluded gases or air, but he did not believe that this occurred at all in what the author called the heterogeneous region when the cables were well made. The problem resolved itself into perfection of manufacture.

Major A. M. Taylor expressed the view that the losses observed by the author in the lead sheathing of his cables were a great deal too high. Prof. Cramp had worked out these losses and gave a figure of 1½ per cent. as against the 10 per cent. mentioned in the paper. Although some American work had suggested that Prof. Cramp was about 100 per cent. out, this only meant 3 per cent. against Col. Mercier's 10 per cent. He could not help feeling that we should have to come to single core cables, because it would be necessary in the future to link up with 120 000 or 130 000 V overhead lines.

Mr. N. A. Allen said in the long run the one factor which would always determine whether a system should be adopted or not was the economic factor—viz., the annual expenditure per unit of power transmitted. A year or two ago he had had occasion to study which system would be economically superior in three cases: (1) three single core cables lead covered and drawn into stoneware ducts; (2) three single core cables lead covered and drawn into U-shaped troughs as described in the paper; and (3) a three-core cable armoured and laid direct in the ground. The pressure was 33 000 V and the power to be transmitted a distance of 10 miles was taken as 10 000 kW As a result he was forced to the broad general conclusion that for English conditions three-core cable laid direct in the ground must be considered economically the best.

Laboratory Pitfalls.

Mr. C. Vernier thought the reasons given in the paper for the choice of single core cables ought to meet with general approval. A great deal of work had been done on the North East coast with 66 000 V cables, both single and three-core, and he was able to speak with first hand experience of their advantages and disadvantages. The main facts which emerged from this experience could be summarised as follows: first, thorough impregnation was much more difficult for 60 000 V than with thinner insulations. Manufacturers at the outset did not appreciate this fact, and failures of single core and three-core cables occurred in England and America, and he believed also in Paris. This difficulty had now been overcome to the extent that patchy impregnation was no longer encountered. Secondly, tangential stresses in three-core cables had assumed altogether unexpected importance at the higher voltages, and for 60 000 or 66 000 V probably no three-core cable of the ordinary type with fillers could be built to give satisfactory service. Thirdly, it had been demonstrated beyond all question that present laboratory tests were no criterion of the quality and reliability of super-tension cables. Cables which in the laboratory thoroughly satisfied the highest tests, frequently failed rapidly in service and more rapidly than other cables not apparently so good, as judged by the laboratory tests. Finally, the best impregnating compounds from the point of view of low and uniform dielectric losses had proved defective and unsuitable in practice. Single-core cables at 66 000 V had proved quite satisfactory after the initial difficulties of thorough impregnation had been overcome. He had had some 15 miles in operation for 12 months without failure. This cable was in series with an overhead line without special protection and in regular commercial service, and it had been supplied by three cable manufacturers, two British and one of the French firms which supplied the 60 000 V cables for Col. Mercier's undertaking. This particular single-core cable was armoured with 0·004 in. copper tape to comply with the regulations, and served over-all with hessian, and waterproofed in the usual manner. The cables were laid side by side direct in the ground in triangular formation and bound together every 6 ft., being protected by a 2-in. creosoted wood board placed over them. The lead and copper armouring was bonded together at the joints, and the separate cables were also cross bonded together at joints. This system followed closely British laying practice and appeared to be better than the method of laying described in the paper.

Mr. T. N. Riley thought the author had fully proved his claim that, at the time these cables were installed, single-core cables were the better proposition, but whether he would hold the same opinion now was a little doubtful.

Mr. R. A. Brockbank said it would be interesting to have some details of the earlier troubles; were they due to faulty manufacture or to subsequent handling and laying? He had been very much impressed with the case made for three single cables and he believed that in the near future we should be able to operate single-core cables with losses very little in excess of those of three-core cables.

A Little Disappointed.

Mr. P. Dunsheath said that at the risk of being out of the fashion, he must express his disappointment with the paper. It should have contained a great deal more detail on many points. His own view was that a three-core cable for 60 000 V was an impossibility if it were to give service for a long period of time. He suggested that an appendix should be added to the paper giving information as to how the cables failed, and much other that must have been accumulated during this work. Every cable user interested in high tension cables would be astonished at the cable running on the lowest point of the power factor temperature curve, which was very much lower than the temperature which users in this country were accustomed to. Could we be told exactly how these cables were bonded together, how frequently and what was the type of insulation on the lead itself between the bonds?

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NEWS IN BRIEF.

Electrically-equipped Christmas Trees—A Tramway Co.'s Jubilee—Electric Laundry Economies—Electrical Treatment for Distemper in Dogs.

A Leeds contractor is selling Christmas trees equipped with electric decoration lamps.

A glowing imitation coal-type electric fire is the central feature of a Victoria Street (London) tailor's window display of winter coats.

Messrs. N. M. Toomer, electrical engineers, of Newbury, are among the subscribers to the Mayor of Newbury's Christmas Relief Fund.

ARE YOU A MEMBER . . . ?

ARE you a M.W.O.B. yet? Like Be..ch...'s Powders, it "makes 'flu fly." Join to-day. For latest W.O.B. Club News see page 733.

In five years sales of electrical energy at Birmingham have increased by 102·3 per cent. Per capita consumption rose from 115 to 234 kWh.

Henley's Dramatic Club gave an enjoyable performance of "The Passing of the Third Floor Back" at the Cripplegate Institute, London, on December 17th.

Following a member's request for younger and more vigorous men in municipal life, Kendal T.C. re-elected the Electricity Committee chairman, who is over eighty years old.

A lecture demonstration of the advantages of electricity for home and shop window lighting was given at Alnwick by the Northern Counties Electricity Supply Co., Ltd.

The British Thomson-Houston Co., Ltd., have presented to the University of Birmingham two a.c. motors for use in connection with the new coal treatment laboratory.

A new c.b. telephone exchange in Diceland Road, Banstead, was opened last week, when all the subscribers in the Burgh Heath telephone area were transferred to the new exchange.

Members of the Leeds branch of the Siemens and English Electric Lamp Co., Ltd., recently held their annual social whist drive and dance. The M.C.'s were Mr. Green and Mr. Webb.

About fifty members of the Paisley Association of Electrical Engineers visited the works of Walter M'Gee and Son, Ltd., and inspected, among other things, a new mining type of motor for use in fiery mines.

The male staff of the B.T.-H. Co.'s Birmingham branch held their annual Christmas supper last Friday at the Woolpack Hotel, Moor Street, Birmingham. Mr. C. E. Webb presided over an attendance of about thirty, which included two of the Rugby representatives of the firm.

Mr. James Dalrymple, who is retiring from the position of general manager of the Glasgow Corporation Tramways, delivered a short address on "Clearing My Desk," at the City Business Club's luncheon last week. Mr. and Mrs. Dalrymple intend to sail for South America on January 14th.

A large party of members of the Birmingham branch of the Electrical Association for Women spent an extremely interesting time at the new headquarters of the B.T.-H. Co.'s Birmingham branch last week. They were conducted over the premises by Mr. C. P. Banham, of the Rugby office, and were later entertained at tea.

At the eleventh meeting of the Electroplaters' and Depositors' Technical Society in London on December 15th, Mr. A. W. Hothersall read a paper on "The Acidity of Certain Electroplating Solutions." Visitors are cordially invited to attend the next meeting, on January 19th, when a paper on "Iron Deposition" will be read.

At a meeting of the National Farmers' Union on December 16th it was reported that information had been received through the Telephone Development Association that women's institutes during the coming winter intended to make a special effort in the direction of urging the extension of telephone facilities in rural areas. It was resolved to support the efforts of the National Federation of Women's Institutes in this direction.

At Padiham Technical School an electrical exhibition was opened last week.

The Lancashire United Transport and Power Co., Atherton, Lancs, requires a charge engineer.

Londonderry Electricity Department has received an inquiry for a supply of electricity for a large baker's oven.

An assistant engineer is wanted in the Wimbledon Electricity Department, Durnford Road, Wimbledon, London, S.W.19.

Last Tuesday the jubilee of the inception of the Anglo-Argentine Tramways Co.'s undertaking was celebrated, the company having been registered in 1876.

Bedford T.C. has decided to exclude from its Parliamentary Bill the electrical fittings clause to which there had been opposition on the part of local electrical contractors.

Barnstaple Guardians are converting their laundry for electrical operation at an estimated cost of £821. An annual saving of £148 is anticipated, while working hours will be reduced materially.

Members, their ladies and friends to the number of 600, participated on Friday in the third annual social of the Brighton Corporation Electricity Works Recreation and Social Club, at the Royal Pavilion.

One of the newest uses of electricity is its application to the treatment of dogs for distemper. The animal is exposed to ultra-violet rays for fifteen minutes at a time, and the treatment is said to be very effective.

At a meeting of the Midland branch of the Association of Mining Electrical Engineers last Saturday, at Nottingham, a paper on "Transformer Connections" was read by Mr. Wright, of the Brush Electrical Engineering Co.

The Admiralty announce that examinations for the rank of warrant electrician, R.N., will be resumed, commencing in March-April, 1927. The number placed on the roster as a result of each examination will in future be confined as nearly as possible to the number likely to be promoted during the ensuing year. The Admiralty state that as a considerable time will elapse before the roster is confined to candidates under 35 years of age, it has been decided as a general rule to allot alternate vacancies during such period to candidates under and over the age of 35 respectively.

Electricity in Mines.

Electrical Inspector Reports Increasing Employment of Electrical Appliances.

PROGRESS in the use of electricity in mines is summarised in the report of Mr. J. A. B. Horsley, H.M. Electrical Inspector of Mines, for 1925. The report shows that the total horse power of motors connected was 74 000 I.H.P. greater in 1925 than 1924, and over 58 per cent. of the mines at work now use electricity, as compared with 52 per cent. in 1921.

In regard to coal-cutting machines, electrical types are more than holding their own with compressed-air types. During the past ten years, in which the total number of machines of all types in use has nearly doubled, the proportion of electrical machines has increased from 67 to 70 per cent. In this connection the Inspector observes that the extent to which electricity is used for coal-cutting varies greatly as between the different coalfields, and he divides the whole country into three well-defined categories: Scotland, almost wholly electrical; England, excluding Lancashire, half "electrical" and half "compressed-air"; South Wales and Lancashire, less than one-fifth of machine-got coal obtained electrically.

A detailed analysis of electrical accidents during the year and brief descriptions of the more important ones, with the Inspector's comments, are included. This portion will be of the greatest interest to those concerned with electricity in the mining industry, for in it will be found the Inspector's conclusions as to the most common sources of accident, and his suggestions as to the means whereby such accidents may be prevented in the future.

Copies of the report can be obtained from H.M. Stationery Office, or through any bookseller, price 6d., or post free 7d.

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W.O.B. PROGRESS.

The Half-way Mark—Greater Activity in London Area—Over a Hundred Circles Formed—A New Campaign "Contact."

WITH the W.O.B. Campaign practically half-way towards completion, results, on the whole, are encouraging, and if only the effort is maintained during the coming three months the final result will greatly exceed the original expectations of the organisers.

New electrical circles have been formed at Harwich and Dovercourt, Falkirk and Leamington, the total number of circles now in existence being 101.

Things are beginning to look up in the London and Home Counties area, following a recent meeting of some 40 of the supply engineers in the district. At this meeting it was stated that the area now had 22 electrical circles, with demonstration houses or exhibitions opened at Ashford and Potters Bar, and in prospect at Brockley, Tottenham, Basingstoke, Lewes, Portsmouth and Great Yarmouth.

Mr. W. E. Bush stated that in spite of the large number of circles set up in the area, the activities of the circles were not progressing as rapidly as in many of the provincial districts. The discussion which followed showed that intense campaign activity was taking place in certain parts of the area, whilst in others activity was being hampered owing to the alleged difficulty of co-operation. The chairman of the London Committee assured the meeting that, from his personal experience in a large London company, this difficulty was a soluble one, and had been completely solved in his case to the mutual advantage of the supply undertaking and the contractors.

At the close of the discussion the following resolution proposed by Mr. R. W. L. Phillips and seconded by Mr. A. C. Cramb, was carried unanimously:—"That all supply engineers in the London and Home Counties area who have no W.O.B. circles be asked forthwith to convene or form such a circle or circles in their own area. In places where local conditions make co-operative circles quite impossible, supply engineers be asked to push the campaign with their own staffs, and, so far as possible, to operate themselves all those campaign activities being carried out by circles."

One of the London districts in which lively campaign interest is being developed is Wembley, where the North Metropolitan Electric Light and Power Co., in co-operation with Comben and Wakeling, Ltd., builders, and Mr. W. S. Blyth, furnisher, last Thursday opened an attractive exhibition house (illustrated above) at Park Lane, Wembley.

One of the two W.O.B. houses at Nottingham snapped at night when it was floodlighted. It remains open until January 11.

Some big things are planned for the campaign in Birmingham and the South Midlands area generally, and as soon as the Christmas "vacation" is over efforts are to be renewed with greater intensity to get the electrical idea into the minds of householders everywhere.

Mr. J. L. H. Cooper, the local officer, told an ELECTRICIAN representative that after the holidays he hoped to bring the total number of demonstration houses in the area up to twelve or fourteen. In addition to this, there is the lively and sustained interest in the campaign which is being shown by the Shropshire, Worcestershire and Staffordshire Electric Power Co., whose series of rural exhibitions is to be extended to centres in addition to those mentioned here a few weeks ago. Ludlow and Barnt Green are two of the centres suggested. The company has just been holding a very successful exhibition at Dudley. It opened at the Egyptian Hall on December 15th and closes to-day (Friday). Up to

A night view of the well-equipped house which was opened at Park Lane, Wembley, last Thursday.

date the company has disposed of nearly 3 000 competition booklets.

It is also hoped to get four more local circles going in this area after Christmas, at Chesterfield, Loughborough, Shrewsbury and another centre.

The results of the two demonstration houses at Nottingham have been particularly good, and it is estimated that an average number of 200 people visited both houses each day. Orders and inquiries which are directly attributable to the houses have been flowing in to the local traders with steadily increasing frequency. Both the Nottingham houses were flood-lighted at night, and an illustration of one of them is reproduced on this page.

It should be noted that Mr. Cooper, the local officer for the campaign, who is also the Lighting Service Bureau officer for Birmingham and the Midlands, has removed from the Birmingham Corporation Showrooms to new headquarters at 9, Bennett's Hill, Birmingham.

Arrangements are now well advanced for a big New Year effort to revive interest in the W.O.B. Campaign in the North-Western Area (writes the Manchester correspondent of THE ELECTRICIAN). On January 6th, at 2.45 p.m., a conference will be held in the Lighting Service Bureau, Fountain Street, Manchester, to which all supply company engineers, chairmen of Electricity Committees, etc., are being invited. Mr. W. E. Bush will address the gathering. Mr. Hawkins, the District Officer in charge of the campaign, is working assiduously to increase interest in the effort, and is personally addressing lunch-hour meetings of workers at such important points as Metropolitan-Vickers, Ferranti's and the Lancashire Dynamo Co. It is hoped more directly to reach "the man in the street" by these methods.

The demonstration house at 40, Balmoral Drive, Denton, is definitely to be opened on December 31st, at 3 p.m. Delays in connection with the furnishing, etc., have been responsible for the change of date.

We learn that the E.D.A. is contemplating the issue of a further "contact," which will take the form of a flat sheet printed in four colours, from which a very attractive small cardboard model of the Prize House can be cut out and built up. The cost of these sheets will probably be about 2d. each. Supply undertakings and contractors interested in this new campaign-help are invited to write to the E.D.A., 15, Savoy Street, Strand, London, W.C.2 immediately, in order that arrangements can be made for a large printing in the case of orders for fair quantities.

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THE SERVANTS' BALL.

A Special Christmas Fairy Tale with a Decided Moral for all Electrical Engineers.

" The Servants' Ball?—the Servants' Ball?
Why—there ain't no servants here at all!"

[*Translated from an old Scots Haggis by Andrew Corkscrew.*]

"IT'S nigh fifteen years since the young master left," sighed Jeames, gently oscillating his head, gnawing his whiskers and putting down the tray of cigarettes he had been lugging round ever since. "Fifteen long years, and his father, Baron Brothface, lies dying." (This is a Christmas story—we *must* bring in a Baron.) Old Baron Brothface, true to the tradition handed down by his ancestors, who had all died, ceased to breathe, and (*ipso facto, inter alia, ad lib.*, etc.) died too.

"Dancing . . . with a bright young lady . . ."

* * *

"The Baron is dead!—long live the Baron!"

* * *

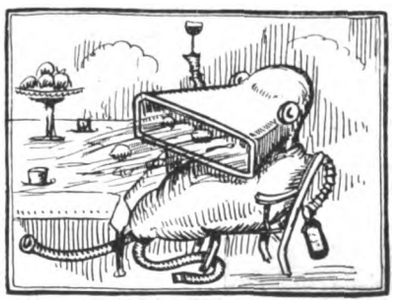
Young Baron Brothface gathered his servants round him in the hall. There were three score and ten. They were of all sizes and weights, but possessed one feature in common—they all moved with the slow stately crawl of the superior servant.

The young Baron stood quite still whilst his eyes travelled round the room, coming to rest on the faithful form of the aged butler Jeames. Jeames, who had butled for his father; Jeames who had seen side whiskers in and out of fashion eleven times, and had never shingled.

A tear was about to come into the Baron's eye, but it (the eye) was now on the move again. Finally it came to rest on the ample figure of Charlotte Russe, the cook. Cooks . . . coal . . . and cocktails; *that* was where his income was going.

* * *

Clearing his throat to give a free passage for the exhaust gases, and to allow his Adam's apple to waggle freely: "My friends," he said, in a pale straw-coloured voice, "it is a sad story I have for you today. You may know that at one time the estate reached the fourth dimension Gradually it has been reduced, until when my father inherited the estate it was only just square. To get to the root of the matter, what with duties for dying and duties for living, there is now only a little left." (This, it must be remembered, is a fairy story, and there really is a little left.)



"Drawing in . . . half-a-dozen buns, it burst forth into song."

"The house is covered with dust and mortgages, and to keep my head above water and prevent that sinking feeling, I have decided to float myself as a limited company. This means that we must, with a few exceptions, part company, as the new company intends to electrify the castle, staff and inhabitants. The old home, however, still requires a few ornaments and a number of you will be kept for decorative purposes."

* * *

Ten years pass. One, two, three, four, five, six, seven, eight, nine, ten!

* * *

There were sounds of music from the servants' hall, dancing and the sound of revelry, of song and laughter. It was the Servants' Ball. The ghosts of Jeames the butler and Charlotte Russe the cook hovered round the room, as though seeking kindred spirits in the assembly. There were none.

The scene before them was a strange one. They looked in vain for servants of the old school, but, to their eyes, there were no servants there at all—but a curious collection of beings such as they had never seen before. But one must remember that they had been locked up in the castle all their lives, until, rather than face the world or a limited company, they had faded away. And here they were again, still faded, so much that they could not be seen by the naked eye, prowling round their old haunts in tear and trembling. Hiding behind one of the palms they listened.

Just in front of them sat two curious individuals who had been dancing. They were now taking an ice and chatting merrily. One was a bright young lady whose face glowed with pleasure and heat. She wore a short skirt which exposed long, thin, silk-covered flexible legs. Pearl White was her name. Rather hot-headed and impetuous, she could be serious when the occasion demanded, and her keen eye missed very little. Her companion, a cheery individual with a long nose, was talking to her in a very serious strain.

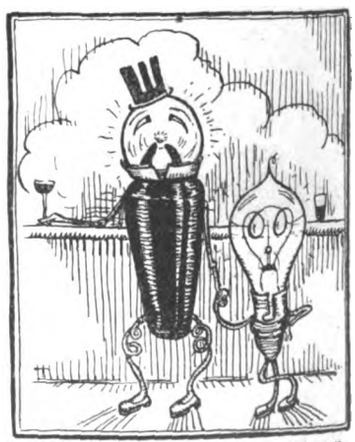
"Pearl," he said, "I have for a long time admired your brilliance—your bright face has fascinated me. We have much in common, being both well connected and moving in the same circuits. When I am depressed, you brighten up at once, and when I turn and look up at you, you lose your colour, and, I am sure, feel very dull. There are no two ways about me, Pearl, I'm not first switching this way and then that; straight to the point, that's me every time. Why not join forces with me? Think of it. Jack Sprat and his wife would be excelled. You're bright; I'm depressed. I feel uplifted, cheerful and open when you feel dull and cold. Think of this delightful combination; what an equalising of joys and sorrows! . . . Pearl, say you'll be mine!"

At this point, Jeames, hardened keyhole expert that he was, remembered that he was, nevertheless, a gentleman, if only a gentleman's gentleman, so he moved away. He also noticed that Charlotte was looking rather coy and casting him sly glances, and so to escape any inductive effect, he passed into the next alcove, Charlotte drifting along after him. Above the general murmur of conversation two voices could be heard discussing the assembled company.

"A cold-looking customer," said one. "A newcomer, I suppose?" "Yes," was the answer "Works in the housemaid's pantry. She's quite a frigid air. "Must have been warm at one time, for I understand Kelvin ate her," came the reply.

"There's Mrs. Western. You wouldn't think to look at her she took in washing; but then, she only works for about two hours a week. They tell me she's a glutton for work, gets straight on with it, no hesitation, no waiting; does a week's wash in two hours, and well done, too." This seemed to startle the spirit of Charlotte the cook. "That queer-looking creature do washing!" she exclaimed in a sepulchral voice. "And a week's wash in that time, too. Well, I always did say as how Martha were slow, but I fancy that takes some beating; a week's wash in two hours."

"It's a queer world we've come to," said Jeames. "Very queer. I cannot for the life of me see these funny creatures running the house. Why, with a staff of 72 it took me all my time to keep things going. It's very queer." The voices continue.



"Leaning against the bar . . . relishing the light of brighter days."

"There's Mrs. Bell, the cook." (Strange sounds are heard behind, the rustling of garments, with groans.) "Oh, yes, they tell me she is hot stuff." "Rather, but a jolly good sort. I've seen her boiling, stewing, frying and grilling all at once." "Yes, and not a bit hot and bothered, but quite cool about it all." (More weird sounds proceed from the back of the screen.

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The groaning becomes more distinct, and a spirit voice cries "Take me away, Jeames, take me away, I can stand it no longer.")

* * *

"Hello, here comes Vick. He's a nice boy. Hot-headed, but he manages to glide through life quite smoothly, although he is so impetuous; but he can be guided quite easily. Very sympathetic, too; he's always pressing somebody's suit.". "Hello, Vick, I want you to meet an old friend of mine. Perky, you haven't met Vick, have you? Now you two amuse each other whilst I run along and arrange for supper." "Funny we haven't met before," said Vick, his nickel-plated shirt-front flashing in the firelight. "I rarely leave the dining-room," returned Perky stiffly. "And I suppose you do not often come up from the kitchen." "No," said Vick sadly. "I am generally so busy pressing other people's suits that I rarely have time to press my own. But now . . . Oh! . . . I'll tell you, Perky, later." Once more the gentlemanly Jeames moved on, carrying with him the form and figure of the fainting Charlotte. They passed on to the refreshment buffet.

* * *

In the centre of the room, half-sitting, half-lying on a chair, was a strange figure. Drawing in a deep breath and half a dozen buns it burst forth into song:

THE SONG OF THE SUCTION PIG.

Give me dirt and give me grime,
Anything with much on;
Lay it thick, I'm in my prime,
And I live by suction.

From marble halls to pantry walls
There's nothing that I stop at;
I'll clean the fluff from factory shawls
Or renovate a top hat.

His song ended suddenly as he disgracefully subsided under the table. Then entered Mrs. Western, the washerwoman, dancing and singing. Swinging round the room wringing her hands, she, too, overflowed into song:

THE SONG OF THE WESTERN WAVES.

Sing me a song of the rolling rollers,
Bearings wide and free:
The flying scud of soft soap sud,
O, that's the song for me!

With a heavo this way, heavo that,
Round and round we roll,
The steady slosh of the weekly wash
Is music to my soul.

Round and round the room she oscillated, now this way, now that, finally finishing up with steam leaking from her joints.

* * *

Leaning against the bar was a weird assortment of characters apparently rekindling the light of brighter days with the assistance of liquid in a glass. The faint form of the butler Jeames drifted above the bar.

"Yes, Sir," said one of the figures, "Mark Arc is my name, and although I may look as though I came out of the Ark I have been a bright young spark in my time; in the good old days, Sir," he spluttered. "And now I've been pushed out of every job by those young Half Watts. Half-witted, not half-watted, I calls 'em Sir; no life at all in 'em. Not a spark, not a splutter. Bah! Give me the good old days!" Waving the bottle, he sang, or fizzed:

Gone are the circuits in which I used to glow,
Gone are the lamps in which ten amps did flow,
Gone are the fluttering lights of long ago,
I hear no breakers breaking for the lights so low!

I'm coming, I'm coming,
For my arc is burning low,
I hear those gentle voices calling
Poor old glow.

"Bravo, bravo!" echoed the group round the bar. "Well spoken; them's my sentiments," said a little man in the group. "Carbon's my name—Phil Carbon, generally known as Carbon Phil. I, too, was once at the top of the tree, the pampered pet of Society. Too proud I was. People pumped me until I was exhausted, but I refused to be drawn! Now I get only the rough work; the hard knocks and the bumps, but I can stand it, which is more than some of these upstarts can."

* * *

"Come, gentlemen," said another, "let us drink to the good old days."

THE GOOD OLD DAYS.

Here's to the good old days,
The days we used to know,
When copper was so very cheap
And commutators twice as deep,
When ratings were all liberal
And work was always plentiful,
Those were the good old days.

Cheers sounded round the bar. "Those were the days," said another, "I remember . . ."

* * *

His reminiscences were interrupted by the loud voice of the loud speaker announcing: "The Baron Brothface, Limited."

* * *

"Jeames, Jeames," exclaimed the shade of Charlotte Russe, "the Baron!" "Yes," answered Jeames, "it is the Master, but how changed he looks; much younger and happier." From force of habit the faded form of Jeames took its place alongside the Baron. Everyone gathered round. "My friends," he said, "many years ago I addressed a similar gathering in this same hall. I say similar—there is one vital difference. Then there were 72 members of my staff, now there are none of that same group, but just this small select gathering. The old school worked hard, as hard as they knew how; but they had not one-tenth of your efficiency. (Various groans and flutterings are heard on the left, but are put down to the family ghost.)

"I took a bold step. I sacked the lot and called you in I am pleased to say that the move has been amply justified. The shares of Brothface, Limited, stand high in the market. After allowing for betting and income tax, and setting aside a sum for restocking the cellars, we have declared a handsome dividend.

"To show my appreciation I have decided to raise your voltage by 10 volts (cheers) and your frequency by 15 cycles (groans and cheers). Let me waste no more of your time; let the dance go on!"

* * *

Slowly, arm in arm, the shadowy forms of Jeames and Charlotte floated through the window into the night. Snow was falling steadily and the air was sharp and chilly.

"Slowly . . . the shadowy forms . . . floated . . . into the night."

Inside, the revelry was rapidly becoming more hilarious, whilst through the window could be seen in the distance, like twin snowflakes, two vague, fairylike forms rising higher and higher in the sky.

THE END.

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W(ALTER) O(LIVE) B(ARNES).

A Christmas Carol with Few or No Apologies to Dickens—How Two Love Birds Electrified Their Nest.

OLIVE and Walter sat on the couch in front of the coal fire. The intensity of the illumination in the room would not have met with the approval of Mr. Bush, but it was sufficient for the business on which they were engaged. The mistletoe was within easy reach, but what a modern Mrs. Malaprop might have called "oscillatory" phenomena occurred from time to time without its assistance. At intervals the two chattered softly, undisturbed by the stertorous breathings of Carlo or by the ill-concealed contempt of Tabitha the cat for their proceedings. In the background a loud-speaker softly discoursed distortionless and carefully censored music. Outside a wait or two howled. In short, it was Christmas, 1926. Lest it should be asked why they were not dancing the Charleston, the answer is that Olive had burnt her hand, using a foolproof iron. And if someone trying to be funny or clever says that the Charleston is not danced on the hands, the reply is that I know that. Now let's get on with the story.

* * *

Softly pressing Olive's undamaged hand with one of his, and short-circuiting the place where a year or two ago her waist would have been with the other, Walter talked of many things, With most of these things you, dear reader, need not be troubled. Anyhow, you have done the same yourself, if not many times, at least once; and in these cases *facta non verba* is the best policy. Soon, however, our hero touches on a subject which will make you prick up your ears.

"If we are to be married in June, darling," says he, "we ought to begin to look about for a house."

Olive is understood to remark that she knows nothing about being married in June, but after a digression having been concluded to the satisfaction of both parties, she consents to discuss the main question with some seriousness.

"Of course I don't want a very big house," she says; "say three, or perhaps four, bedrooms. That would be enough at first. I always think a large house is easier to run than a small one. But, of course, it must have plenty of labour saving appliances and a good hot water supply.

Walter not only looked, but felt glum. He began to wish he had not taken the job on. Did the girl think he was a film star or a bank clerk with free access to the till?

"I'm not a blooming millionaire," he said shortly. "We shall have to go very quietly for a bit, unless of course my gas shares go up."

"Oh I know that, dear," replied Olive, "but I've seen some lovely curtain material only 1s. 11¾d. at Harridges.

"But we haven't even got the house yet," said Walter, with the stern masculine logic, which has founded the British Empire and wrecked many homes. "And here you are buying the curtains. We must have a house of some sort, but we could at a pinch get on without curtains."

* * *

The reverse relay then came into action and tripped the oil switch. Surges passed up and down and round the line and punctured an insulator. Several rotaries went to earth preliminary to going to heaven; and generally there was great confusion. In a word, they quarrelled and made it up again.

* * *

When the steady flow of current had been resumed and the machines were humming in that contented way which is music to the shift engineer, a loud cough was heard outside, and a still louder knock forced itself, as they say in France, on their ears. Carlo awoke and barked. Tabitha arched her back. Olive and Walter moved to opposite ends of the couch. The door opened, and what would have been a flapper, if the Eton crop were not fashionable, appeared.

"Hello, my love birds," she said.

The love birds regarded her in morose silence.

"I've got something for you," she went on unabashed, and threw on the couch, between them a booklet on the cover of which a house with a crimson lake roof was visible. This house was flanked by piebald trees, which stood out against a Reckitts' blue sky. With entire disregard of the F.B.I. circular to the Prime Minister on the need for economy, every light was turned on, notwithstanding the fact that the sun was apparently shining brilliantly outside. Need one add it bore these magic words "ELECTRIC LIGHTING IN THE HOME. YOU CAN WIN THIS ELECTRIC HOUSE"?

"I've got one, too," she continued. "I got them from such a peach of a boy. He explained it all to me. If I win I'll give it you as a wedding present. If you win it you'll have to put up with the usual toast rack.

"We shall want it," said Walter. "Supposing neither of us wins it," he added wisely.

"Don't be a goat," said the Eton crop. "Be a brain. Be a live wire. We must pull it off. I'll help. If you aren't out of this soon I shall go mad.

In a large number of badly-chosen words she explained the details of the wonderful scheme which is to make the wiring contractor blossom like the rose.

"The chances are about a million to one against it," said the pessimistic Walter.

* * *

But Olive was busily turning over the pages, criticising the designs, and arranging the fittings to her satisfaction.

"He says," burst out the Eton crop, "that they call it WOB—short for 'Wiring the Homes of Britain,' and the idea is that no house in the whole blooming country shall be without electric light."

"Then bang go my gas shares," said Walter. "And anyhow he, whoever he is, must be a beastly Cockney, if he spells home with an o."

"You are marrying a little sunbeam, Olive," said the Eton crop. "He, the young bloke, that is, said it was not that sort of 'ome, home I mean, but an electrical home, ohm, I mean. Oh, don't argue. What do you think about it, Olive?"

But Olive was deep in the book, and from her indistinct murmurs it would not require a psycho-analyst to find out what she thought about it.

* * *

Let us not recount the happenings of the next few days. The arrangements, the re-arrangements, the discussions, the arguments, the spoilt books, the visits to the electrical shop, the talks with the young man, the talks with each other, the hopes, the fears, the concentrated study and the general hullabaloobalay. Suffice it to say that one morning Mr. Beauchamp's letter box was rather fuller than usual.

* * *

Olive and Walter were perfectly sure they were not going to win it. But then, of course, they *might*. But if they *didn't* they would still want a house; one with at least a table, a chair, and a saucepan or two. While waiting for the result, then, it was only sensible to look around, for if they didn't win it, and were to be married in June, there was very little time for anything.

"I don't see why we shouldn't have an electric iron," said Olive, mindful of her damaged hand.

"And perhaps we could run to a vacuum cleaner," remarked Walter; "that would save you a lot of trouble, darling."

"You can hire cookers from the supply showroom," continued Olive. "And you can't get away from it, they *are* convenient—and clean."

"Oh, I think we ought to do that," said Walter. "And a bowl fire for the bedroom. Very jolly to go to bed in the warm."

"An electrical sewing machine would be very useful," pondered Olive. "I could make my own clothes."

"And other people's," said Walter, in a tone which temporarily brought the discussion to a close.

* * *

Of course they won it. This is a Christmas story. What is more they found exactly the site they wanted, and, after a satisfactory interview with Mr. Imray, lunch at the Savoy was obviously indicated. At its conclusion Walter proposed a toast: "Wiring the Homes of Britain; good old WOB."

The Eton crop, who was present, choked suddenly.

"I knew champagne would upset the child," said Olive.

"Don't be a goat," replied the young lady, "But WOB—W-O-B, it's most extraordinary. Your initials—Walter Barnes, Olive Levick soon to be Barnes—WOB—see. Of course you can keep it in Christian names if you like; and call the first one Bertram or Beatrice, according to sex."

"Don't be a goat," said Olive.

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IN LIGHTER VEIN.

Christmas Day in the Power Station: Or The Shift Engineer's Dream.

WHEN we are having a jolly time at Christmas, the station engineer is on duty. When we are pouring the brandy sauce over the pudding, he is, perhaps, putting a little more oil into the bearings. As we settle down in the easy chair after a wonderful dinner, let us remember the engineer who is pushing that extra little bit of current into the mains to make the lights glow even brighter.

This is the story of a shift engineer who had dined well on Christmas Day, and, hurriedly drinking "The King," rushed off to duty. Sitting down to digest his Christmas dinner, he fell asleep and dreamed a dream.

[For those who are not familiar with the language of the power station, the glossary given below will prove helpful.—ED.]

THE DREAM OF THE SHIFT ENGINEER.

He dreamt he saw a snoker (*a*)
Abaft (*b*) the boiler door.
He said "I'll roast the joker,
To raise the pressure lower."
So he took the root of the cube of three
And the snoker's snooze was o'er.

He dreamt he saw the gauges
A Bourdon the Tooting 'bus.
He said "They've left their brages (*c*]
This is the last of us!"
So he swulped (*d*) his bottle of CO_2
And climbed the pole marked plus.
[Proving, of course, that he was positively "up the pole."—ED]

He dreamt he saw the volts rising
To X times beans times 3. 1412
He said "It's most amising (*e*)
The compounding's run dry!"
So he flung a line in the nick of time,
But it went right through to the sky.

He dreamt he saw a motor burst
The bluttons (*f*) from its tum.
He said "This clearly shows the worst
Of oiling them with rum!"
So he drained the last and woodled (*g*) past
And beat it back to Brum.

GLOSSARY OF TERMS.

(*a*) *Snoker.*—A stoker who stands snoozing on one leg, like a carraway seed.

(*b*) *Abaft.*—At the back of the front. A term probably left behind by naval ratings.

(*c*) *Brages.*—Brass cages made of aluminium.

(*d*) *Swulped.*—To swill, swallow and gulp in one breath without moving the Adam's apple, at the same time reciting the second verse of the "Wireman's Wedding."

(*e*) *Amising.*—Amazing, amusing and surprising, in parallel and synchronised.

(*f*) *Blutton.*—A bolt with a nut on.

(*g*) *Woodled.*—Walked on three legs like a poodle, only without.

To avoid a repetition of such sad happenings—for not only did the engineer sleep, but the meters were dead beat and the steam pipes and the current lagged—it has been suggested that in future the generators be given an extra "flip" so that they will free-wheel during the holidays.

Until this has been arranged, let us drink to those on duty.

"Gentlemen—the Engineers on Duty!"

* * *

Our congratulations to an electrical contemporary on having joined the Mustard Club.

* * *

A popular Joule-tide query: Watt's yours? Certainly Noel-oquence could improve upon it.

* * *

A well-known Newcastle electrical contractor records the following incident: A female 'bus conductor purchased sixpennyworth of salammoniac, and explained that it was for the driver's chilblains. The salesman was left wondering whether the lady would be the "conductor."

* * *

One of our readers in China sends the following cutting from the "Radio Notes" of a Hong Kong paper:—"Huge ampherage.—Eight steel towers, each about 200 feet high, will be built, while the machinery to be involved will be capable of generating an ampherage of 500 kilometres and 120 000 metres."

Commenting on this interesting item, he says: "It is many years since I last saw an "Amph," and had no idea that they grew to such a size. When I was a child, we captured a pair of small ones, but found that they wouldn't live in captivity, although we gave them a very comfortable ohm. We christened the male one "Henry" (because of his reluctance to being kept in a coil). His habits were not nice; he absorbed so much juice that he became dissipated, and couldn't tolerate the least resistance. Eventually he refused to eat his voltoids, and so died. We were very sorry to lose him, and covered his grave with beautiful ornamental ceiling roses.

"A Negative Creature."

"We kept the female Amph in a cage, with plenty of busbars and poles for her to exercise on. She was rather a negative sort of creature as a rule, though she had a very pretty skin effect. One day she got into a state of high tension, and after switching about from one pole to another for some minutes, she settled down, and gave birth to a litter of milli-amphs—positive darlings. We put them in a nice clean dry cell, with plenty of coulombs, and fed them on the best sal-ammoniac, but they never amounted to much, and finally died of some internal trouble. It is nice to know that these pretty creatures can now be kept till they are fully grown. I understand that the new home for these creatures is to be called the Amphitheatre."

* * *

Here are some new electrical limericks:—

A battery maker of Tottenham
Marked the poles by putting a spot on 'em
So the current would know
Just which way to go,
And the maximum charge always got in 'em.

* * *

A fair young electrical contractor,
Felt that taking a mate would distract her,
So she fixed all the cable
When perched on a table,
With legs of a large safety factor.

* * *

A rising young power engineer
Had a lady for Chief, which is queer.
When trying to instruct her
He touched a conductor.
She carried one end of the bier.

Electrical Abbreviations.

The interest taken in finding a suitable name for registered contractors leaves no room for doubt that, if suitable contractions could be found people would no longer waste breath on unnecessary words (writes a most unreliable correspondent).

Some abbreviations are natural, for instance, h.t. or l.t., a.c. and d.c., and so on. Others must be made. Therefore, why not carry it a step further? If "Registrician," why not some of the following?

Star-delta starter, quite a mouthful which must have cost the makers of switchgear pounds in ink for printing and in typewriter ribbons, could be shortened to "Startler," giving a name at once descriptive, short and snappy. Again, Series-Parallel—why not "Sparallel," once more saving time, ink and breath.

A turbo-generator could be known as a "Turgenator" without much loss to anyone. Whilst on the subject of central stations, the chief engineer gets the natural diminutive of "Chief," but to address his assistant as "Ass," or the shift engineer as "Shift" may cause trouble!

Gasfilled bulb is another long and weary term. Compare the time taken to say "Give me a gasfilled bulb" with "Give me a gulb."

Points of View.

IT is safe to predict that higher powered ships would be more feasible with the Diesel-electric method than with the direct or geared drive methods.—*Mr. W. E. Thau.*

* * *

The universal supply of electricity throughout the kingdom is likely to produce the reverse effect to that experienced during the last century, when the conditions of power production imposed by the steam engine forced industries to centralise in localities of cheap coal and good transport facilities.—*Prof. W. E. French.*

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SECRETS OF THE SELLING ART.

Imagination in Salesmanship—Knowledge of Human Nature—The Value of Words—"Born" *v.* "Made" Salesmen.

AT the E.D.A. London Salesmanship Conference, on December 17th, a lecture was given by Mr. G. S. Francis on "Some Secrets of the Selling Art." Mr. J. W. Beauchamp presided in the unavoidable absence of Mr. P. J. Pybus (managing director of the English Electric Co., Ltd.).

Mr. Francis said the purpose of his talk was not to give slick hints regarding methods of forcing sales, but rather to disclose some important but often overlooked factors in the art of selling, with the object of stimulating the imagination of

WHAT IS W.O.B.?

IF you want an answer to this question, ask any member of the E.D.A., E.L.M.A., E.C.A., B.E.A.M.A., A.M.A., E.W.F., C.M.A., A.O.F.B., or the Mustard Club. Most of them are members of the W.O.B. Club, too. Also refer to page 733.

salesmen, engendering pride in their profession, and thus adding zest to their work.

To the salesmen of the present generation had fallen the task of carrying the blessings of electric power to the homes and industries of to-day. Thus, right at the outset, did we discover one of the secrets of the selling art to lie in the fact that, by the simple act of serving our limited and personal ends, our energies were woven into a vast network of inter-locked relationships between producers and consumers which extended over whole continents of space and whole centuries of time, shaping the channels through which energy would flow, and thus moulding the future course of human destiny.

The Catalyst.

It might be interesting to note in passing, the peculiar function the salesman performed in the circle of economic activity. The personal qualities and abilities of the producer entered directly into the product, just as the personal qualities and abilities of the consumer entered into its use, but nowhere, neither in the product nor its use, could any trace of the salesman's work be discovered. The salesman worked, in fact, as what was known in chemistry as a catalyst, one of those mysterious substances which did not enter into the substance of chemical compounds yet whose presence was essential if effective union was to be made. Until quite recent times, the art of selling was to a high degree personal, and the links between producer and consumer were all human links. With the advance in mechanical and mass production, however, with the rise of big industry and big business, goods must be distributed more quickly and in larger quantities than could be achieved by the unaided services of individual salesmen. Therefore, "mass production" had to be assisted by "mass suggestion" through the medium of Press advertisements, circular letters and the organised propaganda and publicity of organisations like E.D.A. The underlying aim of this process of mass suggestion was to create a mental atmosphere within which the efforts of individual salesmen could work with more ease, less friction and greater certitude. If people could be induced to think electrically, induced to turn naturally and instinctively to electrical solutions of their problems, the work of the individual salesman was relieved of a lot of mere spade work, and the task of selling electrical apparatus was made easier. Thus the salesman, the supply undertakings, and the makers of apparatus all participated in the benefit.

Personality was still necessary on the part of the individual salesman to push the particular goods of which he was the custodian, but he should never underestimate the value of the associative efforts of trade organisations, like the E.D.A., etc., whose work was directed, not so much to securing direct sales as to creating a psychological atmosphere favourable to the salesman, turning the tide, as it were, from an opposing one against which the salesman would have to struggle, to a favouring one in which the salesman could move with greater ease and with more certain effect.

Truth in Selling.

In the business of selling there were certain tricks of the trade by which reluctant customers might be forced into buying goods they did not want. Such methods usually had an unpleasant reaction subsequently, and were the last means to adopt if a lasting connection was to be built up. Truth in selling, therefore, was essential.

Popularly considered, the main art of salesmanship was to induce prospective purchasers to buy one maker's goods in preference to others. Therefore, the art of selling involved some action by the salesman on the mind or emotion of his customer, and any attempt to acquire an effective knowledge of the technique of the selling art implied some knowledge of human nature, some study of the relation of the conscious and sub-conscious mind, together with the nature of the effects produced by the various forms of external stimuli.

Men varied considerably as individuals; they were subject to temporary fluctuations of temperament or mood, and all human problems must be handled in accordance with the character of the persons involved, their state of mind at the moment, and the immediate nature of the circumstances, in which they were acting. The ability to perceive these factors and their connections correctly, and the ability to relate these factors harmoniously so as to produce the desired action or result was purely a personal ability.

The instrument the salesman used in his endeavour to influence the minds and actions of others was speech, and the separate tools were words. In our time, language had become a very abstract thing and, except in the hands of the few poets who had managed to survive to this very utilitarian age, words were just used to convey thoughts or ideas. But the mere meaning of words which appealed directly to the intellect, was not the only quality they possessed. In addition they possessed colour or tone and form, and these latter played directly upon the emotions and the will.

The Discussion.

The chairman said the lecture had shown that the greatest study of mankind was man. At present the electrical industry was making such a great demand upon the public that there were not enough born salesmen to go round, and it was therefore necessary to make salesmen and saleswomen. The E.D.A. Council had determined to do that in the future in a far more effective way than had hitherto been possible.

Mr. L. Gaster spoke on the necessity for truth in salesmanship, and particularly urged that salesmen should not adopt the policy of decrying their competitors' goods, and mentioned an instance in which an electric lamp salesman had spoken to him in depreciatory terms of other lamps which he knew from experience were good ones.

Mr. W. E. Bush said it was difficult for him to relate much of what the lecturer had said with the sale of electrical goods and apparatus. Could they imagine a salesman going to a contractor who had just got an order for wiring a housing estate at a cut price and talking to him of the circulatory or rhythmic system of the human body, in the way Mr. Francis had laid before them, and then expect to get an order for lamps or ceiling roses? Salesmanship problems in the electrical industry were rather different from those of many other industries. For instance, the salesman dealing in soft goods, ladies' costumes and so on, had already had his market created for him by very skilful advertising, or by the natural desire of people to buy these goods, whereas the electrical salesman had to educate his public before he could effect sales. The present position seemed to him that there were too many salesmen on the road and not enough educators. Quite recently he had been told by a contractor that he had had as many as 40 salesmen call on him in one day to sell him a similar product, and it seemed time that some change should be made in this position because, in the end, the customer had to pay.

Mr. F. T. Hall regarded the paper as one representing the high water mark of individuality in salesmanship. He personally believed the lecture would stand out for a long time

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as a wonderful accomplishment, and one of which the E.D.A. could be extremely proud. What was wanted in salesmanship was individuality, not standardised salesmanship, and what our salesmen wanted was more knowledge, through the medium of such lectures as these, of the work of the pioneers of the electrical industry. How many of them really knew all about the work of Faraday or even of Ferranti and Crompton, both of whom, fortunately were still with us? The story of the Deptford 10 000 V cable, installed at a time when everybody else said it was impossible, was an outstanding instance of the value of imagination. Dr. Ferranti had been told that it would not be safe but he allowed an iron wedge to be driven right through the cable, and he held it all the time without any harm coming to him; it was only then that the cable was allowed to be laid.

Mr. Edwards said a salesman must have real technical knowledge of the articles he offered for sale, and he must also have tact in handling the prospective customer. He should not all the time be expressing his own opinions and not letting the customer have any opinions of his own.

Mr. F. H. Howell said he thought he was coming to a lecture on salesmanship but it had been more like a seance. However, he was in hearty agreement with every word he had understood of the lecture.

Mr. Hughes asked whether the salesman really went out, or could be expected to go out, with the high ideals outlined in the paper, or was he not all the time possessed with the desire to make a living.

Mr. Francis, in the course of a short reply, said he had only hoped to induce salesmen to look at the matter from the wider standpoint he had indicated, because he assured them there was a great deal in it. As to the born or the made salesman, everything depended on the individual, but experience had shown that where things were done consciously, as in the case of the trained salesman, and not sub-consciously as by the born salesman, then a higher level was reached, and we must begin to do these things consciously in the electrical industry.

London Electricity Scheme.

Views of Two Municipal Undertakings on the District Proposals.

MARYLEBONE (London) Electric Supply Committee, having been asked by the Conference of Local Authorities Owning Electricity Undertakings in Greater London for observations on the technical scheme for the London and Home Counties Electricity District, has commented upon the fact that, in the table in par. 65 of the report, a reduction of the capacity of the Marylebone power station (which is now 45 000 kW) to 28 500 kW by 1935–6, is recommended. The Committee states that by installing modern plant in place of existing 2 000 kW sets, the turbo-generator capacity could be increased to about 70 000 kW without any extension of the present buildings, and that energy can be generated locally at much lower cost than is scheduled for the Chiswick supply.

Hackney (London) Electricity Committee has submitted to the Council the comments of the borough electrical engineer (Mr. L. L. Robinson) upon the report of the technical adviser of the London and Home Counties Joint Electricity Authority (Mr. J. H. Rider). Mr. Robinson says, in the original scheme, Hackney was a station included as suitable for use under the scheme, and for extension. Mr. Rider, who recommended that it be extended by 10 000 kW only, has (says Mr. Robinson) probably not heard of the Council's scheme for improving water facilities contained in the Council's 1926 Act, which would render the further installation of two more 20 000 kW sets as economical as any that could be installed in a super-station. So far, no station in London has, for a given load factor, generated so cheaply as the Hackney station. Mr. Robinson thinks Mr. Rider's advice to erect a large station at Chiswick is absolutely correct, but, in regard to Mr. Rider's proposal to instal two 50 000 kW sets as part of the initial equipment of the Chiswick station, he is of opinion that, unless each of the 50 000 kW sets really consists of two 25 000 kW alternators driven by two turbines with re-heat between, and each turbine can be run alone in emergency, the installation of 25 000 kW sets would be preferable. It is doubtful whether the river Lea at Brimsdown can provide enough condensing water for the load of 100 000 kW, which is anticipated to be erected by 1935-6, and it would seen desirable that Hackney should be kept in being to share some of the load.

H.T. "CABLE-GRAMS."

Humours of Rural Overhead Construction.

By "A CONTRACTOR."

RUNNING an overhead h.t. cable system through rural districts is not without its humours. It is the farmers who provide most of the fun—though usually unwittingly. In my experience, only one farmer—Graves by name—appreciated the alterations.

"Doant 'e want any more poles, mister?"

"No, I don't think so, farmer. We've knocked your land about quite enough, I guess."

"Huh, doant 'e moind me, zur. Oid loike to plant the wull field wi 'em. They bring in a zoight more'n wozzles!"

I suppose they would, too. We paid quite a lot for the few feet of earth we used.

The funniest case was that of Farmer Meadows. He was a tough nut if ever there was one. We had to serve the whole four letters on him before he gave in, and then one of our fellows had the rear portion of his attire damaged by intimate contact with the muzzle of the "varmer's" collie. In passing, I may mention that the four letters consisted of a request for permission, a polite reminder, a solicitation, with reasons, and finally an official order, unembellished.

Well, after a lot of trouble with Meadows, the poles were erected. He'd threatened to pull them down, but had apparently thought better of it. Just as well, perhaps; it's not particularly healthy to meddle with 30 000 V cables!

"A Bitter Enemy."

One day, who should arrive at the office but Farmer Meadows. We found that he had come to request us to fit an electric light in the farm. Not that *he* wanted it, mark you! Oh, no. It was for his "missus," who read those "danged" books. We went to great pains to explain to him that it was not possible to tap house leads from high tension wires. Of course it was useless to argue with him. "Dang me, zur, I can see them ——— wires from me front winder!"

We managed to get him away at last by promising to send him an estimate for lighting his precious front room. I sent it along to-day. It includes all necessary for a sub-station to fetch the voltage down to a reasonable figure. Something over £300, I fancy. I'm afraid we've made a bitter enemy of Farmer Meadows!

Sometimes the local authorities insist that we place the cables underground, and the wires are supposed to go pretty deep into the earth, the depth depending on the same local authorities. The depth varies considerably, going from the sublime (not sub-lime) to the ridiculous. I remember once we had a lot of trouble over a stretch of wiring. It was a particularly annoying job laying it, although the distance was not very great. When we put the test current along, we could get no reading. Gee, but there was a shindy! After some considerable time spent in investigation, we found that it was earthing badly in the middle of a ploughed field. It seemed that the workmen had done their part badly, but not so one of those steam ploughs!

In Parliament.

Royal Assent to Two New Acts of Electrical Interest.

AMONGST the new Acts of Parliament to which the Royal Assent was read on December 15th, were the Electricity (Supply) Act, and the Wireless Telegraphy (Blind Persons' Facilities) Act.

London Telephone Service.

Viscount Wolmer (Assistant Postmaster-General) stated in the House of Commons last week that it was hoped to re-open the Holborn Exchange, the first of the London automatic exchanges, next summer.

British Broadcasting Corporation.

After the Earl of Lucan, replying to a question, had given particulars of the proposed charter of the British Broadcasting Corporation, in the House of Lords last week, Earl Russell urged that any surplus revenue should be applied to the reduction of licence fees and the improvement of services, and not pass to the Exchequer. The Corporation, he thought should not be allowed to issue publications and turn the monopoly of programmes to financial account. He also urged the Post Office to be more energetic in the prosecution of unlicensed wireless users.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

MR. R. W. Grubb, borough electrical engineer, Dewsbury, is the new Worshipful Master of the St. John's Lodge of Freemasons.

Mr. I. N. Smirnoff, People's Commissar for Post and Telegraphs (Postmaster-General of the Soviet Republic), has arrived in London.

Mr. Price F. White, electrical engineer to Bangor Corporation, has been appointed consulting engineer to the Llanfairfechan U.D.C.

Following the resignation of Mr. J. Dalrymple, Glasgow's tramways manager, a special sub-committee has been appointed by the Tramways Committee to consider the appointment of a successor.

Mr. T. R. Smith, Leicester's borough electrical engineer, has been appointed to succeed Mr. T. P. Wilmshurst, now an Electricity Commissioner, as chairman of the East Midlands Electricity Advisory Board.

Mr. A. J. Dilling, a young electrician in charge of the installation at the Marine Hotel, Salcombe, is the winner of the chief prize, a Clyno two-seater motor car, valued at £160, in connection with a draw in aid of the Devon Crippled Children's Hospital Appeal Fund.

Mr. Walter White, of Blackburn, sailed for Buenos Aires last week to take up an important telephone appointment. After service with the Post Office Telephones he served in the war, and on demobilisation he joined the Western Electric Co., now Standard Telephones and Cables, Ltd. He has now been selected as chief engineer at Buenos Aires, where the automatic telephone system is being installed.

At the Trocadero, London, recently, a complimentary dinner was given by Mr. H. L. McGurk, of the Frigidaire Co., in honour of Mr. G. D. Riedel, of the Delco Light Co., on the occasion of his appointment as European manager. Mr. Riedel, though well known to many electrical men in this country, came here less than four years ago, and starting with one assistant, and in one room, he built up a business the turnover of which is expected to be in the neighbourhood of £500 000 in 1927.

Obituary.

The following deaths have been announced :—

MR. JAMES HOOLEY, on December 12th: He had for over 20 years been assistant electrical engineer at the Crewe Corporation Works. He was found at his home with his throat cut. Mr. Hooley was 45 years of age, and was Worshipful Master of the Four Cardinal Virtues Lodge of Freemasons.

MR. JOHN HIKELEY, in his 66th year. Well known in electrical engineering circles in the North, he had for the past 37 years been employed as engineer by the Newcastle-upon-Tyne Electric Supply Co. In 1908 he patented a slot meter, and in 1915 introduced the printing recording watt meter. During recent years he held the post of buyer for the Newcastle Co., and at the time of his death was just on the point of retiring.

MR. L. M. ERICSSON, on Friday last, aged 80 years. Mr. Ericsson was the founder, in 1876, of the organisation bearing his name, and therefore was the world's pioneer manufacturer of the commercial telephone. He commenced business in a very modest way, but being a man of keen intelligence and foresight his business rapidly grew until to-day it is one of the largest telephone manufacturing concerns in Europe. In this and other countries the Ericsson concern employs many thousands of workpeople.

CAPT. WILLIAM HENRY COTTRELL, at Wellington (N.Z.), on November 18th, at the age of 63. Captain Cottrell, during the Gallipoli campaign, laid the cables from Mudros to Cape Helles and Anzac, landed the terminals under fire, and supervised personally the repairs and renewals which enemy activity from time to time made necessary. He was trained at the School of Military Engineering, Chatham, and at the age of 15 joined the service of the Eastern Telegraph Co. After being present at the bombardment of Alexandria in 1882, he was appointed chief electrician of the company, and served in the Mediterranean the Red Sea, India, and East and West Africa. In 1892 he joined the shore staff as superintendent, and in 1909 was appointed divisional superintendent at Athens. After the war he was made divisional manager of the company in the Levant. He retired in 1922.

BUSINESS ITEMS.

Changes of Address, Representatives, and other Developments.

THE Electrolux Co. have just opened a showroom in Northgate, Blackburn. The premises are not far from the Corporation's electrical showroom in Darwen Street.

Major A. M. Deakin has been appointed sole agent for A. J. S. wireless products for the Birmingham district, and has opened premises at 6, Colonnade Passage, New Street, Birmingham.

Mr. J. H. Charlesworth, for 25 years with Carrington and Button and their predecessors, has commenced business as an electrical and radio engineer at 12, West Street, Crewe, in partnership with Mr. G. S. Whiston.

Electricity Distribution of North Wales and District, Ltd., have opened a wiring and installation department at 31a, High Street, Sandbach, in connection with the pending supply of electricity to Alsager, Elworth, Sandbach, and Haslington.

An important amalgamation in the paint and varnish industry has recently taken place by the fusion of interests of the Indestructible Paint Co., Ltd., and Standard Varnish Works (of Great Britain), Ltd., who will in future operate under the title of "Indestructible Paint and Standard Varnish, Ltd." The combine will be still further strengthened by the financial interest and close co-operation of the London Electric Wire Co. and Smiths, Ltd., who will continue to act as the selling agents for Great Britain of the "Standard" insulating specialities.

Forty Years Ago.

Brief News Extracts from "The Electrician" of December 24th, 1886.

THE following extracts are taken from the pages of THE ELECTRICIAN dated December 24th, 1886 :—

An Okehampton cabinet maker installed a private hydro-electric plant to light his premises.

* * *

Electric lights were first used in pearl fishing, the illumination extending to 17 fathoms against the 7 or 8 fathoms of other methods.

* * *

After inspecting the wiring at the Royal Pavilion, Brighton, Mr. W. H. Preece described the installation as dangerous, and estimated for an expenditure of £412 to put it right.

* * *

The following is from an account of proceedings in the Appeal Court :—

JUDGE (to eminent counsel) : Do you mean that Van Choate's carbon was to be used for arc lamps and not for incandescent lamps ?

EMINENT COUNSEL : For arc lamps, I think, my lord, but I am not quite certain. (Hurried consultation of Bar. Second counsel to first ditto, in whisper : Van Choate's carbon was for incandescent lamps without a globe, but *you'd better say arc lamps*.)

EMINENT COUNSEL : I find, my lord, that it *was* for arc lamps.

Birmingham Electric Club

Membership Further Increased During Twenty-Second Year of Operation.

THAT the Birmingham Electric Club is gradually attracting members from all branches of the electrical industry, and that during the past year the membership roll has increased from 213 to 237, are pleasing points from the Club Committee's report for the twenty-second session. The financial position of the Club is on a sound basis.

The new members are : Sir William Noble, and Messrs, J. A. Asdell, H. V. Barber, P. J. Bloye, C. W. Bridgen, T. Day. C. J. F. Ealand, H. Bevan Evans, W. H. Fellows, F. Forest, A. M. Fletcher, H. G. Gunner, P. G. Hammond, G. F. Hoyland, F. W. Highfield, F. Lawrence, G. R. Osborne, A. G. H. Oxley, J. Parkinson, J. Penford, R. R. Rudman, S. Shaw, J. R. Sayers, F. R. L. White, A. Wynn, and F. Whipp.

At the annual meeting last Friday the following officers were appointed : President, Mr. T. Birkett ; hon. treasurer, Mr. J. Entwistle ; hon. secretary, Mr. D. G. Brooks ; hon. social secretary, Mr. W. Martin.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited, with the closing date, if available.

SITTINGBOURNE AND MILTON REGIS JOINT HOSPITAL BOARD.—Electric lighting installation, including two 15 kW sets, for Keycol Hospital.

DEVON MENTAL HOSPITAL, EXMINSTER, December 24th.—Three months' supply of electric lamps. Particulars from the Clerk at the Hospital.

DUNDEE CORPORATION, December 24th.—Supply of 4-core, 3-core and 2-core l.t. cable. Specifications, etc., from Mr. D. H. Bishop, Electricity Department, Dudhope Crescent Road, Dundee.

HASTINGS CORPORATION, December 24th.—Electric lighting installation (including complete re-wiring) and heating installation, at the Town Hall, Hastings. Specification from Mr. R. F. Ferguson, borough electrical engineer, 20, South Terrace, Hastings.

MASSEREENE HOSPITAL, ANTRIM, December 29th.—Vertical two-stroke heavy oil engine and dynamo, with belt-driven booster. Specification from the Clerk or from Mr. F. D. Brown, 93, Ann Street, Belfast.

DOWN COUNTY REGIONAL EDUCATION COMMITTEE, December 30th.—Electric light installation, etc., at Banbridge Technical and Secondary Schools. Specifications can be seen at the Committee's offices, or with Mr. W. W. Larmor, architect, Banbridge.

MELTHAM PARISH CHURCH, HUDDERSFIELD, December 31st.—Electric light installation. Particulars from Mr. W. R. Carter, secretary of the Church Council, Birchfield.

NOTTINGHAM CORPORATION, December 31st.—Two 30-inch electrically-driven centrifugal pumps (section F.F.); one motor-driven twin booster; each for an output of 10 kW (section K.K.); and one storage battery of 256 cells, capacity 275 Ah at one-hour discharge rate (section M.3), for North Wilford power station. Specifications, etc., from Preece, Cardew and Rider, 8, Queen Anne's Gate, Westminster, S.W.1; deposit £2 for each section.

ROYAL WELSH NATIONAL EISTEDDFOD, HOLYHEAD, December 31st.—Electric light wiring of pavilion. Plan can be inspected at the office of Mr. T. E. Thomas, Central Chambers, Holyhead.

EAST HAM CORPORATION, January 1st.—Supply of 10 double-deck bogie tramcars, complete, or for supply of: (*a*) bodies and top covers; (*b*) motor equipment; (*c*) controller equipment; and (*d*) bogie trucks and brake equipment. Specifications, etc., from Mr. W. R. Elliott, Tramway Offices, Nelson Street, East Ham, London, E.6.

MANCHESTER CORPORATION, January 3rd.—Supply and erection, at Barton power station, of 33 000 V, 420 V, and 240 V switchgear. Specification (B.52) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

DUBLIN BOROUGH COMMISSIONERS, January 4th.—Surface condenser with auxiliary plant for 5 000 kW steam turbine. Specification, etc., from the City Electrical Engineer, Fleet Street, Dublin; deposit £2 2s.

INDIA STORE DEPARTMENT, January 4th.—Supply of about 264 650 copper bonds for track rails. Specifications (5s.) from the Director-General, Branch No. 36, Belvedere Road, London, S.E.1.

HUDDERSFIELD CORPORATION, January 5th.—Electric light installation at open-air school, Woodhouse Hall. Particulars from the Borough Architect, 26, Ramsden Street, Huddersfield.

SOUTH INDIAN RAILWAY CO., January 7th.—Overhead transmission line materials and cables. Specifications, etc. (10s.), from the company's offices, 91, Petty France, Westminster, S.W.1.

BRITISH ALUMINIUM CO., FORT WILLIAM, January 10th.—Water turbines (impulse type), and d.c. generators, for Lochaber water power scheme.

CAMBERWELL (LONDON) BOROUGH COUNCIL, January 10th.—Maintenance of electric lighting, heating and power installations, telephones, etc. (section H.); supply of electric lamps (section S.). Forms of tender from the Borough Engineer and Surveyor, Town Hall, Camberwell, S.E.5.

PORT OF BRISTOL AUTHORITY, January 10th.—Grain-handling machinery at Royal Edward Dock, Avonmouth, including motors and switchgear. Specifications from Mr. T. A. Peace, engineer, Avonmouth Docks; deposit £5.

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY CO., January 11th.—Crude oil engine generator sets. Specification (10s.) from the Secretary, 91, Petty France, Westminster, S.W.1.

HULL CORPORATION, January 20th.—Two 12 500 kW M.C.R. turbo-alternators and condensing plant. Specification, etc., from Mr. H. Bell, Electricity Works, Sculcoates, Hull; deposit £2 2s. to City Treasurer, Guildhall, Hull.

W.O.B. CLUB RAIDED.

THE ELECTRICIAN learns that a raid has been carried out by members of the electrical trade on the premises of the W.O.B. Club in Savoy Street, Strand, London. No cash was abstracted, but a number of valuable documents relating to an anti-gas campaign was taken. It is understood that the documents in question have a definite cash value.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 21st.—One year's supply of cables, electricity meters, oil circuit-breaker switches, transformers, etc. Specification, etc., from the Town Clerk,, Municipal Offices, Upper Street, N.1.

NORTH BRITISH ALUMINIUM CO., LTD., February 1st.—Construction, delivery and erection at the company's power house, near Fort William, Inverness-shire, of (1) water turbines (impulse type) (specification No. 100); and (2) direct-current generators (specification No. 101). Specifications, etc., from the company's offices, Adelaide House, King William Street, London, E.C. Preference will be given to contractors on the King's Roll.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

VICTORIAN GOVERNMENT RAILWAYS, December 29th.—Electric rivet heaters. (Reference B.X. 3 014.)

SOUTH AFRICAN RAILWAYS AND HARBOURS, December 30th.—Switchgear, cables and transformers. (Reference B.X. 3 040.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 1st.—Supply and erection at site of Seru pumping and power station of four Diesel engine alternator groups, three pumps and accessories. Specification (10s. 6d.) from Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1.

INDIA STORE DEPARTMENT, January 4th.—Supply and erection of overhead equipment (1 500 V) and steel structures for about 140 miles of railway route, in connection with the Great Indian Peninsula Railway electrification. Specification (£2) from the Director-General, Branch No. 10, Belvedere Road, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 4th.—Supply of switchgear and transformers for Waikaremoana electric power scheme. (Reference B.X. 2 872.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 4th.—Bells and buzzers (schedule C.147). (Reference B.X. 2 984.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 10th.—Electrical generating plant, for the Survey Department, Giza, Cairo. (Reference B.X. 3 079.)

SYDNEY CITY COUNCIL, January 10th (extended date).—High and low tension cables (contract 1 057). (Reference B.X. 2 950.)

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JOHANNESBURG MUNICIPALITY, January 13th.—Supply of 10 miles of 4/0 s.w.g. round section h.d. copper trolley wire. (Reference A.X. 3 938.)

CHINA, January 15th.—Turbo-generators, condensers, boilers, switchgear, transformers, etc. Tenders are invited by a Chinese company holding a concession for water and electricity supply. (Reference B.X. 2 998.)

NEW ZEALAND GOVERNMENT RAILWAYS, January 17th.—Switchgear, cables, motor-generators, lamps, etc. (Specification E.14.) (Reference B.X. 3 020.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 18th.—Transmission line steel towers for Waikaremoana electric power scheme (section 31). (Reference A.X. 3 732.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 18th.—Switchboard cable (schedule C.151). (Reference B.X. 3 013.)

NEW ZEALAND POST AND TELEGRAPH DEPARTMENT, January 19th.—Electric bells and tumbler switches. (Reference B.X. 3 011.)

STATE ELECTRICITY WORKS, MONTEVIDEO, January 19th.—Supply of 100 500 metres of 250 V wires and cables. (Reference B.X. 3 042.)

JOHANNESBURG MUNICIPALITY, January 20th.—Supply of electric lamps. (Reference B.X. 3 112.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, January 20th.—Electric railway car equipments, including motors, control equipment, air compressors, etc. Specification (No. 1 065) from the Chief Mechanical Engineer, Wilson Street, Redfern, N.S.W.

STATE ELECTRICITY WORKS, MONTEVIDEO, January 24th.—Supply of 220 V cables, telephone cables (20-pair) and branch and terminal boxes.

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 25th.—Telephone transmitters and parts. (Reference B.X. 3 012.)

POSTS AND TELEGRAPHS DEPARTMENT, MELBOURNE, January 25th.—Telephone receivers and associated parts (schedule No. C.153). (Reference B.X. 3 041.)

NEW SOUTH WALES GOVERNMENT RAILWAYS AND TRAMWAYS, January 26th.—Manufacture and supply of electric train equipment for 105 motor cars and 100 trailer cars. (Reference A.X. 3 810.)

STATE ELECTRICITY WORKS, MONTEVIDEO, January 28th.—Supply of 923 000 metres of special wires and cables for outdoor use.

NEW ZEALAND GOVERNMENT RAILWAYS, January 31st.—Electrical equipment for Otahuhu car and wagon workshops. (Reference B.X. 3 038.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 1st.—Storage battery and booster for Waikaremoana Electric Power Board (section 28). (Reference B.X. 2 937.)

NEW SOUTH WALES GOVERNMENT RAILWAYS, February 2nd.—One 30-ton five-motor electric overhead travelling crane.

PRETORIA MUNICIPALITY, February 3rd.—Cable and accessories, switches and cut-outs. (Reference B.X. 3 097.)

NEW ZEALAND GOVERNMENT RAILWAYS, February 14th.—Switchgear, armoured cable and accessories, motor-generator sets, incandescent lamps and reflectors. (Reference B.X. 3 078.)

NEW ZEALAND PUBLIC WORKS DEPARTMENT, February 15th.—Transformers for Waikato (section 207). (Reference B.X. 2 985.)

DUNEDIN (N.Z.) MUNICIPALITY, February 19th.—Motor-generator, with control board and accessories, for the Gas Department. (Reference B.X. 3 095.)

Tenders Accepted.

LONDONDERRY CORPORATION.—English Electric Co., Ltd., e.h.t. switchgear, £302 10s.

INDIA STORES DEPARTMENT.—F. C. Osler and Co., Ltd., electrically-driven pumps, Rs. 20 244.

KENT COUNTY COUNCIL.—J. W. See and Sons, wireless installation for Mental Hospital, Barming.

OHIO RIVER EDISON CO., TORONTO.—International Combustion, two Raymond 15-ton super mills, with conveying equipment.

BURTON-ON-TRENT CORPORATION.—Johnson and Phillips, Ltd., for extension of South Derbyshire mains to Woodville, £19 829 3s. 6d.

ADMIRALTY.—General Electric Co., Ltd., 200 000 Osram gasfilled and vacuum lamps; 15 000 special Robertson carbon filament lamps.

METROPOLITAN ASYLUMS BOARD.—Synchronome Co., Ltd., repair of electric clock system at Queen Mary's Hospital, £179 (recommended).

WOLSTANTON EDUCATION COMMITTEE.—E. M. Evans and Son, Ltd., electric light and power installation at new Boys' Secondary School, £1 197.

HACKNEY (LONDON) BOROUGH COUNCIL.—Chloride Electrical Storage Co., Ltd., renewal of battery of electric vehicle, £239, minus £33 for old battery.

WALTON-ON-NAZE URBAN DISTRICT COUNCIL.—J. Godden and Co., cable, £854, less 2½ per cent.; W. T. Henley's Telegraph Works Co., Ltd., pillars, £206.

PHŒNIX UTILITY CO. (for HOUSTON LIGHT AND POWER CO., HOUSTON, U.S.).—International Combustion, Lopulco furnace equipment for 1 650 H.P. Stirling boiler.

WATFORD RURAL DISTRICT COUNCIL.—J. W. Russell, for electric light installation at 20 cottages at Herne Road, £109. Other tenders: Lockwood and Thornton, £190 10s.; C. Attwood, £115.

EAST GRINSTEAD URBAN DISTRICT COUNCIL.—Johnson and Phillips, Ltd., work in connection with overhead line to Sunnyside pumping station, £3 820. Other tenders: Callender's Cable and Construction Co., Ltd., £3 855 2s. 4d.; W. T. Henley's Telegraph Works Co., Ltd., £3 899 12s. 1d.

HAMMERSMITH (LONDON) BOROUGH COUNCIL.—Stirling Boiler Co., Ltd., supply, delivery and erection of two water-tube boilers, with auxiliary plant and contingent works £31 982 (recommended). Also tendered: John Thompson (Water Tube Boilers), Ltd., £27 266; Clarke, Chapman, and Co., Ltd., £33 647 10s.; Babcock and Wilcox, Ltd., £33 633; Vickers Boiler Co., Ltd., £33 666; International Combustion, Ltd., £38 490.

SWANSEA CORPORATION.—H. N. Kirk, electric light installation at Isolation Hospital, Hill House, Sketty, £1 200. Other tenderers: Alpha Manufacturing and Electrical Co., Ltd., £2 230; D. O. Williams and Co., 2 080; J. Eade and Son, £1 893; Smith and Co., £1 773; Furneaux and Thomas, £1 717; S. Davies, £1 612; Morgan Bros., £1 601; L. S. Roderick and Co.; £1 521; Brightside Foundry and Engineering Co., Ltd., £1 514; L. F. Haddrill and Co., Ltd., £1 438; Page and Stibbs, £1 422; R. Alger and Sons, Ltd., £1 260.

GOVERNMENT CONTRACTS.

Recent Orders for Electrical Machinery, Apparatus and Material.

The following contracts have been placed recently by British Government Departments:—

POST OFFICE.—*Apparatus, Testing, Protective and Miscellaneous:* Walter Jones and Co.; Power Equipment Co., Ltd., and L. Weekes (Luton), Ltd. *Battery Stores:* Accumulators of Woking, Ltd., and Tudor Accumulator Co., Ltd. *Cable, Various:* British Insulated Cables Ltd.; Connolly's (Blackley), Ltd.; General Electric Co., Ltd. (Peel-Conner Telephone Works, Ltd.); Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Pirelli-General Cable Works, Ltd.; and Standard Telephones and Cables, Ltd. *Coils, Loading, to Encase:* General Electric Co., Ltd. *Cords for Telephones:* Phœnix Telephone and Electric Works, Ltd., and Standard Telephones and Cables, Ltd. *Lamps:* A. C. Cossor, Ltd., and Edison Swan Electric Co., Ltd. *Wire, Copper, Enamelled and Silk Covered:* Concordia Electric Wire Co., Ltd.

CROWN AGENTS FOR THE COLONIES.—*Cable:* W. T. Henley's Telegraph Works Co., Ltd. *Conduit:* Key Engineering Co., Ltd., and Braithwaite and Co. *Fans, Ceiling:* Metro-Vick Supplies, Ltd. *Signalling Materials:* Tyer and Co., Ltd. *Switchgear:* Ferguson Pailin, Ltd., A. Reyrolle and Co., and Metropolitan-Vickers Elec. Export Co., Ltd. *Wireless Apparatus:* Siemens Bros. and Co., Ltd., and Marconi's Wireless Tel. Co., Ltd. *Wire etc.:* British Insulated Cables Ltd.

H.M. OFFICE OF WORKS.—*Engineering Services:* Adastral House—Wiring: Electrical Installations, Ltd. Teddington, National Physical Laboratory—Converting Plant: British Thomson-Houston Co., Ltd. Westminster, S.W., Industrial Museum—Wiring: Commercial Telephone and Electrical Co., Ltd. *Miscellaneous:* Cable Wire, etc.: Edison Swan Cables, Ltd., and Ward and Goldstone, Ltd. *Engineering Works:* Teddington Laboratory—Storage Battery: D.P. Battery Co. Ltd.

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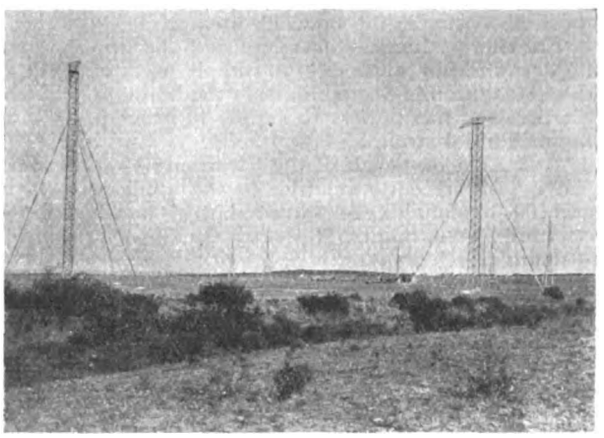
NEWS IN PICTURES

A new portrait of Mr. G. D. Riedel, who, as reported on p. 740, has been appointed European manager of the Delco Light Co.

This dialite bitumen cable made by the St. Helens Cable Co. for a colliery in the Midlands is believed to be the heaviest drumload of bitumen cable ever made. This 0·1 sq. in. 3-core e.h.t. cable is 770 yd. long, the overall diameter being 4 in., and the total weight 15 tons, of which the drum weighs 2 tons.

Mr. L. M. Ericsson, founder of the telephone manufacturing firm bearing his name, died last Friday, aged 80 years (see p. 740).

Studio "effects" used at the American G.E.C.'s broadcasting station (WGY) to imitate the noise of a train. The ingredients are a bell, a whistle, a flour sieve, a pair of roller skates, two boards covered with sandpaper, and a metal plate.



The Portuguese Marconi Co.'s wireless receiving station at Vendas Novas, near Lisbon, which was opened last Wednesday, with a direct high speed wireless service to London. There are two sets of masts carrying Marconi short wave beam aerials. There is also a group of four Bellini-Tosi directional receiving aerials.

An electrically-driven exercising machine for ladies desirous of becoming slimmer.

Considerable extensions at the Glasgow branch of the General Electric Co., Ltd., completed last week, have allowed provision to be made for the equipment of a model electric home. Here is a view of the electrically-equipped drawing room.

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ELECTRICITY SUPPLY.

Inquiry into Douglas Proposals—Deficits at Poplar and Edinburgh to be Met by Increased Charges—L.C.C. on Dual Theatre Lighting.

CARLISLE T.C. received sanction to a loan of £10 000 for mains and services.

Whitehaven T.C. has received sanction to a loan of £1 290 for electricity mains.

Hucknall Torkard (Notts) Council Chamber was lighted electrically for the first time last week.

Workington Electricity Committee has reduced the charge for electricity for heating purposes from 3d. to 2d. per kWh.

Hull Electricity Committee recommends the Corporation to apply for an Order to supply electricity to Beverley and Cottingham.

Northampton T.C. has received the approval of the Ministry of Health to a proposal to instal electric light at Harborough Road Hospital.

Experimenting with Cookers.

Gillingham (Kent) T.C. has decided to purchase 12 electric cookers, as an experiment, and a report on results is to be made six months hence.

Notwithstanding heavy charges due to the coal dispute, Exeter Electricity Committee has decided not to make any increase at present in electricity charges.

The Minehead Electric Supply Co. proposes to ask the Electricity Commissioners to dispense with the consent of Watchet U.D.C. to the company's application for an Order to supply electricity in the Council's area.

The Electricity Commissioners refused the application of Darlington T.C. for authority to supply electricity to the parish of Houghton-le-Skerne, outside the borough boundary. The Corporation has powers to supply in other parts of the Darlington rural district.

Col. T. C. Ekin, on behalf of the Electricity Commissioners, held an inquiry recently relative to the application of the Douglas (Isle of Man) T.C. for leave to borrow money to extend the electricity undertaking. Recently the Council decided to adopt steam-driven plant.

The total deficit on the Poplar (London) electricity undertaking to the end of September was £18 115. Increases in charges for energy have been authorised, and it is estimated that the amount of the deficit will be recovered by this means by the end of the financial year in March next.

Alderley Edge U.D.C. has decided to ask the Ministry of Transport to institute a public inquiry with a view to reducing the present maximum prices charged for electricity by the Alderley and Wilmslow Electric Supply, Ltd., from 10d. to 7d. per kWh for lighting, and 3d. for heating and power.

Richmond (Yorks) T.C. has decided to extend the mains, in order to give a supply to the Convent of the Assumption, on an undertaking that a supply will be taken equivalent to a return of 20 per cent. on the outlay involved, estimated at £300. The cable will also feed premises on a site in Reeth Road.

The deficit on the Edinburgh electricity undertaking amounts to £95 000, and the Electricity Committee is recommending an increase of the charge for electricity for lighting from 4d. to 4½d. per kWh, the expectation being that this will result in the extinction of the deficit by the end of the financial year, in May next.

Torquay Developments.

Torquay T.C. has applied for loans of £2 212 for circulating water screens at Newton Abbot power station; £285 for metering equipment, and £731 for main transmission line for Teignmouth bulk supply; and £25 415 17s. for cable, stations and switchgear in connection with a ring main from Newton Abbot power station to Paignton.

At the last meeting of Largs T.C. it was intimated that an agreement had been signed between the Ayrshire Electricity Board and the Council, under which the burgh will be taken into the county area of supply. The Board will distribute direct to consumers, and the charges for electricity in Largs will be the same as those throughout the area of supply.

Col. Moore Brabazon, Parliamentary Secretary to the Ministry of Transport, speaking at the Junior Constitutional Club last week, said the number of stand-by plants would be reduced as a result of the passing of the Electricity Bill, and the standardisation of frequency would come into operation just in time. In a few years it would have become impossible, as it had done in America. Agriculture would assuredly come in for its share of the benefits accruing under the new Act.

When application was made recently to St. Austell R.D.C. by the St. Austell District Electric Light Co. for permission to erect poles and overhead lines for the purpose of supplying Tywardreath with electricity, the Council, by a majority of two votes, refused permission for the erection of overhead poles and lines, but intimated that there would be no objection to underground cables. One of the members said he understood the proposal was to bring electricity not only to Tywardreath but to other places in the district.

The Theatres and Music Halls Committee of the London County Council reports that it attaches importance to the retention of the dual system of electric lighting in places of public entertainment and the keeping of the two supplies entirely separate under any scheme for linking up the sources of generation in London. The fact that an alternative main supply could be brought into operation would not prevent a break in the continuity of the lighting, and the requirements of the licensing authorities would, consequently, not be complied with.

At a recent meeting of Portadown U.D.C. the chairman, Mr. S. R. Henry, suggested that it might not be advisable to proceed with the new electric generating station, in view of the proposed Bann power scheme. Mr. Brown said no doubt the Bann scheme would go on, and he proposed that the building of the new station should be deferred for a year. Mr. Lynch said that the Bann scheme had been talked of for ten or twelve years, and he thought it would end the same way as before. The resolution to defer the new station for another year was passed.

Work has been commenced at the Hayle Power station in connection with an extension scheme by the Cornwall Power Co. A new engine and boiler house is being erected at the works to accommodate a 10 000 H.P. turbo-alternator, which, with three boilers, each capable of evaporating about 20 tons of water per hour, is on order. With the new plant, the capacity of the station will be raised from 9 700 kW to 17 200 kW. An additional main will be carried to the tin mining area, to serve districts at present untouched. Steps are also being taken to construct new mains from Carn Brea to St. Agnes to serve mines in that neighbourhood, and in the coming spring the mains are to be extended to Truro.

Electrical Engineers' Ball.

List of Executive and General Committees for Forthcoming Dance.

FOR the eighteenth Electrical Engineers' Ball, to be held in London on February 11th next, the following have agreed to serve on the general and executive committees:—

GENERAL COMMITTEE.—Sir T. O. Callender, Dr. S. Z. de Ferranti, Sir Arnold Gridley, Sir Hugo Hirst, Sir James Kemnal, Lt.-Col. F. A. Cortez Leigh, Sir Philip Nash, Sir William Noble, Col. T. F. Purves, Sir John Snell, Sir George Sutton, and Messrs. G. L. Addenbrooke, H. Alabaster, G. H. Alabaster, Leonard Andrews, Ll. B. Atkinson, O. H. Baldwin, George Balfour, M.P., J. H. Bowden, R. A. Chattock, A. C. Cramb, A. J. Cridge, H. W. Couzens, T. C. Elder, H. W. Fairman, E. J. Fox, E. Gatehouse, Frank Gill, M. M. Gillespie, James Gray, J. P. Gregory, A. E. Hadley, J. S. Highfield, C. W. Hill, P. V. Hunter, R. W. Hughman, M. J. D. Kerr, J. E. Kingsbury, C. M. Knight, H. M. Leaf, W. Stanley Lonsdale, J. J. McGregor, A. E. McKinstry, H. J. S. McKay, Wm. McClelland, P. V. McMahon, A. V. Mason, W. Lee Matthews, H. E. Midgley, W. M. Mordey, E. W. Moss, F. H. Nalder, E. S. New, G. W. Partridge, F. Pooley, M. J. Railing, G. E. Riley, L. L. Robinson, F. M. Rogers, P. F. Rowell, C. E. Sayer, H. Scholey, E. H. Shaughnessy, H. C. Siddeley, A. M. Sillar, C. D. Taite, G. M. C. Taylor, James Taylor, J. M. G. Tresize, R. J. Wallis-Jones, A. H. Walton, David Wilson, W. B. Woodhouse, F. E. Worsdell.

EXECUTIVE COMMITTEE.—Messrs. O. H. Baldwin, H. W. Couzens, C. W. Hill, J. E. Kingsbury, W. S. Lonsdale, P. V. McMahon, A. M. Sillar, R. J. Wallis-Jones, and A. H. Walton.

The hon. secretaries are Messrs. A. M. Sillar and C. W. Hill. Mr. J. E. Kingsbury is hon. treasurer.

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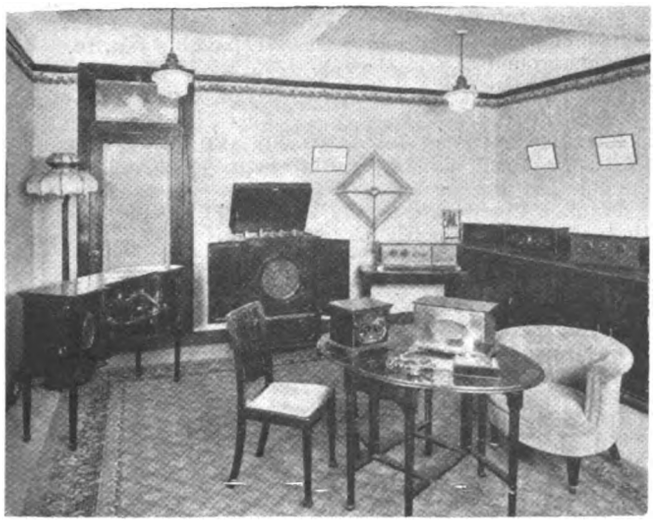
WIRELESS NEWS.

Wireless Retailers' Association and the R.M.A. Dealers' Proposals.

SURPRISE is expressed by members of the Wireless Retailers' Association at the decision of the Radio Manufacturers' Association (reported in THE ELECTRICIAN last week) to make a grant of £400 to the old N.A.R.M.A.T. Retailers' Sectional Executive for the purpose of forming a new Retailers' Association and to provide office accommodation for this Association for a period of one year.



A corner of the new radio showroom at the Glasgow branch of the G.E.C.

In conversation with a representative of THE ELECTRICIAN, Mr. A. H. Clifford, one of the joint hon. secretaries of the Wireless Retailers' Association, pointed out that in the four years during which the W.R.A. has been in existence it has staunchly upheld the interests of retailers, and has fought for the principle of one association for each section of the industry. One of its chief criticisms of the N.A.R.M.A.T. was that a composite arrangement of associations militated against complete independence, and was, therefore, not in the best interests of the retail trader.

"I have always understood," said Mr. Clifford, "that one of the leading principles of the Society of Radio Manufacturers was that there should be one association for each section of the trade. Yet one of the first actions of the R.M.A. is to promote the formation of another retailers' organisation."

Mr. Clifford added that the W.R.A. was an entirely independent body, and as such was best qualified to protect the interests of wireless retailers. It had worked hard for the improvement of discounts for retailers, and was now launching a campaign with a view to stopping the granting of trade discounts to people outside the trade.

There has been a rumour that the Aberdeen, Bournemouth and Newcastle broadcasting stations were closing down. An official of the British Broadcasting Co. has stated, however, that the B.B.C. knows nothing about it.

British Industries Fair.

Representative Delegations from Electrical Associations.

THE Birmingham Executive of the British Industries Fair reports that wholesale and retail organisation in practically every section have decided to send representative delegations to that section of the Fair next February. Among the bodies to be represented by the official delegations are the Association of Consulting Engineers (Inc.), Association of Electric Power Companies (Inc.), Association of Mining Electrical Engineers (Inc.), British Electrical Development Association, Electrical Contractors' Association, Electrical Power Engineers' Association, Electrical Wholesalers' Federation, Ltd., Illuminating Engineering Society, Incorporated Municipal Electrical Association, Institution of Electrical Engineers, Municipal Tramways and Transport Association, National Association of Supervising Electricians and National Federation of Electrical Associations. The total of trade visitors is expected to be well over half a million.

LEGAL INTELLIGENCE.

Tramway Company's Claim Against Aberdeen Corporation.

A SUMMONS against Aberdeen Corporation has been presented by the Aberdeen Suburban Tramways Co., for the payment of £26 800 for alleged loss and damage as a result of the operations of the Corporation in connection with the construction of a new aqueduct from Invercannie to Mannofield. The matter has been remitted to the Finance Committee of the Council.

Mr. Dalrymple and Telegram Charge.

A charge of forging and uttering a telegram was preferred against Mr. James Dalrymple, general manager of the Glasgow Tramways, in the Glasgow Sheriff Court last Saturday. It is alleged that Mr. Dalrymple sent a telegram on June 29th in the following terms: "Reply prepaid—Aquacora, London —Kindly wire dates I was in your hotel in November last, between 4th and 12th.—William Reid, Trams, Glasgow." The solicitor for the defence submitted that a typewritten document was not a forgery, and the telegram in question was typewritten. Sheriff Mercer said he would take time to consider the point, and adjourned the case till December 31st.

Workman Injured by Touching Live Wire.

In the Sheriff Court, Dumbarton, recently, a charge was made at the instance of H.M. Inspector of Factories against Messrs. D. and J. Tullis, engineers, Clydebank, that on a specified date they were in breach of the Factory and Workshops Acts in relation to the regulations dealing with the use of electricity in the factory; that the electric control wires for the overhead crane in the new foundry were not so worked as to prevent danger so far as reasonable and practicable; and that in consequence of such neglect a painter named James Adie suffered bodily injury. Defendants admitted the offence.

Mr. Lauder, factory inspector, said Adie, who was, at the time, working with another painter painting steel girders, touched a live wire with his right hand. The power was cut off immediately, but Adie fell to the ground unconscious. After artificial respiration was resorted to the man came round. The current was 440 V a.c. and it was somewhat of a miracle the man escaped death. The wires should have been dead when men were working near them. Sheriff Menzies imposing a fine of £50, with 25s. expenses, said the precaution pointed out in the charge was a simple and an effective one.

Complaint by Unlicensed Wireless Listener.

At Stratford (London) Police Court on Saturday Arthur Frank Harrison, a wireless dealer, of Cavendish Drive, Leytonstone, was summoned for working a wireless apparatus without a licence. It was stated that a complaint was received from a number of people respecting oscillation, and defendant signed it. When his house was visited it was found that he had a wireless set and no licence. Harrison pleaded that he had a licence for a receiving set at his shop and did not think he had to have one for that at his home. A fine of £2 was imposed.

Electric Traction.

News of Latest Tramway and Electric Railway Developments.

EXTENDED facilities for the London County Council tramways' shilling all-day tickets allow holders to travel over 182¼ miles of route, changing when and where desired.

Leamington T.C. has decided to make a strong representation to the Leamington and Warwick Electrical Co., that there should be a general reduction of tramway fares between Warwick and Leamington.

The Thurnscoe and Wombwell Councils are in favour of, while the Wath-upon-Dearne Council is opposed to, the application of the Mexborough and Swinton Tramway Co. for an Order to run a trolley omnibus service in the Councils' districts. The Bolton-upon-Dearne Council has the matter under consideration.

The Metropolitan-Vickers Electrical Co. have secured the contract for the complete electrical equipment of the passenger service on the central section of the Southern Railway's suburban system. The contract is for £603 500, and is the biggest contract for complete electrical railway equipment ever placed with one firm in this country.

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COMPANY NEWS.

Holiday Approach Reflected by Easing Off of Activity—Supply Shares and Bonus Anticipations—Strong Position of Cable Shares.

WITH the approach of the Christmas holidays the renewal of activity in the market for electrical shares has somewhat eased off, and the only real feature calling for notice has been the selling of Marconi's Wireless shares, the quotation for which has fallen half-a-crown to 13s. 9d. Buyers were in evidence, however, at the lower figure. Eastern Telegraph ordinary stock has also fallen a couple of points. City of London Electric suppiy shares fell 3s. on bonus anticipations. In the manufacturing group, Henley's and Callender's maintained their higher level, and Johnson and Phillips and Siemens each put on 1s. 3d. General Electrics are 6d. up at 31s. and Thomson-Houston 7 per cent. debentures have gained a point.

Last Annl. Divd	Description.	This Week.	Last Week	1912 to 1925. Highest.	Lowest.
%	**Electricity Supply.**				
10	Brompton & Kensington Ord. ..	30/-	30/-	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	89	89	100	67
15	Charing Cross Elec. Ord. (£1) ..	25/-	25/-	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	25/-	25/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	42/6	45/7½	52/6	20/3
6	,, ,, 6% C.P. ..	23/-	23/-	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	62/6	62/6	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£1)	24/-	24/-	104/6	3/-
10	Lon. Elec. Sup. Ord. (£1) ..	34/-	34/-	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	39/4½	39/1½	41/6	8/-
4½	,, ,, 4½% C.P. ..	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/-	22/-	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/9
17½	St. James' & P.M. Ord. (£1) ..	24/-	24/-	62/-	22/-
15	W'minster Elec. Sup. Ord. (£1)	24/6	24/6	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
6	,, ,, 6% C.P. ..	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	144½	144½	123	24
6	,, ,, 6% Pf. Stk. ..	109	109	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd.)	69	69	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	78	77½	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	57½	57½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	76½	76½	89	65
4	Lon. Un. Trams. 1st Deb. ..	42½	42½	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	65½	65½	101½	49
5	,, ,, 5% Deb. ..	66½	66½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	63	63	84½	19
3½	,, 3½ Pf. Stk.	63½	63½	88½	40½
3½	,, 3½% Deb.	70½	70½	92½	51
3½	Met. Dis. Rly. Ord. Stk. ..	56½	56½	58	12½
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb. ..	68	68	73½	48½
5	Yorks. (W.R.) Trams. Ord. ..	12/6	12/6	27/-	1/-
4½	,, ,, ,, 1st Deb.	69	66	87	52
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	67/6	67/6	62/-	26/6
6	,, ,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	22/3	22/3	23/4	19/7
7	,, ,, ,, 7% Deb.	106½	105½	107½	92
10	Brush Electrical Ord.	26/3	26/3	29/-	10/-
‡15	Callender's Cable Ord.	68/9	68/9	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref.	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)	12/9	12/9	28/9½	1/11
7½	,, ,, 1st Pref. ..	22/6	22/6	26/-	5/-
10	Elec. Construction Ord. ..	31/3	31/3	30/4	6/7
7	,, ,, 7% C.P. ..	22/6	22/6	25/3½	16/-
—	English Elec. Ord.	15/-	15/-	29/3	7/3
6	,, ,, 6% C.P. ..	17/6	17/6	21/3	10/6
—	Ericsson Telephones 7% Pref.	21/10½	21/10½	21/-	12/7
6	Ferranti 6% Pref.	19/3	19/3	18/6	16/9
7	,, 7% 2nd Pref. ..	18/9	18/9	19/-	13/9
7½	General Elec. Ord.	31/-	30/6	59/-	13/6
20	W. T. Henley's Ord.	87/6	87/6	86/6	23/3
17½	Johnson & Phillips Ord. ..	60/-	58/9	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	23/9	23/9	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	46/3	46/3	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	30/-	28/9	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	29½	29½	56/2/6	19
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	74	74	87½	60
10	Eastern Ord. Stk.	178½	180½	213½	113/2/6
3½	,, 3½% Pref. Stk. ..	65½	65½	84/17/6	49
4	,, 4% Deb.	77½	77½	103½	60
10	Eastern Extension Ord. (£10) ..	18	18	21½	10/12/6
4	,, ,, 4% Deb. ..	77½	77½	97½	60
22	Gt. Northern Telegraph (£10) ..	27	27	42/12/6	19
10	Indo-European (£25)	47½	47½	59½	25
—	Marconi's Wireless T. Ord. ..	13/9	16/3	9/16/3	20/9
7½	,, Int. Mar.	22/6	22/6	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	17½	17½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	77½	77½	10	60/2/6

‡ Plus share bonus.

WESTERN UNION TELEGRAPH CO.—Regular qrly div., $2.

BENN BROTHERS, LTD.—Intm. div. 6¼ p.c., less tax, payable Jan. 1.

NORTHERN MEXICO POWER AND DEVELOPMENT CO.—Div. 1 p.c. on common stk., payable Jan. 15.

CHILI TELEPHONE CO., LTD.—Intm. div. at rate of 6 p.c., p.a., tax free, on ord. shs., payable Jan. 15.

SHAWINIGAN WATER AND POWER CO.—Div. of $2 p. sh. on common shs. for qr. ended Dec. 31, payable Jan. 10.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—Half-yr.'s div. on 7 p.c. cum. pref. shs. payable Jan. 1, in respect of ½-yr. to Dec. 31.

EASTERN EXTENSION, AUSTRALASIA AND CHINA TELEGRAPH CO., LTD.—Intm. div. for 3 mos. to Sept. 30, 1926, 5s. p. sh., payable Jan. 15.

ITALIAN COMPANY'S NEW YORK ISSUE.—It is reported that the Terni Electric Co., Genoa, is about to issue a $5 000 000 loan in New York.

ANGLO-ARGENTINE TRAMWAYS CO., LTD.—Div. 2s. 9d. p. sh. less tax, on 5½ p.c. cum. 1st pref. shs., and 3s. p. sh., less tax, on 6 p.c. 2nd pref. shs. for ½-yr. to Dec. 1, payable Jan. 1.

EASTERN TELEGRAPH CO., LTD.—Div. at rate of 3½ p.c. p.a., less tax, on pref. stk. for qr. to Dec. 31, and 3rd qrly. intm. div. 2½ p.c. on ord. stk., tax free, in respect of pfts. for 1926, both payable Jan. 15.

AMERICAN MONEY FOR ITALIAN COMPANIES.—The "Financial Times" states that recent additions to borrowers from America are the Edison Electric Co., Societa Lombarda Distribuzione Energia Elettrica, and Montecatini Mining and Chemical Co. The loan to the Montecatini Co. is expected to amount to $25 000 000.

SOCIÉTÉ INTERNATIONALE D'ENERGIE HYDRO ELECTRIQUE (SIDRO).—Meeting was to be held in Brussels on Wednesday to consider proposals to increase cap. to 200 000 000 fr. and to issue 11 250 pref. and 11 250 ord. shs. to International Holdings and Investment Co. in exchange for 7 500 7 p.c. $100 pref. shs. of Barcelona Traction Light and Power Co.

FULLER'S UNITED ELECTRIC WORKS, LTD.—Mr. John Mann (recr. and mgr.) announces that he has now disposed of accumulator department and cable and wire department of business, and that as from Dec. 14 he is not responsible for goods ordered for these departments from that date. Fuller Accumulator Co., (1926), Ltd., has purchased the accumulator department, and Metropolitan Electric Cable and Construction Co., Ltd., the cable department. The ebonite and carbon black departments are still for sale, and the recr. and mgr. remains responsible for goods ordered by his authority for those departments.

New Companies.

LOUIS SAMUEL, LTD.—Cap., £500. Wireless set manufacturers and salesmen, etc. Reg. office: 54, Gracechurch Street, London, E.C.

R. L. IRVINE (1926), LTD.—Cap., £300. To acquire business of Electric Power Units, etc. Reg. office: 47, Oswald Street, Glasgow.

TEMPTER, LTD.—Cap., £1 000. Motor electricians, ignition specialists, etc. Reg. office: 8A, Clare Terrace, Earls Court, London, S.W.5.

WESLEY AND CLARK ENGINEERING CO., LTD.—Cap., £4 000. Electrical engineers, etc. Reg. office: Acton Lane (opposite Park Royal Hospital), Harlesden, London, N.W.10.

BURKE AND CO., LTD.—Cap., £1 000. To acquire business of electrical engineers lately carried on by B. Burke and W. Burke, trading as Burke and Co., at 55, Stamford Street, Old Trafford, Manchester.

IRONSIDE, SON AND CO., LTD.—Cap., £5 000. Suppliers of electricity, manufacturers of and dealers in railway, tramway, electric, magnetic, galvanic and other apparatus, etc. Solicitor: T. G. New, 6, Market Street, Leicester.

ELECTRIC DRIERS, LTD.—Cap., £2 000. To acquire the benefit of certain existing inventions in relation to the drying or curing by electrical process of tea, coffee, tobacco, etc. Reg. office: 30, Grosvenor Gardens, London, S.W.1.

ABBA ELECTRICAL CO., LTD.—Cap. £2 000. Manufacturers of, agents for and dealers in electrical, radio and mechanical appliances, illuminated and other advertising signs, etc. Reg. office: Abba Works, Engine Street, Smethwick.

A. MELVILLE SIDLEY, LTD.—Cap., £1 000. Manufacturers of and dealers in wireless and electrical instruments, apparatus, accessories, machines and materials, electricians, electrical engineers, etc. Reg. office: 320, Foleshill Road, Coventry.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts They may be for actions. But the Registry makes no distinction Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

ALBION ELECTRICAL CO., 112, Albion Street, Wallasey, electrical contractors. £13 17s. 0d. November 16th.

APPLE, Mr. B., 87, Tottenham Court Road, W., electrical dealer. £10 15s. 11d. November 8th.

BAKER AND CO. (DONCASTER), LTD., 27, High Street, Doncaster, electrical engineers. £22 12s. 8d. November 9th.

BROWN, Humphris, 3, Swan Street, Littlehampton, wireless factor. £26 12s. 3d. November 4th.

DILLISTONE, St. John, 21, Sackville Road, Bexhill-on-Sea, electrical dealer. £11 7s. 2d. November 8th.

FLEET ELECTRIC CO., LTD., Hind Court, Fleet Street, E.C., dealers. £15 1s. 2d. November 8th.

KEMP, Mr. J. T., 13, Derby Road, Nottingham, electrical wholesaler. £20 8s. 4d. November 9th.

KIRBY, Mr. A. J., Whitchurch, wireless dealer. £23 14s. 10d. November 8th.

LAMB AND CO., Ronald Park Avenue, Westcliff-on-Sea, electrical engineers. £20 10s. 3d. November 18th.

STANDARD ELECTRICAL ENGINEERING CO., 39, Eastcheap, E.C., electrical engineers. £30 7s. 4d. November 10.

Private Meetings, etc

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

CHRISTIE, Bessie Anna, widow, trading as J. C. CHRISTIE, 3/5, Mansell Street, London, wholesale wireless and electrical contractors. A largely attended meeting of the creditors was held on December 17th, when a statement of affairs prepared by Trenchard Hay and Co., C.A., 22, Basinghall Street, E.C., was presented, showing liabilities of £8 674 (£5 860 due to the trade and £2 814 to cash creditors), against total assets estimated at £8 474, from which have to be deducted preferential creditors £542, leaving net assets of £7 932, or a deficiency of £742. The accountant also mentioned that there were no private assets belonging to the debtor outside the business. In 1922 a profit was made of £3 600, but of that amount £1 600 was a refund by way of excess profits duty. Since then the firm had always made a loss: £1 400 in 1923; £1 600, 1924; 1925, £1 600; and in 1926, June 30th, £1 100. These losses included the drawings of the debtor, which during recent years had averaged £500 per annum. The turnover averaged between £26 000 and £30 000 a year. A deed of assignment was executed in favour of Trenchard Hay and Co., on 10th November. Several writs had been issued, but no judgments had been obtained. The deed was confirmed subject to a committee being appointed and to the chairman of the meeting, Mr. E. H. Hawkins, being appointed joint trustee. The committee of inspection consists of Suggs and Co., creditors for £291; Fletcher Russell, Ltd., (£179); Norman Pearson, (£167); London Scottish Foundry Co. (£117); and Mr. Ball, representing creditors.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Companies Winding-up Voluntarily.

ALPHA ELECTRIC AND OXY ACETYLENE WELDING CO., LTD. F. Reed, Westgate Chambers, Newport, Accountant, appointed liquidator, December 3rd.

STRATHPEFFER AND DINGWALL ELECTRIC CO., LTD. By special resolution, passed 26th November, confirmed 13th December. C. G. Macdowall, chartered accountant, Dingwall, appointed liquidator. Meeting of creditors in the offices of C. G. Macdowall, C.A., 4, Tulloch Street, Dingwall, on Wednesday, December 29th, at 12 noon. (Formal notice). All creditors have been or will be paid in full.

Bankruptcy Information.

DONOVAN, Daniel Timothy, and LANGLOIS, Herbert Augustus, trading as the LONDON ELECTRICAL CO., 119, St. Mary Street, Cardiff. Receiving order, December 13th. Debtor's petition.

Bankruptcy Proceedings.

McMAHON, Albert James, 51, St. Thomas Street, Weymouth, and Melcombe Regis, Dorset, electrical contractor. The public examination of this debtor was held recently at Dorchester. The statement of affairs showed liabilities of £704 and the net assets were estimated at £481, a deficiency of £223. It appeared that debtor commenced business as an electrical engineer in July, 1922, with £500 capital, his own money, in partnership with another. It was stated that the partner provided nothing as cash capital on going into the business, and in December, 1923, the partnership was dissolved, debtor taking over the liabilities. Early in November a meeting of the creditors was called, but was cancelled as a result of debtor filing his petition. A bill of sale was given by the debtor dated October 18th, 1926, covering his household furniture and effects, to secure a loan of £60, advanced by a firm of professional moneylenders, and it was stated that the money obtained was employed in paying pressing creditors, five having obtained judgments and levied executions. The examination was closed.

PARRIS, Harold Edward, trading as the ST. GEORGE'S ELECTRICAL MANUFACTURING CO.), 134, Upper Thames Street, London, E.C., and late of 20, High Street, Sydenham, S.E. The affairs of this debtor, who was adjudged a bankrupt in January, 1905, came before Mr. Registrar Mellor in the London Bankruptcy Court last week on the hearing of his application for an order of discharge. The Official Receiver in his report on the application stated that the ranking liabilities were returned at £215 and that the assets had realised 37s. In 1900 the debtor began business as an electrical supply factor and two years later opened a small shop in High Street, Sydenham, where he traded under the style above mentioned. In the following year he removed to 134, Upper Thames Street, E.C., where he carried on the business until the date of the receiving order. He attributed his failure and insolvency to lack of capital and to bad trade. He admitted that he was aware of his insolvent condition throughout his trading. The Official Receiver opposed the application on the grounds that the debtor's assets were not of a value equal to 10s. in the £; that he had omitted to keep proper books of account; and that he had continued to trade after knowing himself to be insolvent. His Honour granted the discharge subject to a nominal suspension of one month.

Metal and Chemical Prices.

TUESDAY, December 21st

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£62 15 0	—	10s.
Electro Wirebars	„	£64 15 0	—	—
H.C. Wire, basis	per lb.	9¼d.	—	—
Sheet	„	9⅞d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 0¼d.	—	—
Brass 60/40—				
Rod, basis	per lb.	7¼d.	—	—
Sheet, basis	„	10¼d.	—	
Wire, basis	„	10¼d.	—	
Pig Iron—				
Cleveland Warrants	per ton	£4 10 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	„	£14 0 0	—	—
Lead Pig—				
English	„	£30 10 0	—	5s.
Foreign or Colonial	„	£29 2 6	—	—
Tin—				
Ingot	„	£307 15 0	—	—
Wire, basis	per lb.	3s. 10½d.	—	—
Aluminium Ingots	per ton	£112 0 0	—	—
Spelter	„	£32 12 6	—	7s. 6d.
Mercury	per bottle	£17 12 6	—	—

Sulphur (Flowers)—Ton £12 5 0 *Sodium Chlorate*—Per lb. 2¾d.
„ (Roll-Brimstone)—„ £11 0 0 *Sulphuric Acid* (Pyrites, 168°) per ton, £6 15 0
Copper Sulphate— „ £25 to £25 10s.
Boric Acid (Crystals) „ £37 *Sodium Bichromate*—Per lb. 3¼d
Rubber—Para fine, 1s. 4¼d.; plantation 1st latex, 1s. 6⅝d. to 1s. 6¾d.

The Lead Market.

IN their lead market report dated December 18th, James Forster and Co. state that the week again witnessed a professional market, prices fluctuating within narrow limits. At the close there was a slightly firmer tone, and a further fall of 10 points in the American price to 7.80 on December 15th had little effect on prices in this market.

Although imports during November (18 192 tons) were quite moderate, a large quantity of lead totalling about 16 000 tons has already arrived this month, part of which will, no doubt, go into warehouse. Arrivals during the next few weeks, however, are likely to be on the light side, and should consumption improve after the turn of the year, it is probable that there will not be too much lead to meet any increased demand. Consumers would be well advised to cover their forward requirements at the present level of prices.

Closing prices on December 17th were £29 2s. 6d. for December and £29 7s. 6d. for March.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

230 073 LODGE-COTTRELL, LTD. (LURGI APPARATEBAU GES.) Method of and means for operating mechanically-driven rectifiers in connection with electric transformers. (25/2/25.) (Convention date not granted.)
245 634 FULLER'S UNITED ELECTRIC WORKS, LTD. and A. P. WELCH. [Formers for use in the winding of electric inductance coils. (9/3/25.)
230 497 NAAMLOOZE VENNOOTSCHAP and PHILIPS' GLOEILAMPENFABRIEKEN. X-ray tubes. (10/3/24.)
230 831 SIEMENS-SCHUCKERTWERKE GES. Coating of welding electrodes. (12/3/24.)
245 635 P. C. RUSHEN and SIEMENS-SCHUCKERTWERKE GES. Jacketed welding electrodes. (11/3/25.)

A NOVELTY in the advertising of wiring systems is the introduction of this poster on hoardings throughout the country, particularly in districts where electricity has only recently become available. A miniature edition of the poster has been prepared in showcard form for contractors.

245 637 E. SHIPTON and B. PHILLIPSON. Coil-holders for wireless and like apparatus (16/3/25.)
233 692 AKT.-GES. BROWN, BOVERI ET CIE. Automatic electrode-regulating apparatus for electric furnaces. (7/5/24.)
245 662 G. R. BIMM. Electrically-operated vacuum cleaners (10/6/25.)
245 672 GENERAL ELECTRIC CO., LTD. Electric luminous tubes. (9/2/25.)
238 863 DR. O. T. BLATHY. Alternating-current induction meters. (23/8/24.) (Addition to 201 573.)
245 676 J. BATE and C. A. VANDERVELL AND CO., LTD. Electrical condensers; (21/7/25.)
245 680 DUBILIER CONDENSER CO. (1925), LTD. Combined electrical condensers and resistance uuits, more especially for use in radio circuits. (2/5/25.)
243 673 NATIONAL CARBON CO., INC. Electric flashlights. (1/12/24.)
238 565 DR. W. DALLENBACH. Device for regulating the pressure of mercury vapour in the working chamber of mercury vapour apparatus, and more particularly in mercury vapour rectifiers. (15/8/24.)
245 707 G. WALL and METROPOLITAN-VICKERS ELECTRICAL CO., LTD. Direct current ampere-hour meters. (18/10/24.) (Cognate application, 7 475/25. Divided application on 245 536.)
245 708 P. C. RUSHEN (HAZELTINE RESEARCH CORPORATION). Method of and apparatus for converting electric power. (4/7/24.) (Divided application on 218 675.)
219 321 J. A. TRAYLOR. Electric reciprocating motors. (16/7/23.)
245 810 STANDARD TELEPHONES AND CABLES, LTD Telephone transmitters and receivers and the like. (14/8/24.)
245 829 N. E. DAVIES and W. T. DITCHAM. Wireless transmitters. (13/10/24.)
245 839 P. W. WILLANS. Wireless telephone receiving systems. (14/10/24.)
245 846 BRITISH THOMSON-HOUSTON CO., LTD., and F. W. LEEVERS. Electric heating devices. (15/7/25.)
223 589 WESTINGHOUSE BRAKE AND SAXBY SIGNAL CO., LTD. Electrical discharge devices for use as translating apparatus. (19/10/23.)
245 854 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and W O. PASSMORE. Automatic or semi-automatic telephone systems. (17/10/24. (Addition to 230 006.)

Applications for Patents.

November 22nd.

29 457 C. P. ALLINSON. Wireless signalling.
29 495 BRANDES LABORATORIES, INC. Electromagnetic sound reproducer. (15/7/26, U.S.)
29 467 BRITISH THOMSON-HOUSTON CO., LTD. Motor control systems. (21/11/25, U.S.)
29 493 E. G. BUDD MANUFACTURING CO. Electric welding machines. (24/11/25, U.S.
29 448 H. J. B. CHAPPLE. Holders for resistances, condensers, etc.
29 416 D. O. N. EVANS. Coupling circuit for signalling over electric mains.
29 424 FALKIRK IRON CO., LTD., H. J. KENNARD and A. R. WOOD. Electric cooking apparatus.
29 500 GENERAL ELECTRIC CO., LTD. Manufacture of incandescent lamps. (1/5/26. Germany.)
29 472 M. HEDLUND. Electric heat accumulating ranges.
29 412 J. B. HICKMAN. Radio receiving apparatus.
29 494 R. E. JACOBS. Electric motor frames.
29 471 A. JUST. Thermionic valves. (21/5/26, Austria.)
29 459 I. A. LAUDER. Electric fires.
29 525 MASCHINENFABRIK OERLIKON. Oil-immersed electrical apparatus. (2/12/25, Switzerland.)
29 410 E. PREECE. Electric motor for driving looms.
29 477 J. W. PURKIS. Low frequency transformers.
29 501 J. STEPHENSON. Electric locking and releasing switch.
29 536 F. TRINCHERO. Electric cut-out.

November 23rd.

29 629 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., C. E. BEALE and G. A. BURNS. Telephone systems.
29 608 BRITISH THOMSON-HOUSTON CO., LTD. and C. I. SARJEANT. Electric control systems.
29 593 A. CHALMERS. Globe fitting for electric lamps.
29 636 CHAMBERLAIN AND HOOKHAM, LTD., and S. JAMES. Electricity meters.
29 623 CREED AND CO., LTD., F. G. CREED, R. D. SALMON and C. O. SYMONDS. Telegraph receiving apparatus.
29 655 S. GOWAN, C. H. LAST, METROPOLITAN-VICKERS ELECTRICAL CO., LTD., and C. T. SCARF. Electric control apparatus.
29 613 E. HAEFELEY ET CIE. AKT.-GES. Protective appliance for h.t. transformers (30/8/26, Germany.)
29 607 INTERNATIONAL GENERAL ELECTRIC CO., INC. Electric locomotives. (23/11/25. Germany.)
29 604 A. L. KAVANAGH. Electric primary cells.
29 656 METROPOLITAN-VICKERS ELECTRICAL CO., LTD., and J. F. PERRY. Electrical controlling and distributing system.
20 571 BRUCE PEEBLES AND CO., LTD. Apparatus for converting a.c. to d.c.
29 611 J. W. PICKLES. Electric switch.

November 24th.

29 734 ALLGEMEINE ELEKTRICITATS GES. Registering faults in insulated conductors. (24/11/25, Germany.)
29 720 W. E. BARBER. Electric condensers.
29 700 R. GREAVES. Magnetic separators.
29 673 A. R. HARDWICK. Interlocking device for ironclad switchgear, etc.
29 705 J. T., D. F., T. A. E. and T. E. HAYWOOD. Radio receiving and transmitting instruments.
29 730 INTERNATIONAL GENERAL ELECTRIC CO., INC. Electric welding devices. (24/11/25, Germany.)
29 750 E. J. JOFEH. Disinfection of telephone mouthpieces.
29 677 J. E. KEITH. Apparatus for protecting switch arrangements of electromotor.
29 769 J. MODERN and L. RADO. Electric signalling apparatus. (25/8/26, Austria.)
29 674 A. H. REYNELL. Dynamo-electric machines.
29 748 A. J. STEVENS AND CO. (1914), LTD., and H. TAYLOR. Thermionic valves.
29 652 EDISON SWAN ELECTRIC CO., LTD., and T. W. PRICE. Thermionic valves.

November 25th.

29 864 AKT.-GES. BROWN, BOVERI ET CIE. Electric drive of paper machines. (26/11/25, Germany.)
29 845 AUTOMATIC TELEPHONE MANUFACTURING CO., LTD., and R. W. TARRANT. Electro-magnetic movements.
29 828 A. E. BARTLETT, M.O. VALVE CO., LTD., and J. W. RYDE. Electric discharge tubes.
29 803 J. BOUSFIELD. Electric lighting device.
29 827 A. BROOKES, ERICSSON TELEPHONES, LTD. and F. MCCLARENCE. Lightning arresters.
29 824 A. G. BULLEN. Detecting electrical leakage, etc.
29 812 J. A. CRABTREE. Fittings for wiring systems.
29 858 S. C. DAVEY, J. STONE AND CO., LTD., and A. H. M. J. WARD. Battery boxes, etc.
29 776 K. E. EDGEWORTH. Tuning inductances for high-frequency amplifiers, etc
29 791 ELECTRO-DYNAMIC CONSTRUCTION CO., LTD., and N. PENSABENE. Dynamo-electric machines.
29 855 ELECTRICAL IMPROVEMENTS, LTD., and L. C. GRANT. Electric protective systems. (19/8/25.)
29 817 J. M. D. GAUNTLETT. Supporting devices for electric lamp shades.
29 870 R. J. L. GUYOT. Means of attaching conductors to sparking plugs. (4/12/25, Germany.)
29 862 F. W. HANDLEY, J. LUCAS, LTD., and E. O. TURNER. Electric ignition apparatus.
29 835 R. LANE. Electric alarms.
29 861 J. LUCAS, LTD., and E. O. TURNER. Magneto-electric machines.
29 829 G. C. MARRIS, M.O. VALVE CO. and M. THOMPSON. Thermionic valves.
29 804 E. C. ROOKER. High tension battery eliminators for wireless telephony.
29 755 SOC. FRANÇAISE RADIO-ELECTRIQUE. Thermionic valve generators, etc. (25/11/25, France.)

November 26th.

29 948 BRITISH THOMSON-HOUSTON CO., LTD. (GENERAL ELECTRIC CO., N.Y.). Electric arc cutting.
30 001 E. K. COLE. Supply of current from mains to wireless sets, etc.
29 936 P. P. FLETCHER. Flexible conductors.
29 967 GENERAL ELECTRIC CO., LTD., G. H. IDE and K. J. KAULA. Lamp caps.
29 934 GENERAL RADIO CO., LTD., and G. W. WALTON. Primary batteries.
30 000 D. P. LONG, C. L. PETERS and SIEMENS BROS. AND CO., LTD. Automatic telephone systems.
29 966 SIEMENS-SCHUCKERTWERKE GES. Three-phase transformers.
29 887 J. H. D. WATSON. Electric bed-warmer.
30 021 J. BELL and CROYDON, LTD., and J. W. MASON. Electric heaters.
30 100 A. R. HARVEY. Magneto lead holders
30 014 R. NETTLE. Electric lamp holders.
30 027 S. O'BRIEN AND PARTNERS, LTD., and H. WEBB. Electro-deposition of metals.
30 011 R. M. WILMOTTE. Electric converters, etc.

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THE ELECTRICIAN

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POWER AND THE FUTURE.

ONE of the advantages of railway travelling is that it enables the curious to learn the viewpoints of all and sundry on a variety of weighty and diverting subjects. The other day, for instance, we heard a clergyman express the opinion that science had killed romance, though he was forced to admit that he could not get on without the electric light and that broadcasting had added to the pleasures of existence in a remote parsonage. Being of a peaceful nature we had not the temerity to join in the conversation. Had we done so we might have informed him that, romantically speaking, recent discoveries in physical science far outdistance even the most beautiful conceptions of Greek mythology and that the debt which even the Church owes to engineering is so great that it can never be repaid. For though it may be argued that nowadays life is more complicated, it is certainly more healthy than it was in the age of chivalry; and while certain evidences of the modern widespread dissemination of scientific practice are to be deplored, even these are a great improvement on the consequences of the superstition of the Middle Ages.

In this article we are, however, not so much concerned with the present as with the future. This is a not unusual attitude at the end of a year; and in the closing days of 1926, at any rate, it is pleasanter to look forward than to look back. If we do so we may envisage two things: one the greater use of machinery for carrying out the routine work of existence, and the other the more widespread employment of electricity for driving that machinery. Though electrical engineers generally will welcome this development, there are some people who will not. SAMUEL BUTLER, for instance, bases his famous novel "Erewhon" on the effect on human existence of the increasing use of machinery. It will be remembered that the Erewhonians had tried machinery and had discarded it. As a result they were much happier. This will not be the course taken by the inhabitants of this planet. For we have no doubt that the use of what we conveniently call machinery will increase not only in the factory but in the home. And the effect of this increase on future conditions of existence is a factor which electrical engineers should be the first to ponder and speculate about.

If this is done, it is at once evident in the first place that the factory will tend to become more "mechanicalised" and more and more automatic; and that machinery which may not be essentially electrical, though its operation will only be possible by the use of electricity, will be devised to perform operations which are now done manually. We already have the automatic sub-station, the machinery in which is started up and shut down from a distance. While working, the operation of this plant can be distance-controlled and any mishap that may occur is immediately made known at the control position. The number of diverse factors, which are taken account of in this way, is already extraordinarily large; and to extend this method of operation to the machine shop will be a change in degree rather than in kind. The result will be that all the processes in a machine shop, which now require local human control, will be centralised, with a consequent saving in labour and increase in efficiency.

Objectors may argue that the "human machine" will never disappear. This may be countered by three arguments—economic, sociological and technical. Up till recently, the great advantage of the human machine has been that while it has been relatively inefficient, it has been cheap. That cheapness disappeared some time ago in America and is rapidly disappearing elsewhere. The result is that machinery is now increasingly replacing human labour. That this replacement will continue to the limit cannot be doubted. It will ultimately no longer pay to employ human labour, because, when electricity is universally available and the changes that we have sketched have taken place, it will be cheaper and more efficient to rely more and more upon machines. Sociologically this tendency will be increased by the disinclination of the human labourer to perform repetition work. Even to-day it may be postulated that the cause of much industrial trouble is the lack of inherent interest in the work that has to be carried out. With the spread of education this distaste will increase rather than diminish, so that not only will human labour be unwise economically, but it will disappear from many operations because no one will perform them. Summed up, then, the result of engineering progress will be the complete transformation of the factory to automatic working.

In those days the staff of the factory will be mainly supervisory and engaged on designing work. Tools, of course, will have to be made and machines maintained, but this is skilful, and, therefore, interesting work, and any monotony inherent in it will be reduced by the well thought out use of machinery. Advances will also be made on other

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lines. The increase in our knowledge of materials and the improvement in our methods of workmanship, which may be expected, should greatly lower maintenance charges and the cost of repairs. In a factory which is mainly concerned with the production of articles of consumption, not with the manufacture of machinery required for production, this maintenance may be looked after by a travelling staff, while a further result may be the break-up of the large factory and the concentration of factories making the same thing in certain parts of the country. For instance, all the nuts and screws required by all industries might be made in one district. This change would be assisted by that improvement in our methods of transport, which we have a right to expect. It would lead also to a rejuvenation of the village industry, and thus to the collateral benefits which may be summed up in the phrase, a solution of the housing problem. The advantages from the point of view of the health of the nation are obviously so great as to require no further discussion.

This, however, is for the future, though the day when it will not only be a possibility but an actuality may dawn sooner than is generally expected. To bring it about will require that engineers must tackle and solve a number of interesting problems. We do not doubt their ability to do this. Previous experience has amply shown their capacity not only for dealing with present difficulties but for looking forward, so as accurately to survey the best road along which to make the advance. What has been done during the last few years is an ample guarantee of this. There is every reason, therefore, to believe that progress in the future will be more rapid than it has been in the past.

Current Topics.

Materials Handling.

THIS is the tenth special Materials Handling Number of THE ELECTRICIAN. In our leading article we deal prophetically with some of the broader aspects of the subject. But though it is always advisable in engineering to look well ahead, it is no less desirable to pay full consideration to immediate problems in particular fields. The special articles which we publish in this week's issue enable this to be done. They are contributed by specialists and give some useful information about the equipment which can be used in three fields to replace manual labour. Mr. JOHN D. TROUP, for instance, deals with "Boiler Flue Dust Removal." Economy is now the watchword in the boiler house and a factor necessary to secure it is to keep the external heating surfaces of the steam raising plant clean. This can either be done by periodically cleaning the flues by hand, a necessary preliminary to which is the shutting down of the boiler, or by removing the soot during operation by steam jets or pneumatic methods. The former procedure is the standard practice for cleaning water tubes and is being used to replace the mechanical scraper in the economisers. In both cases manual methods are discarded, though Mr. TROUP puts in a good word for them under certain conditions. This apparatus has, however, a great rival in the soot blower, so far as the cleaning of water tube boilers is concerned. The development in the use of the latter device is in itself therefore a proof of the inefficiency of the older methods. That this development will continue with beneficial results may confidently be expected.

Road and Housing Economics.

THE remainder of the special articles deal with apparatus, which is designed for the handling of various sorts of materials. The provision of more houses and more roads is a dual problem of considerable difficulty at the present time. It would be simplified if the cost of both could be reduced. Mr. G. F. ZIMMER suggests one way in which this can be done by giving a description of some of the handling devices, which can be used on work of this description. One of the principal appliances for such purposes is an application of the well-known skip hoist principle. This collects the spoil, runs up an inclined track and delivers its load into vehicles. The equipment is so arranged that it can easily be moved from place to place and it is, of course, electrically driven. Such a loader will, it is claimed, replace ten hand loaders. The transfer of goods from ship to shore and *vice versa*, as well as from rail or road to warehouse or shop and in the opposite direction, is an operation to whose economic side it is worth while to pay some attention. It is also a field, as Mr. C. H. WOODFIELD shows, in which within recent years electricity has come to its own, with the result that the demand for the high speed electrically operated crane is now steady and continuous. The principal advantage of the electric crane is that it is always ready for service at short notice, while the cost is very small compared with either steam or hydraulic power. In addition, it is much easier to operate. A more purely electrical way of dealing with a certain class of materials is the lifting magnet, some details of which are also given. Considerable advances have been made in the perfection of this equipment during recent years; and it is now capable of meeting all the demands imposed upon it.

The Darwen Tramway Accident.

THE report of Major G. L. HALL to the Minister of Transport on the accident, which occurred on the Darwen Corporation Tramway system on September 20th, discloses a state of affairs which unfortunately is by no means unusual. It appears that a car was descending a steep incline when it ran away and was derailed, two passengers being killed and seven injured. There was a compulsory stopping place at the top of the hill, but evidence shows that this was not observed. The car was fitted with both hand and slipper brakes; and the practice seems to have been to apply the latter gradually, control being mainly effected by the hand brake. As regards the application of the slipper brake, responsibility also seems to have been divided between the driver and the conductor. At the time of the accident it was raining heavily, so that the conditions were trying. As Major HALL points out, the efficiency of the slipper type of brake depends mainly upon an application, sufficiently hard to control the car, being made at the commencement of the gradient when the car is either stationary or the speed very low. The practice of applying this type of brake gradually, which has been adversely commented on before, is particularly dangerous, in that it is frequently quite effective when the rail condition is good and so leads to a false sense of security and consequent risk of accident when the rail is bad. It is therefore recommended that the special attention of motormen should be called to the necessity of observing the compulsory stop; and that instructions should be given that the slipper brake should be applied before the descent with sufficient strength to hold it stationary without other assistance. Various suggestions for modifying the details of the equipment are also made.

Research on Illumination.

A FEW months ago, when the work of the Committee on Illumination, operating under the Department of Scientific and Industrial Research, was reviewed at a meeting of the Illuminating Engineering Society, it was mentioned that individual researches would be dealt with in technical papers. The first three of the series, dealing respectively with "The Terminology of Illumination and Vision," "The Transmission Factor of Commercial Window Glass," and "Light Distribution from Industrial Reflector Fitting No. 1" have now been published by the Stationery Office. The definitions of terms used in illumination and vision is presented as an aid to those studying subsequent reports, and attention is drawn to the somewhat novel step of assembling these two series of definitions together. This is useful in connection with problems involving the co-operation of the physicist and the physiologist. The second research,

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dealing with the transmission of light through window glass, is of primary interest to architects and builders. But to others interested in illumination, it is of service in showing that the amount of light absorbed by window glass, even when clean, is far from negligible. We gather that plate glass and prismatic glass may both be expected to absorb at least 20 to 25 per cent. of light—in practice, no doubt, often considerably more. This item ought to be taken into consideration in calculations of access of daylight, as well as in comparisons of natural and artificial lighting.

Industrial Lighting Reflectors.

THE third paper dealing with industrial lighting reflectors is, however, of the greatest importance to electrical engineers. It is evidently based on researches which formed the preliminary to the issue of the recent B.E.S.A. specification. A considerable number of diagrams illustrating the effect of the angle of cut-off on the efficiency and distribution of light are included. Ideas in regard to the efficiency of industrial reflectors have hitherto been rather vague. To some it may come as a surprise to find that this efficiency ranges from 50 to 80 per cent. according to the angle of cut-off and the size of the lamps used. It is worth noting, however, that a decrease of 1 to 1·5 per cent. may be expected for each increase of 1 deg. in the angle of cut-off, for angles up to about 20 deg. We think that any illuminating engineer would agree that this loss of light is of small moment in comparison with the advantage of diminishing the glare. Apart from this, it is, of course, recognised that some angle of cut-off is necessary, if the reflector is to fulfil its proper function of directing most of the light downwards. A glance at the curves of distribution is sufficient to show how materially calculations of illumination may be upset by variations in the positions of the filament within the reflector. This indicates, not only the desirability of standard forms of lamps and reflectors, but the need to educate consumers in the use of lamps with reflectors for which they are intended. If a lamp fails and another one of quite different power and shape is substituted, the plans of the engineer who designed the installation are brought to naught. Another point incidentally deduced is the effect of different shapes of filaments. A ring filament gives more efficient results than a "festoon" filament, and the difference may be as much as 5 per cent. The whole problem is obviously one which could only be efficiently dealt with by a representative committee with strong scientific backing. The carrying out of these researches must have involved a considerable amount of work, and both the members of committees and the Department deserve the thanks of the lighting industry for the work so far done. Reports on other subjects in prospect—notably that relating to the effect of illumination on efficiency of work in printing establishments—should prove equally interesting.

Japanese Electric Progress.

WE have received a copy of the report of the Bureau of Electricity from the Japanese Ministry of Communications. This contains three monographs dealing respectively with the "Utilisation of Water Power in Japan," "Electric Railways" and "The Electrification of Agriculture." It appears that about 6 415 000 H.P. of water is available throughout the year and 14 090 000 H.P. during six months. Between 1920 and 1924 the water power utilised increased from 731 385 to 1 459 200 kW and the capacity of the thermal power stations from 482 977 to 628 573 kW. Over 600 miles of transmission lines, working at a pressure of 154 000 V, are in use, and no less than 2 152 miles of 66 000 V line. Other transmission voltages used are 55 000 V, 77 000 V and 110 000 V. The distribution voltage is standardised at 3 300 V, while the consumer voltages are universally 100 V for lighting and 200 V for power. During 1924 6 657 000 000 kWh were generated, of which 5 833 000 000 kWh were produced by water power. About 1 823 200 H.P. of motors were in use, while 200 111 kW were employed for metallurgical purposes. As regards electric traction, about 1 900 miles are worked the lines being mainly street railways or of a suburban or intersuburban character. The direct current system either at 600, 1 200, or 1 500 V is used. About 416 000 000 kWh were consumed during 1924 for traction purposes. It is interesting to learn that a great deal of success has been achieved in applying electricity to agricultural purposes. This is partly due to the increase in population and partly due to the shortage of agricultural labour. Rice, is, of course, the cheap food of the Japanese, but considerable labour is necessary for its cultivation. In order to solve the problem, therefore, the Government encourages the use of mechanical power, and in 1925 4 690 small electric motors were in use with a total horsepower of 8 622. These are used not only for rice cultivation but for tea manufacture and for various applications in connection with the production of silk. In addition it is estimated that 190 000 kW will ultimately be required for irrigation and 182 000 kW for drainage. Japan is therefore becoming quite an electrical country and should offer a good market for the export of British goods.

Wireless Telegraphy Commission.

IT will be remembered that in 1920 a Wireless Telegraphy Commission was appointed to decide upon the wireless plant for an Imperial Wireless Telegraph scheme and to design the stations necessary for that purpose. This body issued a report in 1921. It dealt with general principles and was summarised at the time in THE ELECTRICIAN. The second report (Cmd. 2781), which has been issued by the Stationery Office this week, describes the proceedings of the Commission after the decision of the Cabinet in 1923 to go on with the construction of a high power station in England and the arrangements come to in 1924 between the Government and the Marconi Co. for the erection of beam stations for the Australian, South African and Indian services. The Rugby station is described in some detail and an account is given of the lines on which it is to be operated. As is well known, up to the present part of the aerial has been reserved for use with an experimental telephony transmitter. Good and reliable conversation has been carried on across the Atlantic and the telegraph signals can be received all over the world. Experiments on simultaneous telegraph and telephone transmission are being made, while it is also proposed to erect short-wave and medium-wave plants, utilising the existing masts for supporting the additional aerials. The development of this multi-way working can, the report says, be confidently left in the hands of the Post Office engineers. The result of recent work undoubtedly confirms the correctness of this opinion, as does the announcement that a commercial radio-telephonic service is to be inaugurated between this country and the United States to-morrow. The charge will be £15 for a three minutes' conversation, and special facilities are to be given for obtaining "particular persons."

Pother at Northampton.

THERE has been a good deal of pother at Northampton owing to the determination of the electricity supply company to make the two-rate system of charging compulsory. But, like most agitations, it has been mainly noise, and we are glad to see that the undertaking is sticking to its guns. Those who are adversely affected are, of course, those who demand a full service and give very little in return. Their remedy, as many consumers in the town have discovered, is to use more electricity for all purposes and thus cease to batten on those who are more enterprising. As the company correctly points out, the two-rate tariff is a sliding scale which enables the regular and consistent user to obtain current at a lower rate than the intermittent user. But they show the right spirit in allowing those who wish to do so to pay for "other uses" energy at a flat rate of 2d. per kWh until Michaelmas, 1927. By that time the discontents will doubtless have grasped the benefits of the two-rate tariff.

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BOILER FLUE DUST REMOVAL.

A Discussion of Some Modern Methods—Need for Treatment from the Efficiency View Point—Details of Apparatus Used.

By JOHN D. TROUP, M.I.Mech.E., Editor, "Engineering and Boiler House Review."

THE losses due to soot and flue dust deposits on boiler heating surfaces have been known to power engineers since the early days of steam engineering, and most engineers are familiar with the different hand methods of dealing with this problem. In recent years the demands for still greater efficiency in the boiler house have caused much closer attention to be given to the relatively heavy heat losses which are the result of unclean heating surfaces; we are not, however, concerned here with the internal surface of the boiler, although this is of even greater importance.

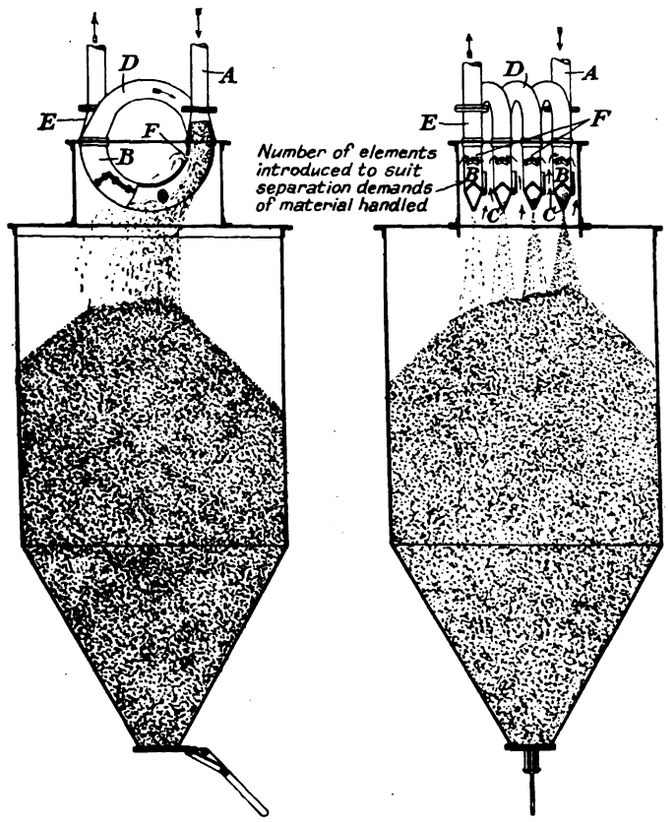

Fig. 1.—"Pneuconex" patent centrifugal separator in bunker. (Pneumatic Conveyance and Extraction, Ltd.)

The closer study of this problem has resulted in a number of different systems for the removal of both soot and flue dust in order to keep the external heating surface in a continuously clean state. The systems themselves do not operate continuously; but in practice the result of this work is equivalent to continuous working, as the period of operation is at the will of the boiler house engineer regardless of the load on the boiler.

The amount of soot and dust to be dealt with is dependent upon the class of fuel burnt and the design of the boiler house plant. The effects of such accumulation of solid matters are twofold. In the first place there is the cost of removal, and in the second place there is the gradual falling off in efficiency of the boilers as the accumulation is allowed to remain. The cost of removal is a more important matter than is generally supposed. It has to be remembered that the boiler flues are much too hot to be entered until some considerable time has elapsed after closing down the plant, and even when they have cooled down sufficiently the work of clearing such flues is not by any means a pleasant one, and therefore is not always carried out with the thoroughness which is necessary for efficiency. Then, again, when this work is done by hand it must necessarily be carried out after relatively long periods of working as it is not always permissible to close down for a thorough flue cleaning. This means that there is a considerable accumulation of both dust and soot, which gradually reduces the effective area of the flues and increases the coating of non-conducting material on the heating surfaces. This results in the efficiency of the boiler gradually falling off, and modern practice has demonstrated quite conclusively that it pays to instal mechanical plant for keeping the heating surfaces clean.

In modern practice, the methods of removing soot and flue dust may be divided into two sections. First, the use of steam jets for removing soot from the heating surface and blowing both soot and dust to a convenient collecting point, and secondly, the pneumatic method for drawing away the soot and dust at certain fixed points in the boiler house. There is also a combination of the two main methods.

The use of the steam jet for keeping the tubes of the water tube boiler free from soot has now become standard practice, and this system has also been applied to a certain extent to economisers with the object of dispensing with the usual mechanical scraper, but there is not yet sufficient evidence available to form any opinion on the relative value of the two methods as regards their use on economisers. Both the steam jet and pneumatic methods have been successfully applied to the Lancashire type of boiler and some larger water tube boiler installations have been fitted with a complete system of pneumatic plant for removing all dust from the boiler flues. This is very simply arranged in the case of a new boiler house, but certain modifications are frequently necessary when the system is applied to existing plant.

The old method of using a hand lance has therefore been very largely superseded by a permanent installation which can be operated while the boilers are working. At the same time, the hand lance may be necessary or more convenient in certain

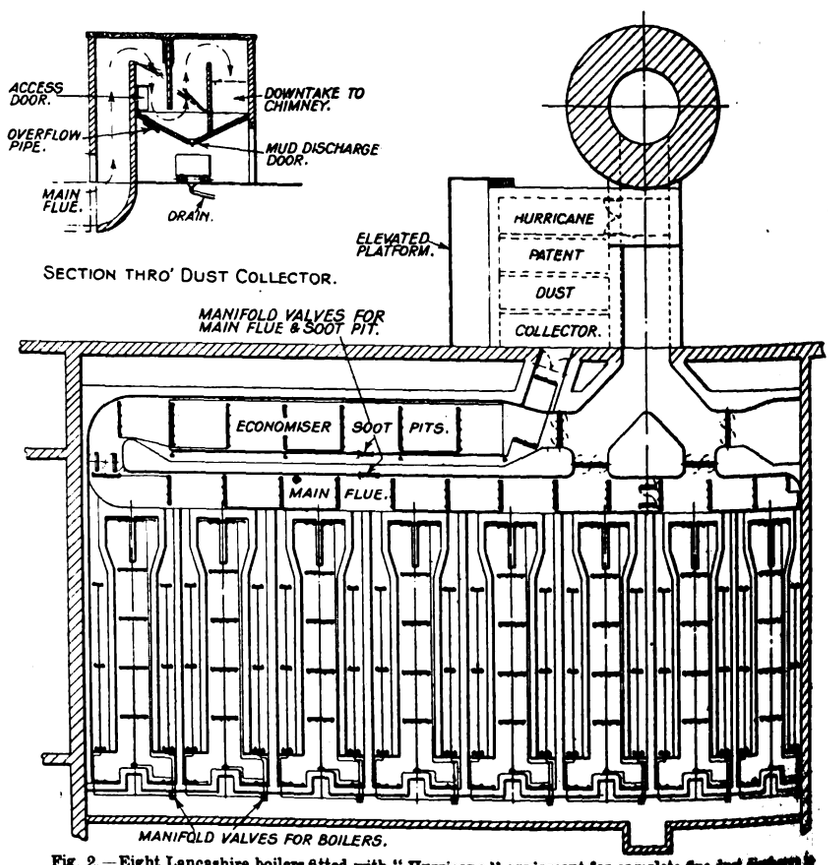

Fig. 2.—Eight Lancashire boilers fitted with "Hurricane" equipment for complete flue dust discharge to collecting chamber. (Power House Components, Ltd.)

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existing plants when used in conjunction with the more modern apparatus, and the flexibility of the system as regards the use of permanent collecting or removal points in conjunction with portable hand lances is one which the boiler house engineer should keep in mind.

Considering now the actual apparatus used : the application of the steam jet principle to Lancashire boilers will be first considered. The arrangement in this case is a very simple one, and consists essentially in placing a series of steam nozzles at different points in the boiler flues in such a manner that each set of nozzles may be operated in a regular sequence so as to give the flue dust a progressive travel right through the flues, following the course of the flue gases to the chimney base. The nozzles are brought into action at regular periods, say once a day according to the nature of the fuel and the hours of working.

Suitable steam pipes are arranged in all the flues of a Lancashire boiler starting with the boiler furnace flue and carrying under the boiler and through the side flues to the economiser flues, and then into a collecting chamber. The nozzles are arranged to operate in the direction of travel of the flue gases, and so force the dust along the floor of the flues. The action as already stated is progressive, and is carried out in an automatic manner so that no skill is required to ensure that the proper sequence is followed. The automatic arrangement consists of a manifold valve which may be placed at any convenient point in the boiler house. In operation, the attendant simply opens one valve, when steam is momentarily admitted first through the boiler furnace flue and bottom flue section, blowing the dust before it. Then automatically, by the action of the manifold valve, the next section of nozzles come into operation and the whole of the dust in the entire flue circuit is in this manner blown right through the boiler flue circuit to the collecting chamber. The time taken for the complete operation of blowing is about two minutes, so that the actual steam consumption is a very minor matter, and the cost of operation becomes one almost wholly of capital charges. On this point, the installation consists of the manifold valve for controlling the steam supply, the steam nozzles in the flues and the piping ; the latter for a Lancashire boiler consists of a two inch main supply, reduced to one inch for the branches.

An important feature of the system is the chamber for collecting the dust at the end of its travel. This may be arranged in any convenient manner to suit the local conditions and consists essentially of a chamber fitted with baffles and inter-

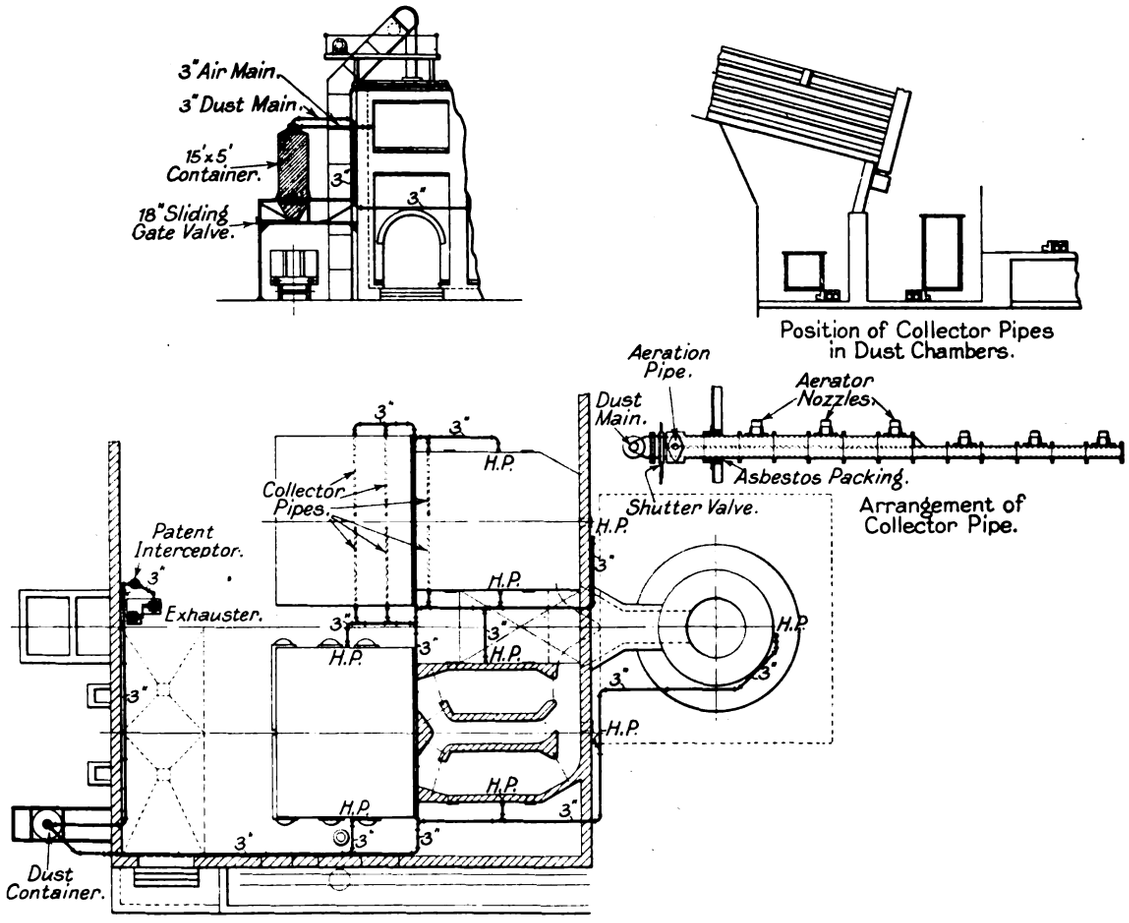

Fig. 3.—General arrangement of a vacuum soot ing plant, showing a combination of fixed suction nozzles and hose connections for manual operation. (British Vacuum Cleaner and Engineering Co.)

connected dampers for opening and closing the inlet and outlet flue opening. The flue gases may be arranged to pass temporarily through such a chamber when, by means of baffles the gas velocity is reduced and the dust deposited. A further auxiliary is the use of water sprays in the collecting chamber which not only assists in depositing the dust but may also be used to damp the collected dust, and in a wet state its delivery from the chamber eliminates the dust trouble. When it is convenient to arrange for such chambers to be erected so as to allow a railway truck or road cart to pass below the chamber, a very effective means is provided for dust disposal, as the bottom of the chamber may be formed with sloping sides and a suitable valve provided for periodic discharge.

For cleaning the tubes of water tube boilers a system of steam jets has been devised to be operated somewhat in the same manner as the steam jets for cleaning the Lancashire boiler flues, but the arrangement is of a different character. The apparatus used on water tube boilers has become known by the name of " soot blowers," and the name describes its function, namely, to blow the soot from the exterior surface of the boiler tubes. The present-day arrangement is of quite recent design and replaces the old hand lance. The development is an interesting example of the trend of progress in giving closer attention to detail for the purpose of increasing efficiency. The old hand lance was effective up to a point, but it was not a pleasant job to use it really effectively, and it was not a practical proposition to use it with the regularity necessary for maintaining the highest boiler efficiency. The proof of such inefficiency is made clear in the progress made by the modern soot blower. Its adoption has become general for new water tube boilers and it is claimed to effect an annual fuel saving of from four to eight per cent.

(*Concluded on page* 762).

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WHARF AND WAREHOUSE CRANES.

Electrical *v.* Hydraulic Operation—Some Layout Details—Braking Systems—Luffing Devices.

By C. H. WOODFIELD, M.I.Mech.E., M.I.Struct.E.

CRANES have been described as machines for lifting weights, either by hand or by steam or by hydraulic power. The description held good until about 20 years ago, when the electric type began to force itself on the public notice. Great controversies then took place respecting the relative merits and economies of the hydraulic and electric types.

The exponents of hydraulic power claimed freedom from revolving shafts and gears which frequently broke if the crane was overloaded, and also special advantages where great force was required through a comparatively short stroke.

The great disadvantage of the hydraulic crane, however,

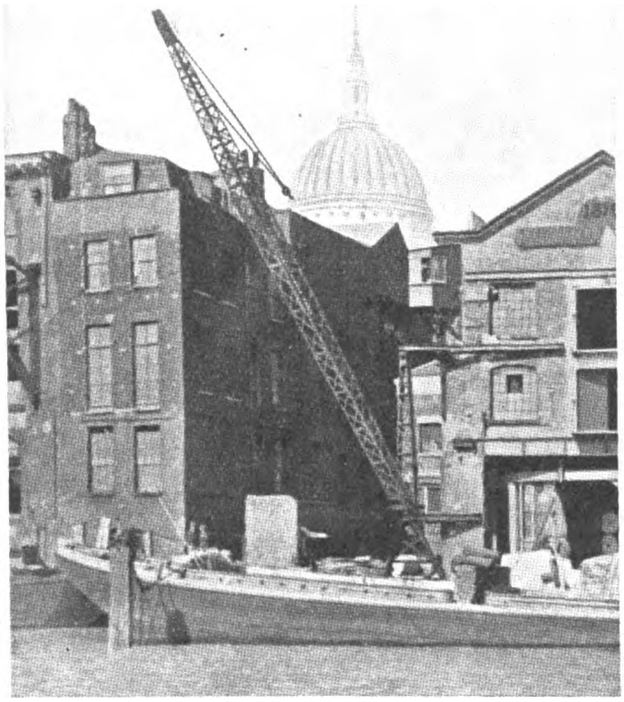

Fig. 1.—View of electric luffing crane, three motor type.

is that it costs as much to lift the minimum as the maximum load and when the crane is running on light loads for long periods, as often happens, the hydraulic crane proves itself most uneconomical.

In recent practice for wharf and warehouse the demand has been steady and continuous for the high speed electric type crane. The present practice represents considered thought in design and justifies itself both in economy of working and cost of upkeep. These cranes have been placed side by side on wharves with the hydraulic type with the result in many cases of displacing entirely the hydraulic crane in favour of the electric, both on account of economy of working and general cleanliness.

Electric power may be said to have changed the whole perspective for dock and river work. The present system of electric control has become so perfected that unskilled labour can be employed to drive the modern type of crane which is now looked upon as an essential unit for handling goods rapidly and cheaply on any modern wharf.

The principal advantages of the electric cranes are that they are always ready for service at short notice. The cost for power is very low compared with either steam or hydraulic. The cost for upkeep is negligible.

Fig. 1 shows the type of crane generally used for lifting goods from barges to warehouse for distribution. These cranes are of the three motor type fitted with jibs to give a radius of 45 ft. to enable two barges or more to be served on the same berth. The cabin is placed near the top of the building to enable the driver to obtain a clear and uninterrupted view of the load. This method makes for quiet working and the only need for any shouting is when an accident occurs.

During the recent general strike when all union men were called out to assist in the general paralysis of trade movement, it became necessary at a certain stage of the stoppage to unload a number of barges which contained paper which was required for the solitary daily newspaper then published by the Government. No skilled men were available and application was made to the proper quarter for such help as could be procured. A few students from the nearest college were sent to do the work and although neither of them had the slightest knowledge of, or had ever handled a crane of any description before, yet they proceeded with the work after a few explanations from the manager, with such success that the whole of the work subsequently was carried through smoothly and expeditiously.

This speaks well for the simplicity of operation of the three-motor type crane which is often considered a complex machine. The cranes in question were fitted with lattice steel jibs varying from 50 to 65 ft. long, and for every lift the three motions of lifting, luffing and slewing were brought into use.

Mention should be made of the term luffing and derricking, both mean the same thing, that of altering the radius, but the term derricking of the jib is used when the motion is only used occasionally, many cranes go on working at a fixed radius over long periods. The term luffing is used when it is used for every lift and thus becomes one operation in a cycle.

There are many types of level luffing gear in use on cranes to ensure an horizontal path for the load during the alteration of radius to jib, but the author has no space to deal with them in the present article. Their use results in lower current consumption and more accurate handling of the load.

Having explained the relative advantages of the hydraulic and electric cranes, a short description of the electric will not be out of place. Figs. 1 to 5 show a series of cranes made to suit the varying conditions prevailing. The structure is built up of mild steel sections, together with the jib which is generally of the lattice type, all shafts, gear wheels and king post should be porportioned so that the steel used should not be stressed beyond 5-ton per sq. in. under maximum working conditions. This factor will allow a safe margin for all the shock loads, due to slipping of chain, bad slinging, etc., to which the crane is subjected.

The wire ropes should be of extra flexible quality having an ultimate tensile strength of about 95 tons per sq. in., and should give a factor of safety of not less than 7 between the working load and the actual breaking strength.

Where thimbles or sockets are fitted to a rope the ends should be tested to twice the maximum working load on a single rope.

All rope barrels should have machined spiral grooves and suitable rope anchors fitted. The rope anchors should be at least equal in strength to the wire rope used.

When solenoid brakes are used they should act without shock and be fitted with dash pots where necessary. These should be fitted to the hoisting and derricking gears to act automatically and hold the load in the event of failure of current either by accident or design.

Where necessary mechanical brakes should be provided also. The speed control of series wound motors for crane work has always been a difficult question. No simple way has hitherto been devised for controlling the lifting speed at light loads and the lowering speeds at all loads, in a manner entirely satisfactory.

The principal systems which have been in use in the past are :—(1) The rheostatic braking system, and (2) the potentiometer braking system. There are variations of these two systems.

In the rheostatic braking system, a series wound motor, when driven by the load, will not regenerate into the line if the connections are such as to give power in the lowering direction. If, however, these connections are made the same as for hoisting, but the circuit is disconnected from the mains and closed on itself, the motor will generate current into its own circuit, thus causing a braking action. This is known as rheostatic braking, the great defect of which is there must always be sufficient load to drive the motor, whilst the lowering

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speed with light loads, even with a big resistance in circuit, is never fast enough.

In the case of the potentiometer braking system the armature and series are connected for lowering, in parallel circuits across the mains, with a varying resistance. This system is not as efficient as it might be as the current must be taken from the mains, even for lowering the lightest loads ; and here also it is difficult to get high speed when lowering light hook.

It may be asked " why not lower in the ordinary way by reversing the motor connections until near the bottom of travel, and then bring in either the potentiometer or rheostatic braking when lower speeds are required. This, of course, has been tried over and over again, but if either rheostatic or potentiometer braking is suddenly applied when motor is running at high speed, the result is almost always a bad flash-over at the commutator of the motor.

In the past this dfficulty has been got over by means of the power rheostatic system, but this is rather expensive and complicated.

With the new system of floating brake control many of the difficulties enumerated above are overcome, and a method of control is obtained for series wound motors that after a long series of experiments, is now put forward as solving the problem of the control of series wound electric motors. In this system electric control is given up altogether and a combination of electro-magnetic and mechanical control is substituted for it.

The disc type of brake on which the floating brake system is based in proving a great success on cranes and winches. What might be called the smoothness of its action as well as the power available for braking, is quite remarkable, and in this it has a great advantage over any form of solenoid brake. The brake is controlled by a small shunt winding, only used for full lifting and lowering, and a heavy series winding which when energised attracts the steel armature against the pressure of suitable springs, thus taking off the brake. The " floating " or slow speed step of the controller, with the starting resistances in circuit, are arranged to divert current from the series winding of the brake to such a degree that the pressure of the springs begins to overcome the opposing magnetic force and put the brake partially on. In this condition the brake is " floating " the speed of the motor depending on the amount of current diverted from the series winding of the brake.

The floating action of the brake on any braking step of the controller is nearly independent of the amount of load lowered; The action is self-corrective—so much so that it is possible to treat the braking surfaces with plumbago so as to diminish the co-efficient of friction without appreciably increasing the speed control effect of the brake.

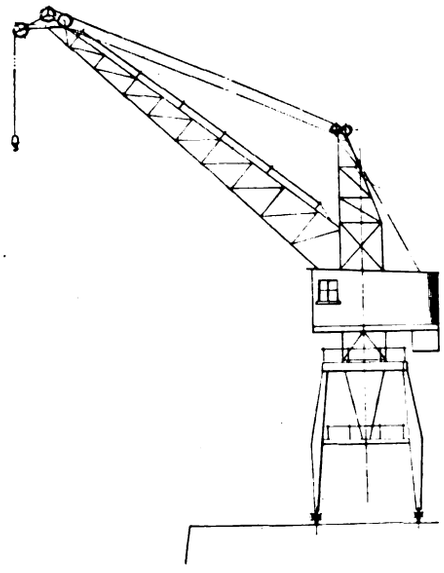

Fig. 2.—Electric luffing crane on high gantry.

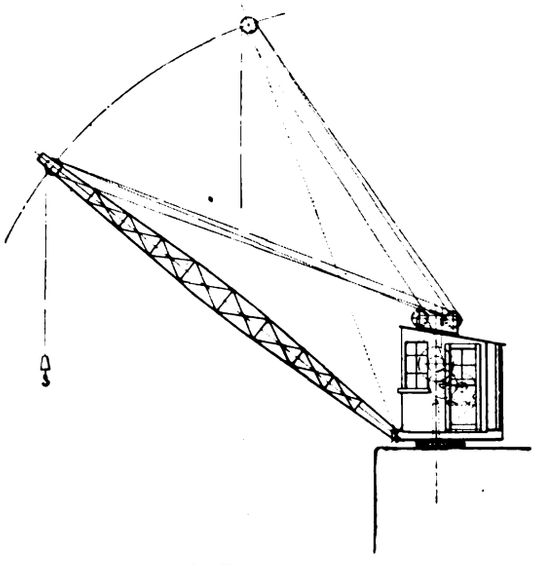

Fig. 4.—Fixed electric jib crane.

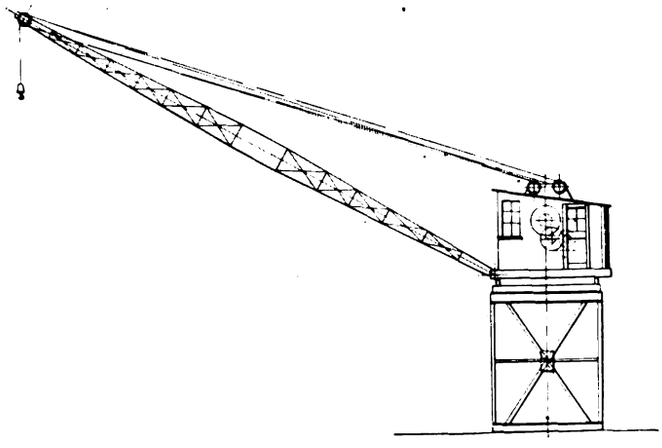

Fig. 3.—Fixed electric crane, portal type.

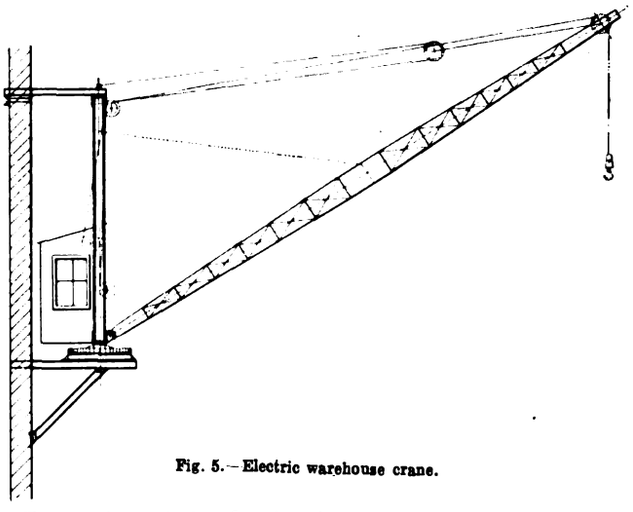

Fig. 5.—Electric warehouse crane.

The action of the floating brake, being automatic, is remarkably even and steady, for if the friction of the brake increases it has the effect of slightly easing the brake. If the braking action decreases, the current in the brake coil decreases and the braking action automatically increases. The action is therefore self-corrective and both the lightest load and heaviest can be lowered gently to the ground.

With wharf and similar cranes having long lifts this brake is usually combined with a centrifugal brake which prevents excessive speed when lowering all loads.

Limit switches of the self-resetting pattern should be fitted to prevent overwinding on the hoisting and derricking motion.

Fig. 2 shows a typical modern wharf crane fitted with crank luffing device. In this crane the jib is balanced for all positions, both with and without load, so that the chief function of the cranks and connecting rods are to hold the jib and alter the radius. The crane jib is pivoted above the machinery cabin thus allowing the driver a clear view of the whole of the operation. When luffing the jib the speed attains its maximum at the middle of the stroke and gradually slows

(*Concluded on page* 762.)

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A PORTABLE SKIP HOIST LOADER.

The Housing and Road Making Problems Dealt with by Mechanical Means—Does the Work of Ten Hand Loaders—Some Other Applications.

By GEORGE FREDERICK ZIMMER, A.M.Inst.C.E.

AT the present day, when, owing to coal shortage we are passing through a period of industrial stagnation, special attention is being given to road making and to the housing problem. The present is therefore an opportune time to

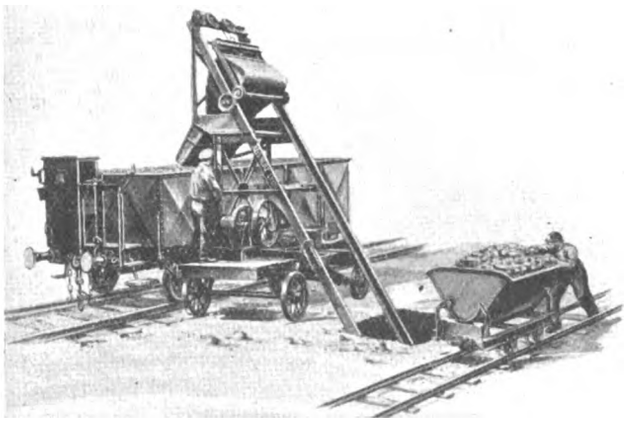

Fig. 1.—View of one method of using the skip hoist loader.

give in THE ELECTRICIAN some details of handling devices which can be used on work of this description. For both purposes mentioned, the getting of clay, sand and gravel are necessary, which operations have, hitherto, been performed largely by manual labour, hence their excessive cost.

One of the principal handling appliances for such purposes is an application on the well-known skip hoist principle (Figs. 1 and 2). This works with an inclined runway track, at the base of which the bucket is filled, and empties itself automatically on reaching the upper terminal, shooting its contents into vehicles.

This machine is mounted on a four-wheeled bogie, with swivelling forecarriage, which amongst its standard fittings has a towing iron and hand brakes on the rear wheels. As an alternative, when standard gauge sidings are available, the machine may be mounted on a standard gauge bogie.

The inclined track for the skip consists of essentially two parts—viz.: (1) The upper portion, which is permanently secured to the platform, extending from the platform level to the top, including the upper terminal; and (2) the lower extension which reaches into the workings and is shown in Fig. 3, stowed away on the platform. For work this extension is bolted to the lower end of the stationary part of the track which is fixed to the platform. The remainder of the track is made in various lengths, which can be combined to suit the extent of the excavation or workings, up to a maximum depth of 16 ft. 8 in. below ground level. These track sections for the lower extensions are of such dimensions that the track can be extended 2 ft. 8 in. at a time, in depth of excavation, to the maximum length. The track is at an angle of 60 deg. to the horizontal.

The track sections are interchangeable and are numbered one, two and three respectively. No. 1 is 1 metre, or about 3 ft. 4 in. long, No. 2 is 1·9 metres, or about 6 ft. 3 in. long, while No. 3 is 3·75 metres, or 12 ft. 4 in. long.

Track section No. 1 reaches from the stationary part of the track to the ground level, while No. 2 reaches 2 ft. 8 in. below ground: a combination of Nos. 1 and 2 reaches twice 2 ft. 8 in., or 5 ft. 4 in. below ground. For a further extension of 2 ft. 8 in. No. 3 alone is used; then a combination of Nos. 3 and 1, and finally one of all three sections which will give the maximum extension, reaching 16 ft. 8 in. below ground level. These combinations are shown in Fig. 2.

In order to be able to move such plant quickly from place to place, say on different jobs, it can be collapsed into the housed position and only the track reaching below ground level, and the skip and its rope have to be dismantled. The device in the housed position is shown in Fig. 3.

The skip is of a size to hold one cubic yard, or by weight 28 cwt., and is of the tipping type—i.e., when reaching its uppermost position, about 7 ft. 3 in. above ground level, it tips automatically from the oblique to the discharging position, while the material slides down via a shoot into the waiting lorries or trailers. This shoot is shown in Fig. 3, hanging down on the right-hand side.

The skip is fitted with four track wheels, the rear pair of which remains always on the main skip track, while the forward pair engage, as the skip approaches the delivery point, with a short pair of auxiliary rails of slightly wider gauge which effect the tipping motion. The bail by which the skip is hoisted is hinged to the bottom end of the skip and coincides with the rear pair of wheels. The skip is operated by wire rope and winding gear and is driven either by electro-motor, or more generally, by a petrol motor. The motor and winding gear are also mounted permanently on the platform of the carriage.

The clutch and the brake are ferodo-lined and are operated by two levers placed conveniently for the use of the attendant. The diameter of the driving pulley is about 2 ft. 3 in., and when it runs at the normal speed of 140 rev. per min., the working speed of the skip is at the rate of 40 ft. per min. The driving power requires is 7½ H.P. for an electro-motor, or 8 to 9 H.P. for a petrol engine.

In Fig. 2 a 7 H.P. electric-motor is shown for driving the plant, driving on to a main pulley, and by a gear wheel reduction on to a hoisting drum. The wire rope from the drum ascends to the top of the skip hoist frame, passing on its way over a guide sheave. At the top of the frame are three sheaves,

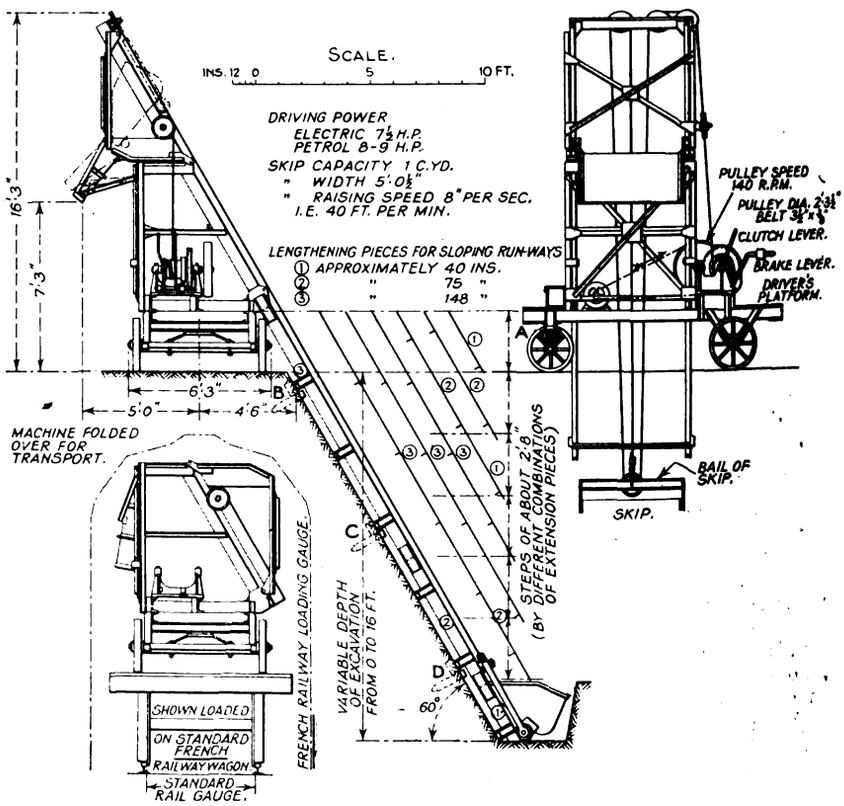

Fig. 2.—Diagram showing front and end elevation of skip hoist when in use, and in housed position, also in housed position in end elevation.

the rope passing over two of these, descends to the bail of the skip, where it passes over another sheave, ascends at the other side again, to the top of the frame, over the third guide sheave, and thence descends again vertically, when it is permanently attached to the bail.

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When at work the winding gear remains in motion till the skip has reached its delivery point and has automatically tipped, when it is returned under the control of the brake. While the skip is on its ascent the material is got ready in barrows for the purpose of refilling the skip immediately on its return.

Concerning the working capacity, this naturally varies with the tenacity of the material; under well organised proceedings, when there is no waiting for empty trucks and where the machine can be constantly in operation, about 30 cub. yd. per hr. can be handled, from a depth of 16 ft. below ground, or about 60 cub. yd. from an excavation 8 ft. deep.

The type of petrol engine employed with this plant is of very ingenious design, and, although water cooled, is without the usual bulky and cumbersome water tank, the cooling of the water being effected by a specially designed and highly efficient radiator enclosed within the engine itself and effectively protected against mechanical injury; the water thus remains at practically a constant temperature, the evaporation being so insignificant that its replenishing is reduced to a possible minimum.

The net weight of such an installation, but without the engine, is approximately 2 tons 15 cwt., or complete with petrol engine, 3 tons.

When loading clay, gravel or sand into lorries, the only economical alternative is a crane in conjunction with a grab. The skip hoist loader is, however, much simpler, and therefore less expensive, takes less room, its weight is considerably less and so is its power consumption, while furthermore, owing to the absence of any delicate working parts, the upkeep is considerably less. Moreover, with the crane, every load has to be raised and the crane slewed, which operation always involves a certain amount of danger to the men employed below, since the crane operation consists in raising, slewing and emptying. With the skip hoist, on the other hand, there is no slewing and it always delivers at the same point, where the loading takes place.

From an economical point of view it is claimed that by means of the skip hoist loader as many as ten hand loaders have been replaced, and the device should therefore pay for itself in a very short time. In addition to the purposes enumerated in the beginning of this article this device may be used with advantage for loading and removing all kinds of material in factory, railway and coal yards, for removing ashes from power houses, loading coke in gas works and also for excavations (Fig. 4) for the foundations of buildings.

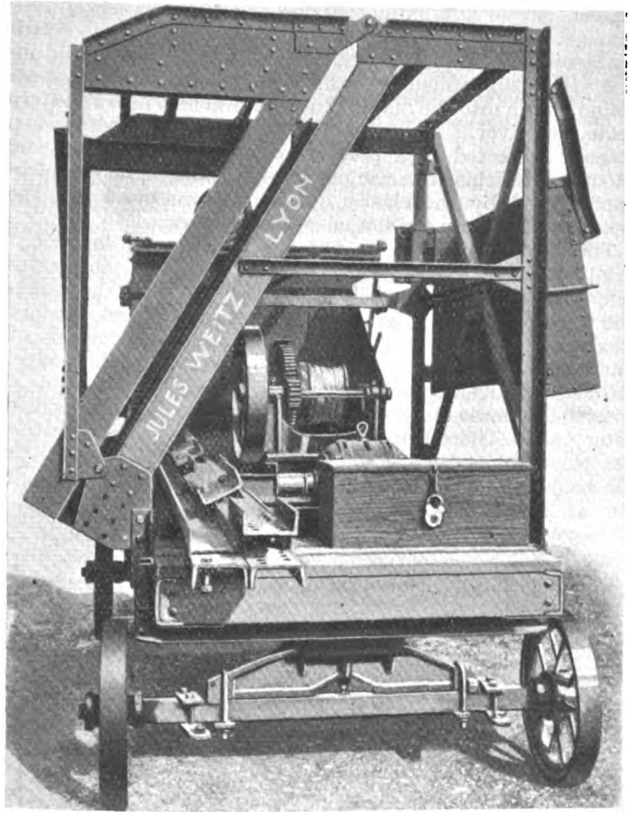

Fig. 3.—Skip hoist loader in housed position.

Another important use for this machine is for loading lorries with lumps of broken concrete such as have to be dealt with on road repairing contracts. The skip hoist being easily movable can be kept close up to the work, greatly facilitating loading of such material, and avoiding the laborious and slow high level hand loading. Furthermore, the lorry itself can be kept off the broken concrete altogether, great saving of time and tyres being thereby effected.

Fig. 4.—View of skip hoist loader as used in excavating work.

This machine is manufactured by the Jules Weitz Company, Lyons, France, whose agent in this country is M. Pierre Weil, 137, Victoria Street, S.W.1.

Wireless Distortion.

At the last meeting of the newly-formed Wireless Section of the South Midland Centre of the Institution of Electrical Engineers, Messrs. J. H. Cooper and H. C. Chatwin gave a lecture demonstration on wireless receivers. The meeting was held in the main studio of the Birmingham Broadcasting station.

Mr. Cooper said that resistance coupling was usually thought to introduce the least distortion, because the voltage drop across the anode resistance was independent of frequency. With regard to transformers, designers had realised that their products were fruitful sources of distortion, and by careful designing, transformers were now being made with negligible self-capacities and high primary impedances. But from the published curves it would be seen that the amplification of frequencies below 500 was still generally unsatisfactory, as there was a sharp cut-off in this region. Headphones were prone to cause distortion because the diaphragms favoured some frequencies more than others. Headphone design had not progressed much since the days when phones were used for the reception of Morse only, and then it was considered desirable to fashion the diaphragm in such a way that it would favour a frequency of about 1 000 cycles. A good loud-speaker usually had a better diaphragm, but designers still had much to learn. For faithful reproduction they must take into account inertia, sound radiation, rigidity of the diaphragm, and the inter-action of sound waves.

Mr. Cooper gave some interesting details of the precautions taken by the B.B.C. to minimise distortion in their transmissions.

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ELECTRIC LIFTING MAGNETS.

Their Design and Constructional Details—Methods of Coil Winding and Insulation—Impregnating Procedure.

AN economical method of handling iron and steel in both the raw and finished states is by means of lifting magnets, and, where a good type of magnet is installed and properly used, the cost can be recovered well within a year, while thereafter the cost of operation often does not exceed 25 per cent. of that of the older methods.

Fig. 1 shows a section of one of the latest types of lifting magnets, of which the following constructional features are of interest. The body of the magnet is made of the best grade high permeability dynamo steel, combining strength and durability with excellent magnetic properties. Lugs for the suspension chains and heavy ribs for the protection of the terminals are cast integral with the body, and deep ribs on the outer periphery add strength and rigidity and protect the heads of the through-bolts holding the outer pole shoe. The pole surfaces and coil cavities are carefully machined to gauge.

The flanged outer pole shoe is made of a special grade of high permeability tough alloy steel, with good strength and wearing qualities. The flange fits over a turned shoulder on the magnet body so that the shock of side blows on the pole shoe is effectively transferred to the heavy magnet body. The inner pole shoe is also made of high permeability alloy steel to give long life.

Coils for magnets 39 in. and larger are wound with strap copper insulated with asbestos ribbon, and the spool on which the coil is wound is unique. It is made of steel and forms a

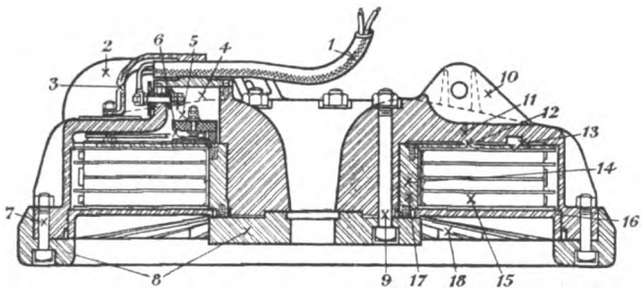

Fig. 1.—Section of Igranic magnet, circular type.

part of the magnetic circuit, eliminating waste space inside the magnet body entirely and adding nothing to the weight of the magnet since, by employing a spool of magnetic material, it is possible to reduce correspondingly the amount of metal used in the magnet frame.

The insulation between the coil sections or layers is of plate mica, with high dielectric strength and good heat conducting qualities. The coil is tightly clamped between the body of the magnet and the coil shield or bottom plate. There are no dead air heat-insulating spaces to retard heat conduction and the number of joints is reduced to the minimum.

The rise in coil temperature is the limiting feature in magnet design. If the rise be too great the efficiency will be reduced owing to the increase in coil resistance and the consequent reduction of current and ampere turns. Hence to secure maximum efficiency for all-day periods, it is necessary to design the magnet so that the heat of the coil may be quickly and easily conducted to the outside of the body from which it is then radiated.

The coil leads are brought out to a special terminal block on the spool plate, making the coil a complete self-contained unit. A dowel in the spool plate registering with a dowel hole in the body mechanically locks the coil and prevents shifting. Tapped holes are provided on the steel coil spool into which eye-bolts can be screwed to aid in lifting the coil out of the magnet body.

The coil shield is made of a special grade manganese steel having the properties of being non-magnetic and extremely tough and wear-resisting. The terminal block on the coil fits into a terminal cavity in the magnet body. In this cavity connections are made by means of flexible leads to the terminal studs which emerge from the side of the terminal box, and to those outside terminals are connected the flexible leads to which is attached the feeder cable. The magnet leads are 5 ft. long and are protected by a length of high grade steam hose. The hose is clamped to the magnet body by a heavy casting which serves also as a protective hood covering the terminal studs.

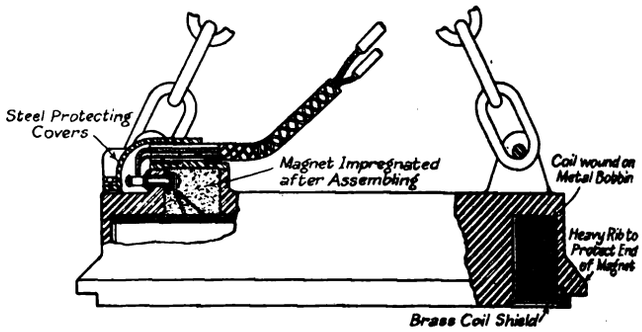
Steel Protecting Covers
Magnet Impregnated after Assembling
Coil wound on Metal Bobbin
Heavy Rib to Protect End of Magnet
Brass Coil Shield

Fig. 2.—Details of rectangular magnet coil and assembly.

After the coil and coil shield are placed in the magnet the joints between the coil shield and the body are packed with asbestos packing. The inner and outer pole shoes are then placed in position and securely attached by heat-treated alloy steel through-bolts. After making the terminal connections and adding the terminal box cover, the magnet is ready to be impregnated.

The magnet is piped up to the impregnating system, as shown in Fig. 2. A pipe from the melting tank is screwed into a tapped hole in the magnet body and a pipe from the receiver connecting to the pump is fitted to a plate over the terminal cavity. The magnet is subjected to a 20 in. vacuum for three hours, during which the coil is maintained at a temperature of approximately 200 deg. C. by passing current through it. This heat drives out all moisture and volatiles which are immediately withdrawn from the case by vacuum. The valve to the melting tank is then opened and hot compound drawn into the magnet interior and also into an external heated receiver. Pump valves are then reversed and the magnet subjected to a pressure of 100 lb. for three hours. At the end of this time the inside of the magnet is completely impregnated by the elastic insulating compound and there is no possible room for the moisture to enter.

The circular magnet is not the most suitable form for handling large plates owing to the fact that the natural flexure of the plate tends to tear it away from the magnet, and to meet this need the rectangular type has been developed, as shown in Fig. 3. The body of this magnet consists of a single electric steel box-shaped casting containing the magnetic coil and having a projection in the centre which forms the inner pole, while the outward walls of the casting form the outer pole. Those portions of the castings which constitute the poles are at least 2 in. thick at the smallest part, thus allowing for sufficient magnetic and mechanical strength. The ends of the body are reinforced with heavy ribs to

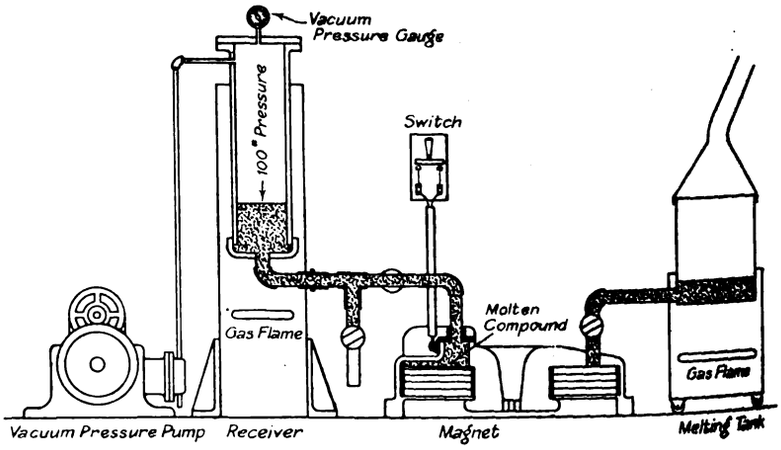

Fig. 3.—Diagram of impregnating system.

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withstand the blows to which this part of the magnet is subjected.

The coil is wound on a metal bobbin, insulated with mica and asbestos. Cotton-covered wire is used for standard service and asbestos-covered wire where the temperature of the load or the surrounding air is abnormally high.

After the coil has been placed in the casting a brass coil shield is used to hold it in place, the shield being secured by a number of countersunk screws. Shoulders on the inner and outer poles form a seat for the shield, as shown in Fig. 3. As soon as the magnet is assembled all joints are made tight and the whole unit is impregnated under pressure.

Flexible leads are carried from the coil to a well-protected terminal box on the body, and the terminal cavity is completely filled with insulating compound. The external leads are protected by a steel cover plate and heavy steel ribs on the magnet body. Quick detachable hand connectors are fitted for connecting the externals leads to the cable.

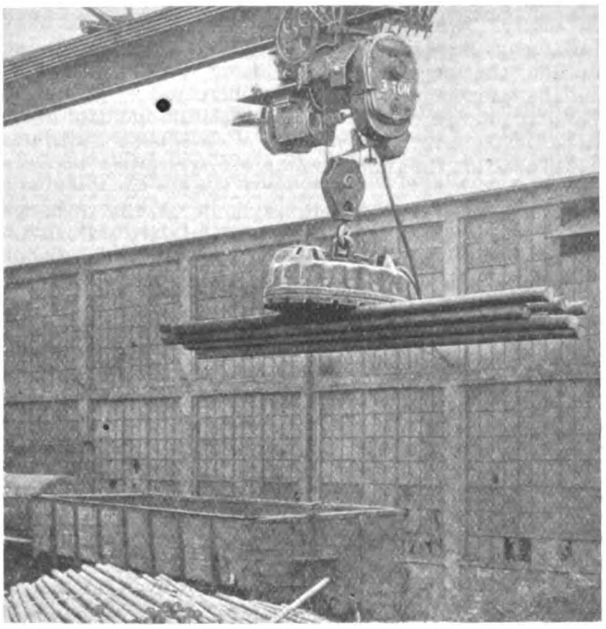

Fig. 4.—Igranic magnet handling steel bars (unloading from railway truck to storage pile).

That the method of impregnation is successful is illustrated by actual under-water operations of an Igranic magnet which was used under 70 ft. of water in a river. This corresponded to 35 lb. of external hydrostatic pressure per sq. in., and there was not the least evidence of fracture of the seal. To moisture in one form or another nearly all troubles with magnets or similar devices can be traced. The result of moisture in the interior of a magnet is to weaken the effectiveness of the insulation leading eventually to short-circuits and burn-outs. It is necessary not only to guard against moisture in the form of rain, snow, or dew, but precautions must also be taken against any moisture gaining access to the interior of the magnet of moisture-laden air since any moisture so introduced will eventually condense owing to changes in the magnet temperature.

When the circuit to a magnet coil is suddenly opened there is a strong inductive reaction or kick, the effect of which is to produce a high voltage at the terminals of the coil. Constant repetition of this kick will, sooner or later, break down the strongest insulation unless provision is made for limiting this induced voltage and dissipating its energy outside the coil. In the Igranic system, for instance, this inductive reaction is dissipated by automatically shunting a discharge resistance across the magnet coil simultaneously with the opening of the magnet circuit, and automatically disconnecting it just prior to the establishment of the circuit. The controller consists of two parts—the magnetic switch panel and the master switch. The master switch has three positions—"lift," "off," and "drop." The magnet is energised by moving the master switch to the "lift" position.

In ordinary service, to drop the load the controller is merely thrown to the mid-position opening the circuit to the magnet coil. When, however, conditions are such that it is desirable to release the load instantly the lever is thrown to the "drop" position. This not only opens the circuit, but reverses the current in the coil, overcoming the residual magnetism that causes the load to cling to the magnet for a second or two after the circuit is opened.

The lever will remain in the quick-release position only while held by the operator, a strong spring tending to force it off. When released it does not swing over the central position and energise the magnet, but is checked in the "off" position by a mechanical stop. From this position the operating lever may again be moved in the direction to energise the magnet.

The switch panel is mounted on a frame which contains the discharge and reverse resistance. This resistance is made of cast metal grids. The small master switch carries only the pilot current controlling the magnetic switches. The lines to the magnet are in no way connected to the master switch.

REVIEW.

Mechanical Design of Overhead Transmission Lines.

By E. T. Painton. (London: Chapman and Hall). Pp. 274, 21s. net.

This book is complementary to "Electrical Design of Overhead Power Transmission Lines" by Taylor and Neale, issued by the same publishers; and though the purely descriptive portion of the work is necessarily largely a réchauffé of existing information, yet the collection of this into a single volume is useful.

The opening section deals with both the geometrical and physical properties of conductors. Some of the former portion of the matter seems slightly superfluous, but the space devoted to it is not large. On the physical side, the properties of various conductor-materials and types of conductor are explained at length, the information being of the practical kind that would appeal to the mechanical designer.

Sag and stress problems are very fully considered, and useful formulæ and graphic methods are evolved in the chapter on this subject whereby solutions may be found of the usual problems that present themselves in this connection. Some readers will probably think that the author approaches this matter in rather too academic a spirit; but it is considered that the full explanation given of the derivation of the various formulæ connected with this rather difficult subject is highly desirable. The policy followed by some writers of giving final mathematical results divorced from the analytical process is unsatisfactory, for unless the reader has some idea of the derivation of a formula, he is unaware of the possible limitations to its range of application and may be entirely at the mercy of a printer's error.

A complete set of figures for constructing the useful Thomas chart for the solution of sag problems is included in this chapter, to which it forms a useful addition.

The properties of the various types of supports are dealt with in detail as well as the more general question of loading, strength, spacing, economic spans, etc. The rather questionable propriety of dealing with economic spans in a volume devoted to mechanical design probably accounts for the brevity with which this matter is dismissed. The section dealing with the actual construction of various supports and the calculations relating to these and their foundations are probably the best things in the book and should prove of real use to the designer, though it is noted that there is an absence of any reference to reinforced concrete poles.

It would appear that insulators in their general aspect hardly come within the author's present scope, though a consideration of their mechanical properties and construction might have been expected. The author, however, describes the properties and the manufacture of porcelain and even goes on to consider a certain amount of electrical theory. This seems a pure diversion, but the matter is nevertheless interesting and useful.

A section is devoted to a fairly comprehensive description of various layouts, guarding arrangements and methods of jointing, as well as an account of many transmission line accessories—some of very recent date.

The organisation and carrying out of erection work is dealt with in a practical manner, though necessarily somewhat briefly.

The volume is well presented considering its price. The paper is strong and the print large and clear; whilst the diagrams, line illustrations and half-tones are not only original, but are commendably clear and copious. The subject is presented in an orderly manner, and the author has, on the whole, a simple and straightforward style of exposition.

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NEW OVERSPEED TEST HOUSE.

Latest Addition to the Metro-Vick Trafford Park Works—Walls 9 ft. 6 in. Thick—An Essential in the Manufacture of Modern Electrical Plant.

THE accompanying illustration (Fig. 3) is an exterior view of an interesting new overspeed test house that has been designed and completed recently by the Metropolitan-Vickers Electrical Co. at Trafford Park, Manchester. Fig. 1 shows an interior view with the rotor of a 12 500 kW 3 000 revs. per min. turbo-alternator in position for a test, whilst Fig. 2 illustrates the rotor of a vertical 12 000 kW running at 250 revs. per min. waterwheel alternator.

The new test house has been designed to deal with two distinct classes of electrical machines, viz. :—

(1) Low speed waterwheel generators of large diameter and weight.

(2) High speed turbo-alternator rotors of great length and medium diameter and weight.

The apparatus provided is also designed for testing turbine rotor discs and similar apparatus, for which, although of light weight, very high speeds must be available.

That very high values are attained by the kinetic energy stored in the rotors of both waterwheel generators and turbo-alternators is well known to engineers. For instance, the rotor of a typical 20 000 kW 3 000 revs. per min. turbo-alternator would weigh 20 tons and under maximum overspeed conditions would possess kinetic energy exceeding 47 000 ft. tons, or sufficient to hurl the 20 ton rotor to a height of 2 390 ft.

It will be apparent that the liberation of such large forces through the bursting of a rotor would be liable to cause serious loss of life as well as great damage to property, the more so as rotor forgings are made of individual weights up to as much as 55 tons. Consequently only the highest class materials should be used in their construction, and the greatest possible care must be taken in their design and manufacture. Incidentally, the fact that mechanical failures are almost unknown must be taken as a tribute to every one concerned.

The material of which each rotor forging is made is subjected to various pulling and bending tests and also to impact tests. The outer surface of the rotor is subjected to a minute visual inspection and should also be examined by the well-known method of sulphur printing, which ensures against the existence of segregations of minute flaws that might escape a visual inspection. Also, to eliminate as far as possible risk from internal flaws, the Metropolitan-Vickers Electrical Co. adopted, in 1917, the policy of boring a hole clear through the centre of the shaft, after which the internal surface is thoroughly inspected by means of electric lamps and a specially designed telescope. In several cases the inspection of the core has revealed faults in various forms which have led to the rejection of the forgings, but it is a tribute to the steel maker to be able to say that a remarkably small number of the forgings have shown any faults at all.

Apart from the above and other tests, the final demonstration of the soundness of the rotor is made by running it at a speed sufficiently above the normal speed to show that an ample margin of safety is allowed. With steam turbine driven alternator rotors the maximum speed that can be attained is limited by the governing arrangements provided in the turbine and in many instances overspeed tests are unnecessary. Water-wheel generators, however, as is well known, may be subjected to overspeeds regularly during operation, the increase in speed being usually 80 per cent. when the stresses in the rotor are increased to 3¼ times the stresses at full speed. In special cases the increase in speed may be 100 per cent. or even more. Consequently with water-wheel generators the running of an overspeed test becomes of special importance.

Overspeed tests are sometimes made in the open shops with, of course, the accompanying risk of very serious consequences that might follow the occurrence of an accident. Occasionally such tests have been made by the manufacturers in a large pit in the floor of the shop, or elsewhere, covered for the duration of each test by steel joists and a heavy load of bags of sand.

In view, however, of increasing business in large high speed turbo-alternators and in waterwheel generators for all parts of the world, to avoid risk of damage to large test beds adjacent to the existing overspeed test pit, and to meet the demands for machines of steadily increasing capacity, the Metropolitan-Vickers Electrical Co. has built the new overspeed test house, which contains many special features.

The internal dimensions of the test house are made large enough to take rotors up to 14 ft. 6 in. diameter, and shafts up to 40 ft. in length. The walls are 9 ft. 6 in. in thickness, and consist of an outer casing of reinforced concrete with internal air pockets, linings of bags of sand, and rafts of timber held in place by a light steel framework. Taking advantage

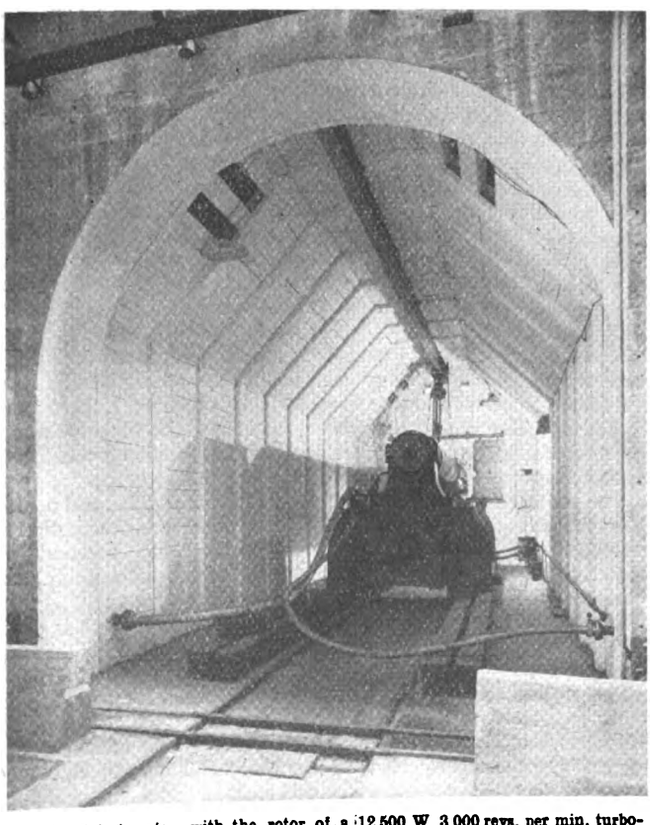

Fig. 1.—Interior view with the rotor of a 12 500 W 3 000 revs. per min. turbo-alternator in position for a test.

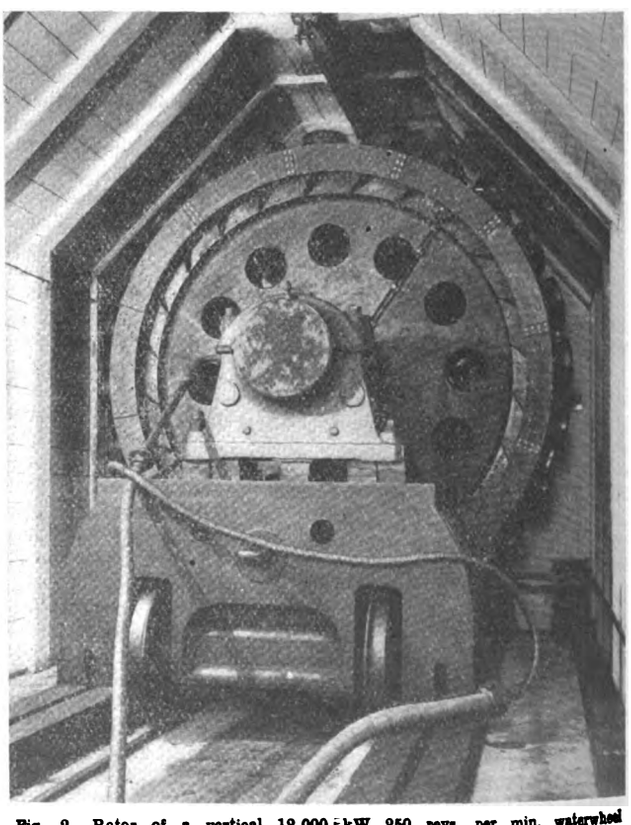

Fig. 2.—Rotor of a vertical 12 000 kW 250 revs. per min. waterwheel alternator.

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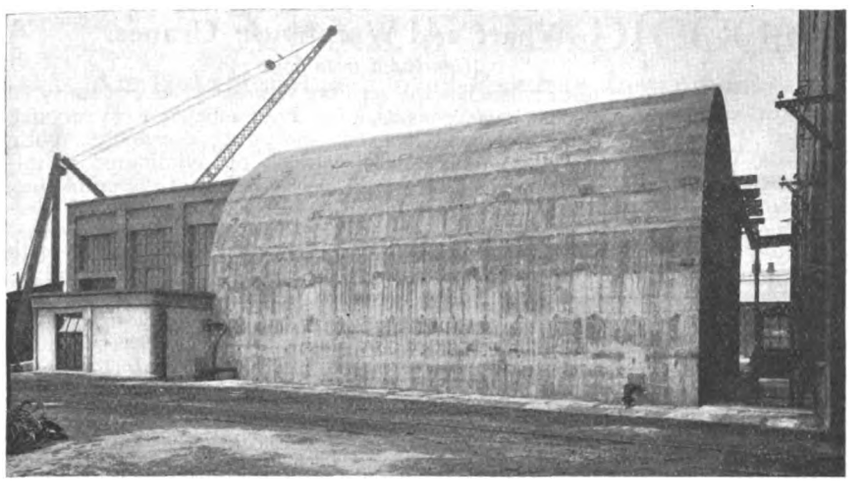

Fig. 3.—Exterior view of new overspeed-test house designed by the Metropolitan-Vickers Electrical Co.

of lessons learned during the recent war in the construction of shell-resisting structures, the composite walls are designed to take out the sting of impact by bringing the flying parts to rest gradually. In the construction of the building 800 cub. yd. of concrete, 30 tons of steel, 2 000 cub. ft. of timber and 7 000 cub. ft. of sand have been used, this being exclusive of the moving door, which consists of ferro-concrete lined with wood, carried on spring mounted wheels, and weighs 17 tons. This building is conveniently situated with respect to the heavy machine shop, where the work to be tested can be erected under the main cranes, and loads of 120 tons can be handled.

Two specially designed bogies, mounted on a standard heavy gauge railway track, are provided to carry the rotors to be tested. The rotors can be mounted in the main shop. after which the bogies are tied together by rigid side bars. They are then wheeled into the test house, after which the bogies are lifted by hydraulic jacks to allow the insertion of 2-in. packing plates, when the bogies are bolted down solid on the test soleplate.

A 7,500 V d.c. motor of 1 800 H.P. provides the necessary power, and is mounted in a separate chamber, together with a specially designed gear-box arranged to give speeds from 250 to 7 200 revs. per min. on the driven shaft. Provision is also made for obtaining speeds up to 21 600 revs. per min. The coupling shaft between the gear-box and the rotor to be tested is designed to sever in the case of any serious disturbance during a test, thus acting as a safety device to save the gear-box from damage. Also the coupling used at the test pit end is made of the large diaphragm type, which allows for a slight out of alignment, and damps out the transmission of vibrations. A complete oil system provides high pressure oil supply for lifting the rotors on to an oil film to reduce the starting effort required, and also low pressure oil supply for the driving motor and the reducing gears.

A separate control cabin is provided in the main shop, where complete control is centred, and data can be recorded under quiet and convenient conditions. The control cabin is very fully equipped with all necessary apparatus, including :—

Apparatus for speed control.
Speed indicating instruments.
Power indicators.
Rheostatic braking control to bring the driving motor quickly to rest.
Full control of the generator supplying power to the motor.
Tell-tale indicators and oil pressure gauges.
Instantaneous stop valves for oil service in case of a burst pipe.
Signal apparatus between cabin, test house, and motor house.

Elaborate provisions are made for measurement of deflections, checking and recording of critical speeds, etc., using vibrographs, oscilloscopes and high speed cameras, etc., and measurements made by electrical apparatus, however small they may be, can be magnified to give readable and comparable records.

In making an overspeed test, the plant is first run at a normal

(*Concluded on page* 763.)

Automatic Telephone Progress.

Strowger Extensions in the Portsmouth Area.

A FURTHER addition to the A.T.M. (Strowger) Automatic telephone network in the Portsmouth area which was inaugurated in 1916, has just been completed by the installation and cutting into service of a satellite exchange at Cosham, a village some 4½ miles to the north of the town.

The new automatic exchange at Cosham, the equipment of which was carried out by Automatic Telephone Manufacturing Co., Ltd., is located at the local Post Office in Southampton Road. The present capacity of the exchange is 180 lines, with provision for immediate expansion to 200 lines. The equipment comprises two A.T.M. (Strowger) rotary lineswitch units which are provided with guarded homing type rotary lineswitches, mounted as usual on swinging gates to facilitate inspection and adjustment. On the other side of the units are mounted the final selectors ; auto to auto repeaters, test and offering distributor and auxiliary equipment for two-party line service.

The system as originally planned, was four-digit, the various group selectors being located at the main Portsmouth exchange. An additional digit has, however, been added, and accommodation for the third group selectors is being provided at Cosham.

Of the 180 initial lines, 75 are allocated to subscribers, 90 to P.B.X., and 15 to coin-box lines. Coin-box calls are originated by lifting the receiver, thus signalling the manual operator at Portsmouth, who completes the connection. Connections with other automatic subscribers in the Portsmouth area are set up by Cosham subscribers, dialling through outgoing auto to auto repeaters to Portsmouth main exchange, where the circuit is completed *via* the several group selectors in that exchange.

Other equipment at Cosham comprises supervisory apparatus with provision for extending the signals or alarms to Portsmouth ; an M.D.F. a one-bay meter rack with accommodation for 300 meters, and ringing dynamotors in duplicate, both being driven from the exchange battery.

View of the A.T.M. (Strowger) automatic telephone exchange at Cosham (Portsmouth) Post Office. Lineswitch units left. Power board and meter rack right.

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THE POSSIBILITIES OF BROWN COAL.

AT the first meeting of the newly formed Institution of Fuel Technology an informative paper entitled "The Occurrence, Working and Treatment of Brown Coals, with special reference to German Practice," was read by Sir Richard Redmayne, K.C.B., F.R.S. Lignite or brown coal is widely distributed. Its chief feature is the high content of moisture, 50 to 60 per cent., and when dried it becomes highly hygroscopic. In spite of this drawback, however, considerable use has been made of the material, especially in Germany. In the British Isles the deposits of brown coal are insignificant, but the resources of the British Empire are considerable; Australia, New Zealand, India and Canada all possess extensive supplies. Some of the brown coals of the highest value are to be found in New Zealand.

Applications in Germany.

Special interest attaches to the applications of brown coal in Germany, where remarkable progress in the use and treatment of this material has been made. The moisture content varies from 40 to 60 per cent. and the calorific value from 3 270 to 5 760 B.Th.U.'s. Owing to the loss to Germany, as a result of the war, of the Upper Silesian coal field, and the Sarre coal field, the brown coal industry has assumed much greater importance, and is now in a highly flourishing state. The chief consumer of German brown coal is the electric power industry of that country. In 1913 only 23 per cent. of electric power was generated from brown coal, but in 1922 as much as 41·2 per cent. The generation of electric power in Germany has trebled during the period 1913-1922. Hydro-electric power accounts for a small part of this increase; but the most substantial addition is due to the use of brown coal.

In the subsequent sections of his paper Sir Richard described in considerable detail the process of mining brown coal and of applying it for the manufacture of briquettes, the distillation of light oils, etc. It is noteworthy that the whole of the town of Berlin derives its electricity supply from the huge Golpa power stations, which obtain the fuel for steam raising from brown coal deposits. The production of briquettes has become a vast industry. The lignite tar known as "montan wax" is obtainable from the richer deposits and yields valuable products. In most of the brown coal carbonisation plants the gases are stripped and the light oil recovered. The latter, however, requires treatment for the removal of its sulphur constituents. Its market value is about 75 per cent. of that of benzol. Another valuable by-product is solid paraffin, which is cast into candles. Despite the very large resources of brown coal outside Europe, Germany stands out as incomparably the greatest producer and user of this material. In 1924 it developed 124 360 000 metric tons, out of a world production of 161 010 000. Czecho-slovakia (20 507 000), Austria (2 777 000) and Hungary (5 429 000) come next.

Use of Inferior Fuel.

The chief item in the discussion was a contribution from Sir Philip Dawson, who estimated that 40 per cent. of the electric power produced in Germany was developed by the use of brown coal. One of the stations concerned had, he believed, the largest steam turbine units in use in Europe, with a capacity rated at 60 000 kW each. Other installations in Saxony were mentioned. Experience in Germany led one to consider the use of inferior fuels in this country. During the coal strike much material formerly regarded as worthless had been burned by the Birmingham Corporation, with extraordinary results. Although the calorific value of much of this inferior fuel was low, it was much higher than that of the brown coal used in Germany, and contained a lower percentage of moisture. The Germans had found it good policy to instal stations on the brown coal fields notwithstanding the lack of supplies of cooling water. Possibilities existed in the millions of tons of cannel coal dumped round the Scottish mines. The analysis of samples showed that they contained from 20 to 30 gallons of oil per ton. At present this fuel could be had for the asking, but once low-temperature distillation was developed this would no longer be the case. He believed that low-temperature carbonisation would prove of great value in the future.

Wharf and Warehouse Cranes.

(*Concluded from page* 755).

down until it reaches the zero position at either extremity of travel. This gear consists of a high efficiency worm and wheel, which is fixed in cabin and easily accessible. With this method of luffing limit switches are eliminated as the travel of jib is definitely fixed by the throw of the crank and if the controller is left full "on" it only has the effect of repeating the cycle of operation inwards and outwards. These cranes are mounted on rail wheels for travelling, but when the amount of travel is limited to a short run the operation is carried out by hand, the gearing being fixed at opposite sides of the gantry structure. Where the travel is of any distance power is used for this operation also.

Fig. 3 shows a fixed type of crane which is much in demand on wharves where the roadway is narrow and little room exists to fix a crane of a travelling type.

Fig. 4 shows a fixed type of crane where the jib is kept low to deal with loading barges, etc.

Fig. 5 shows a single motor type crane which is often used when initial cost is the chief consideration, and is useful on buildings which are directly on the river frontage.

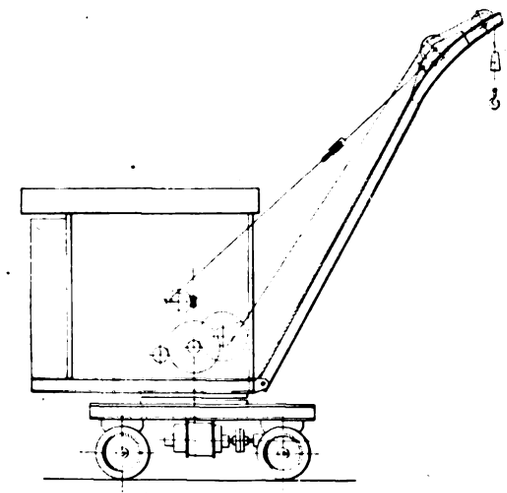

Fig. 6.—Electric runabout crane.

Fig. 6 shows an electric runabout crane for loading and unloading goods from barges to warehouses and for handling miscellaneous goods in warehouses, this is a self-propelled jib crane and has proved in use a very useful machine.

It can travel about either loaded or unloaded on its own power without either steam or smoke. It can be used in warehouses where no engine driven machine would be permitted. It is suitable for loads of 20-cwt. from a depth of 16-ft. below floor level to a height of 12-ft. above. The working radius at full load is 10 ft. and at half load 14 ft. The hoisting speed is 40 ft. per min. and the crane will travel either backwards or forwards at 300 ft. per min. and will slew at 3 revs. per min. The crane is of the three-motor type, one for travelling, one for hoisting and one for slewing and derricking. The electric brakes are fitted to the travelling and hoisting motions. The battery equipment consists of 25 cells, capacity 320 Ah. The crane can if required be operated by means of flexible cable from any suitable source of electric supply.

Boiler Flue Dust Removal.

(*Concluded from page* 753).

In those installations where the pneumatic or suction method is in use for handling coal and ashes, there is every reason for considering its extension for flue cleaning, as the principal elements are similar for all operations. Treated as a separate installation, the pneumatic system for flue cleaning would appear to be more suitable for the larger installation. There is, of course, no practical reason why it should not also be used on smaller plants, but there comes a point when the capital cost becomes too high, and at this point the simpler steam jet plant would seem to have the advantage. In the larger plants, however, the pneumatic system has some clear advantages, as it is only a matter of running a suitable suction pipe to any point where dust and soot are collected, when the piping system carries it to the final collecting hopper for transport from the boiler house.

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A NEW RADIOGONIOMETER.*

An Instantaneous Direct-Reading Instrument—A Close Approximation to the Ideal—Use in the Study of Atmospherics.

By R. A. WATSON WATT and J. F. HERD.

THE defects and limitations of radiotelegraphic direction finders in use are generally realised. Some are inherent in the use of the simple vertical loop as a receiving element, others are peculiar to the method of determining this apparent azimuth. The rotating loop method is not well suited to work on any signal other than a simple wave-train sustained or repeated over a period of the order of several seconds, from a sensibly stationary source and free from interferent signals capable of producing in the loop e.m.fs. amounting to so little as one-half per cent. of the maximum e.m.f. of the desired signal. The inertia of the moving elements prevents the taking of bearings on brief wave-trains or on wave-trains the apparent azimuth of which is varying at more than 1 deg. per sec.

The ideal radiogoniometer would record the true azimuth of arrival of any desired signal, of whatever form or magnitude and however brief its duration; at the same time it should record at least one fundamental parameter determined by peak field strength or one of its derivatives. The indication should be independent of the presence of simultaneously incident signals of any form or distribution.

This paper describes a device which is a much closer approximation to the ideal than its predecessors.

General Principles.

The general principle of the device is simple. Consider two loop aerials, A and B, identical in every respect, with their planes vertical and at right angles to one another. Then a vertical wave-front, in which the maximum vertical electric force is E, and the ray direction of which makes an angle ψ with the plane of loop A, will produce e.m.fs. proportional to $E \cos \psi$ and $E \sin \psi$ in A and B respectively. The e.m.fs. across the identical capacities C_A and C_B will have the same ratio. Let the two perpendicular and identical deflector systems of a cathode-ray oscillograph be connected across C_A and C_B respectively. Then the two fields will recombine to produce a resultant field of strength proportional to E, and making an angle ψ with the axis of deflection corresponding to plates *ns*. Thus the fluorescent spot traces on the screen a line the length of which is linearly related, through the intervention of simple circuital constants, to the e.m.f. which would be induced in a loop, similar to loop A, with its plane in the ray direction; this e.m.f. in its turn is proportional to the rate of change of electric force in the wave-front, and is related to that rate of change by the well-known equation of the loop antenna. Further, the angle which this fluorescent line makes with the reference axis *ns* is equal to the angle between the ray direction and the plane of loop A.

Similar considerations apply in the case of magnetic deflection, but in general it is desirable to operate by electrostatic deflection, since the impedances involved are usually of an order which enables greater sensitivity to be attained by this method.

Connections Used.

In the original paper the connection for the apparatus are illustrated and it is shown that accuracies of 1 deg. can be attained on any deflection exceeding half scale. Two special features are the precautions taken to ensure symmetry and the large areas of loop used. The individual loops have an area of 30 sq. m. The amplification is thus reduced to a minimum, and the amplifier should give a distortionless linear magnification, without rectification, over a range of ±50 volts output. The condition to be fulfilled by the cathode-ray oscillograph, except as regards the different distances between screen and deflecting systems, do not differ materially from those required from a general-purpose oscillograph. Recent researches have resulted in an oscillograph with a sensitivity of nearly 1 cm. per V. After tuning has been effected the arrival of a sustained signal of the selected frequency causes the indicating spot to trace a straight line which makes with the two principal axes angles which are the angles between the direction of arrival of the signal and the planes of the corresponding aerials. Mistuning has the effect of opening the straight line into an ellipse and this is a very sensitive indication.

Besides its primary advantages in fulfilling the requirements stated at the commencement of the paper the apparatus has certain other merits. The cathode-ray direction finder alone has the valuable property that it will give correct bearings, simultaneously, even in the extreme case of two or more signals of the same frequency and strength arriving from different azimuths during the same period. It is thus of great value in direction finding in cases of jamming—ordinarily a very difficult problem. Another special property is its use in throwing light on the causes of "bad minima," so troublesome in the older systems. Thus the flickering bearing due to intermittent contacts in metallic rigging will give a measurable sector of swing of the fluorescent trace, probably accompanied by the elliptic opening indicating dephasing of one aerial.

Reference is also made to the utility of the apparatus in the study of bad atmospherics. The sum of these special properties has also an important relation to the vexed question of the navigational radiotelegraphic beacon. The difficulty is the provision of a network of beacons without undue interference with other radiotelegraphic traffic. With the cathode ray direction finder adopted as the standard instrument for observation of beacons continuous wave transmitters with a frequency that need only be a fraction of a cycle per sec. might be adopted. The scheme involves wide organisation but is justified by the seriousness of the problem of interference.

* Abstract of a Paper read before the Institution of Electrical Engineers.

Correspondence.

HIGH TENSION DISTRIBUTION.

[To the Editor.]

Sir,—In commenting on the Institution Discussion on Col. Mercier's Paper in your editorial of December 24th, you refer to my remarks on the use of 66 000 V 3-core cables. As I expressed myself very definitely on this subject, I should like to avoid being misunderstood. In condemning 3-core cables for this pressure I have in mind, of course, the ordinary type of 3-core cable which has been in use for lower voltages. —I am, etc.,

P. Dunsheath.

Gravesend.
December 23rd, 1926.

New Overspeed Test House.

(*Concluded from page* 761.)

speed until all instruments and the oil service are tested to see that they are functioning properly, after which all men are withdrawn from both test and motor houses, the test house is closed, and the overspeed test controlled entirely from the remote control cabin.

It will be apparent that, apart from avoiding as far as possible all risk of injury to life, and risk of damage to property outside the test house, many important advantages over the underground test pit used previously are obtained for routine tests and also for research work in connection with both generators and turbines.

Houghtons, the Wholesalers (Houghton Butcher, Great Britain, Ltd.), High Holborn, London, W.C.1, have sent us several bulky publications which should be useful to retailers. These include the firm's general catalogue of radio apparatus and accessories for 1926–7, extending to nearly 300 pages, with terms of business and trade discounts; Houghton's Radio Index, which contains an alphabetical list of classes of goods, and of trade names and abbreviations, showing the names of the manufacturers or sole agents with whose goods they are associated. A system of reference numbers has been introduced to enable goods to be ordered quickly and easily. The firm has also issued a new edition of its Dealers' Own Catalogue of receiving sets components and accessories. Houghton's monthly "Radio News" also contains information which should be of assistance to the radio dealer.

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NEWS IN BRIEF.

Improvement of Wireless Service on German Trains—New Showroom at Accrington—Good Development of Load at Lytham St. Annes.

OUT of 2 721 British collieries working in 1925, 1 589 were using electricity.

At Amsterdam, an issue has been made of $2 000 000 6½ per cent. bonds of the Berlin Electric Works.

It is announced by the Controller of the London Telephone Service that there are now 515 340 telephones in the London area

Members of the Normand Electrical Co.'s staff held an enjoyable dance and entertainment last week at the Constitutional Hall, Balham, London.

Newark Town Council has decided to appoint an electrical engineer at £350 per annum. Mr. R. W. Willis is being retained as consulting engineer.

An assistant lecturer in physics is required for the Bradford Technical College. Forms, etc., from the director of Education, Town Hall, Bradford.

Within seven years the number of the Bogota Telephone Co.'s subscribers has been trebled, and over 2 000 prospective subscribers are awaiting connection.

At the Picton Hall, Liverpool, last week the Automatic Telephone Co.'s Orchestra and the Barnabas Singers gave a concert for the benefit of the Goodfellow Fund.

Mr. W. E. Highfield will lecture on "The Transverter" at the next meeting of the N.A.S.E. at the Junior Institution of Engineers, London, on January 4th, at 7.15 p.m.

Dunoon, according to its Provost, is the biggest town in Britain that is still without electricity. He adds, however, that they will not continue to carry on without it!

When the bottom of an electric furnace at Thomas Firth's Sheffield works burnt through about eight tons of molten steel fell into the pit, but no personal injuries were caused.

A continuance of the strike of workers at the Yallourn (Australia) power station has compelled the Melbourne authorities to ration the supply of electrical energy to consumers.

At a meeting of the South Wales branch of the Association of Mining Electrical Engineers Mr. D. Hannah expressed the hope that before long electricity would be taken to the face of the workings.

The German telephone system now supplies market reports to brokers and other business men travelling by train. Prices on the London Stock Exchange and all the Continental Bourses are transmitted.

Built at a cost reported to be approximately £9 000 000, the Soviet's 56 000 kW Volkhov power station was inaugurated last week. If the figures are correctly reported the station cost over £160 per kW.

Retford wiring contractors, with the co-operation of the local Press, were able to inform the public that the wiring of houses and business premises could be proceeded with although the electricity supply was not yet available.

In a lecture on "Electricity in the Service of Man," one of a series of free popular lectures arranged by the Woolwich Libraries and Museums Committee, Ald. H. Berry pointed out that Michael Faraday was a Woolwich boy.

Important contracts for telephone material manufacturing companies in this country are expected to result from the purchase by the Associated Telephone and Telegraph Co. of a large interest in the British Columbia Telephone Co.

A chief engineer is required by the Government of Ceylon, in connection with the completion and development of the hydro-electric scheme and transmission lines to Colombo. Forms of application from the Crown Agents for the Colonies (reference M/15 000).

Accrington Electricity Sub-Committee has visited showrooms in several Lancashire towns, with a view to ensuring the best possible equipment and furnishing for Accrington's electricity showroom, now in course of construction at the junction of Burnley Road and Whalley Road.

In order that readers of reports of the work of the Illumination Research Committee of the Department of Scientific and Industrial Research may not be handicapped by a lack of knowledge of the technical terms, some explanatory notes (Illumination Research Technical Paper No. 1), have been published by H.M. Stationery Office, price 9d.

Vienna's twelfth International Fair will be held from March 13th to 19th, 1927.

Applications are invited for the post of borough electrical engineer of Harrogate.

Bristol Corporation requires a resident engineer for the Portishead generating station.

Some 126 new consumers of electricity were connected at Lytham St. Annes during November—a record.

Electricity consumption in the U.S.A. has increased 69 per cent. in the past six years, according to the New York Trust Co.

A report (No. 1017—M37) on the electrification of balloon fabrics has been issued by the Aeronautical Research Committee.

Marriage by telephone is one of the latest American stunts. A young couple were married recently at Des Moines, Iowa, by the Rev. Paul Clark, who spoke from Oklahoma, 600 miles away.

Among the special features of the Accrington Hospital Ball, to be held on January 14th, will be the illuminations, for which Mr. A. W. Clegg, the borough electrical engineer, is responsible. These will take a novel form.

The electrical exhibition held in Burnley this year and the opening of new showrooms in Manchester Road, have proved very fruitful. The wiring of consumers' premises on the deferred payment system is also making rapid progress.

An advance oversea edition of the catalogue of the British Industries Fair, in nine languages, and with the exhibits of the 800 firms in the London section described and classified, will be ready about January 3rd. The main edition of the catalogue will be issued later.

Negotiations have been proceeding in Constantinople for some time between the Eastern Telegraph Co. and the Turkish Government in regard to the settlement of old claims and the granting of a new concession. It is now reported that an agreement is in sight, and that the company will be granted a new concession.

Cable companies recently introduced regulations which bar cable messages at deferred rates if more than one third of the message consists of figures (or figures expressed in words), combinations of figures in letters, or the usual code abbreviation. Complaints have been made that this practice is likely to handicap British trade. The Federation of British Industries has taken up the matter.

The inaugural luncheon of the Plug Club, possibly the most exclusive of its kind in the world, was held at the Engineers' Club, Coventry Street, London, on December 20th. Every member of this organisation is closely identified with the wireless and electrical industry. Information concerning membership may be obtained on application to Plug No. 1, Engineers' Club, Coventry Street, London, W.1.

At a recent meeting of the South Wales Branch of the Association of Mining Electrical Engineers, Mr. J. K. Davidson gave a report of experiments in collection, for use in power generation, of the floating dust in collieries. By placing sheets of corrugated iron near the screens, he said, 1 lb. of dust per sq. ft. was collected in an hour. In the Rhondda Valley alone 300 to 400 tons of dust were going to waste daily.

Mr. Smirnoff, the Russian Postmaster-General, who has been visiting this country as the head of a delegation to inquire into wireless methods, etc., returned to Russia last week. He informed a Press representative that a new 50 kW station was being erected in Moscow and about 20 smaller stations elsewhere in Russia. Telephone development at a cost of about £15 000 000 was projected. Negotiations had been opened in this country for the supply of plant.

In a paper read before the Institute of Transport recently, Mr. R. F. Morkill said the "divisional" or "decentralised" method of railway signalling was the more suitable for trunk railways of considerable magnitude spread over a large area, while "departmental" or "centralised" systems were suitable for railways of a lesser magnitude, within a more or less confined area, such as suburban or metropolitan lines. The signalling department should be independent, under a signal and telegraph engineer.

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W.O.B. PROGRESS.

Need for Sustained Effort in Last Half of the National Campaign.

THIS week is the accustomed time of the year for the making of good resolutions for the coming twelve months, and is also the thirteenth week of the twenty-six weeks' national campaign for Wiring the Homes of Britain. Resolution framers will, therefore, do well to consider carefully their omissions during the first three months of the W.O.B. campaign and register a vow to re-double their efforts during the remaining period.

Splendid results have been achieved; of that there is no possible doubt. But those results have been most noticeable in places where all the local electrical interests have taken an active part in furthering the campaign work. If everybody in the industry whose business brings him into any sort of contact with the public will make a resolution to do all in his power to broadcast the W.O.B. message, the final result of the campaign will exceed the highest of the organisers' original expectations.

With the campaign already assured of success, members of the electrical industry cannot afford to adopt a complacent attitude. This campaign has already brought a lot of business to contractors and supply undertakings, but it can and will bring a great deal more provided that local efforts are not allowed to flag. The start of the new year is the time to set about a tightening up of individual and co-operative campaign endeavour. By active participation in the effort everyone has something to gain and nothing to lose.

Special attention should be given to the work of the Electrical Circles, which can play such an important part in extracting the maximum value from the E.D.A.—E.L.M.A. organisation. Many quite important towns are still without an Electrical Circle, and there are many circles which are really only circles in name.

At the beginning of the campaign, E.D.A. publication No. 1 004, a lecture on "Electric Light in the Home," and illustrated by lantern slides, was offered to any electrical man or woman for reading to local audiences. While many people have taken advantage of this offer, there must be at the very lowest computation, a thousand potential readers of this lecture who have not yet "put the story over."

Window Publicity.

In some centres, notably in London, the contractors' windows are devoid of any reference to the campaign. Various reasons are given for this, but whatever may be the difficulties in the way of window display there is no earthly reason why there should not be at least some reminder to the public that they can obtain competition booklets inside.

Demonstration electric homes are, it is pleasing to find, being opened in increasing numbers throughout the country, but even in this direction there is still much to be done before the end of March.

The deferred opening ceremony in connection with the demonstration electric house at 40, Balmoral Drive, Denton, Manchester, is to be performed by Mrs. H. C. Lamb, the wife of the city electrical engineer, this (Friday) afternoon. The house is now completely equipped, the furnishings having been supplied by Philip Hart, Ltd., of Manchester.

According to an ELECTRICIAN correspondent, the general expression at Halifax is that the demonstration house in Gladstone Road, which was opened on November 22nd, has been an enormous success during the month it was available to the public. A grand total of 13 300 persons has been recorded as having inspected the house, and the contractors are satisfied that there has been a beneficial effect, and that the results are entirely satisfactory. It is hoped to have another demonstration ready in another part of the district shortly, this time in the Savile Park neighbourhood. Meanwhile, it is interesting to note that on the Wednesday before Christmas the Halifax generating station established a record load of 14 100 kW, the previous maximum being 13 800 kW. This record is stated to be due to the increased use of electricity in the home.

The following are points from the latest progress report issued by the E.D.A.:—

A demonstration house was to be opened at Bishop Auckland, on Wednesday.

Demonstration houses will be opened at Whitley Bay early in January and at Whickham at the end of January.

The new circle at Blyth has obtained a house, and hopes to open it early next month.

South Shields will open a demonstration house on March 9th.

For the Glasgow demonstration houses, dates have now been fixed as follows:—Five apartment houses at Netherlee, January 17th-29th; two tenement houses together, at Shawlands (total of 8 rooms and 2 kitchenettes), February 7th-19th; large 7-roomed house at Hyndland, February 28th-March 12th.

Paisley will run a second and larger house in the new year.

An electrical exhibition is being organised at Leamington.

An electrical exhibition was held at the Town Hall, Greenock, on Tuesday, Wednesday and Thursday.

Tamworth Supply Co. has organised a special local competition in addition to the main competition, with a view to encouraging second visits to the showrooms.

Whitley Bay Circle is exhibiting E.D.A. Poster No. 1 023 throughout the town, and also showing campaign slides at local cinemas.

Dundee and Edinburgh express complete satisfaction with the results of the demonstration electric houses.

Cinema lantern slides in connection with W.O.B. are reported as having been shown in cinemas at all local centres in Scotland.

Trade with Spain.

Electrical Purchases from Great Britain Smaller with the Exception of Cables.

REPORTING on Spain's import trade in 1925, Capt. U. de B. Charles, Commercial Secretary to H.M. Embassy, Madrid, states that in electrical machinery, 5 290 tons of dynamos, alternators, etc., were imported, against 5 479 tons in 1924, Germany taking the lead with 1 480 tons, followed by the United States with 1 140 tons, France with 730 tons, and the United Kingdom with 530 tons. Germany also supplied 124 tons of meters, voltmeters, etc., out of a total of 199 tons.

The United Kingdom supplied 89 tons of accumulators, as against 96 tons from the United States and 68 tons from France, while imports of electric batteries were nearly all from the latter country. Imports of dry batteries increased by 178 tons to 405 tons, 167 tons coming from Denmark, 112 tons from Germany and 50 tons from Norway.

The United Kingdom took the lead in imports of electric cables, her share being 490 tons out of a total of 1 139 tons of cable exceeding 1 cm. in diameter. Imports of telegraph and telephone apparatus increased by 200 tons to 365 tons, 97 tons from France, 66 tons from Belgium, 53 tons from the United Kingdom, 39 tons from the United States, and 35 tons from Sweden. The United Kingdom also supplied 100 tons, against 118 tons from the United States, of electrodes, and shared the trade with the United States and Germany in insulating fabrics and tapes.

Whitworth Society.

Mr. T. Sugden Elected President at Fourth Annual Dinner.

THE fourth annual commemoration dinner of the Whitworth Society was held at the Holborn Restaurant, London, on December 21st, the anniversary of the birth of Sir Joseph Whitworth.

The chair was taken by Dr. F. P. Purvis, and about 70 persons were present. Seven of the scholars appointed during the current year attended as guests, and some interesting speeches were made.

Mr. Thos. Sugden was elected president, to take office at the summer meeting, which will be held in Derby in July, 1927, when it is proposed to place a wreath on the tomb of Sir Joseph Whitworth at Rowsley.

The result of the ballot for new members of the committee was declared, the first three names on the voting list having been elected.

There are now about 500 members on the roll of the Society, and about 250 copies of "The Whitworth Book" have already been sold. Application should be made for purchase forms to the hon. secretary, the Whitworth Society, c/o Institution of Mechanical Engineers, Storey's Gate, Westminster, London, S.W.1.

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PERSONAL.

New Appointments, Presentations and Retirements in Electrical Circles.

MR. A. M. Sillar, president of the N.A.S.E., is, "Contract" states, well on the way to recovery from his recent illness.

Cheadle and Gatley Urban Council has fixed the salary of Mr. R. Willis, electrical engineer and manager at £600.

Sheffield Illumination Society has elected Mr. J. F. Colquhoun as hon. president and Mr. H. Lazenby as president for 1927 session.

Mr. W. H. Goodman.

Sir John Denison-Pender, chairman of the Eastern and other telegraph companies, returned from the Continent to his London residence on Tuesday.

Councillor J. H. Agombar has been appointed chairman and Councillor W. J. Bickham, vice-chairman, of the Lighting Committee of Shoreditch (London) Borough Council.

The accompanying portrait is of Mr. W. H. Goodman, of the Dubilier Condenser Co. (1925), Ltd., who, as reported on page 776, has been elected the first Chairman of the Radio Manufacturers' Association.

Lichfield City Council has decided to appoint Mr. W. C. C. Hawtayne as consulting engineer to the electricity undertaking for five years, at 50 guineas a year plus disbursements.

Mr. F. Twyman, F.R.S., for many years managing and technical director of Adam Hilger, Ltd., has been awarded the Physical Society's Fourth Duddell Medal for meritorious work on scientific instruments and materials.

Mr. James Dalrymple, who retires to-day (December 31st) from the position of general manager of the Glasgow Tramways, has been offered an appointment as tramway adviser in Johannesburg, and has intimated his willingness to accept the offer after the completion of his South American engagement.

M. Ferriaud Ducretet is suffering from radio-dermatitis in the face, chest and hands. He has been conducting X-ray experiments ever since Rontgen rays were discovered in 1895. In 1917 he became blind. He partially recovered his sight, but recently had to undergo another operation, and for the past fortnight has been compelled to live in darkness.

Major N. Bell, Hull's city electrical engineer, has applied for an increase in his salary from £1 108 (with bonus) to £1 850, with annual increments of £50 to £2 000. It was stated that for the size of the undertaking the salary paid at Hull was the lowest in the country. The Electricity Committee has deferred consideration of the question for a month.

Members of the executive committee of the National Union of Conservative and Unionist Associations have passed a resolution placing on record their regret at the retirement of Sir Herbert Blain from the post of principal agent of the party.

Fulham (London) Electricity Committee recommends that Mr. Alexander Murdoch, station superintendent, be promoted to the position of power house engineer, at the salary of £700 per annum; that Mr. Thomas Welch, repairs and shift engineer, be promoted to the position of assistant station superintendent, at the salary of £472 per annum; and that Mr. John Foster White, mains superintendent, be appointed mains superintendent, at the salary of £617 8s. per annum, all with effect as from December 23rd, 1926.

At a special meeting last week, Harrogate T.C. discussed a recommendation by the Electricity Committee to advertise for a borough electrical engineer, and to extend Mr. G. Wilkinson's present appointment until his successor takes up office. The Council recently decided to accept Mr. Wilkinson's resignation, to take effect on December 31st, and to retain him in a consulting capacity at 500 guineas a year for three years. The recommendation was adopted by 11 votes to 8.

Obituary.

The following deaths are reported:

Mr. THOMAS PYE, on December 24th, after only two days' illness. He was a director of H. S. Lett and Co., Ltd., electrical engineers, of Faversham.

Mr. J. ROOTHAAN, electrical engineer, on December 23rd, at the age of 50. Mr. Roothaan had been for some years in the service of the British Electric Transformer Co., and at an earlier period was engaged in the works of Ferranti, Ltd.

BUSINESS ITEMS.

Changes of Address, Representatives, and other Developments.

CHARLES SELZ, lampshade manufacturer, has moved to 47–49, New Cavendish Street, London, W.

An Indian firm in Bombay wants to represent British makers of electrical goods. Inquiries to Department of Overseas Trade. (Reference No. 597.)

The Metropolitan Electric Cable and Construction Co., Ltd., announces that it has acquired, as a going concern, the wire and cable section of Fuller's United Electric Works, Ltd., Fuller Works, Chadwell Heath, Essex. Additions and extensions of the factory are now in hand, and it is stated that the company will be in a position to satisfy the requirements of a very much larger connection than was attempted by the old company.

The Direct Spanish and the Eastern Telegraph Companies have increased to 3d. a word the rate for telegrams between Great Britain (including Northern Ireland) and Spain (including Spanish possessions on the North Coast of Africa) by all routes other than that of the Direct Spanish Co.'s Marseilles-Barcelona cable (*via* Marseilles-Spanish), on which route the charge is now 5d. per word. The rate between Great Britain and the Canary Islands has been increased to 5d. per word.

Forty Years Ago.

Brief News Abstracts from "The Electrician" of December 31st, 1886.

THE following abstracts are from the pages of THE ELECTRICIAN of December 31st, 1886:—

A break in one of the Atlantic cables off Land's End was repaired, after six weeks of inactivity.

* * *

The staff of the Eastern Telegraph Co. gave their sixth annual concert to provide Christmas dinners for the poor.

* * *

A project was on foot for utilising the water-power of Niagara Falls. It was then considered "that it would be entirely practicable to light the city of Buffalo, twenty miles away, with power furnished by the Falls."

* * *

A storm "of almost unprecedented violence" throughout the country on December 26th caused widespread damage to overhead telegraph and telephone lines. In London, it was stated, "quantities of broken wire hung down either sides of the streets. In many instances the iron poles are bent into grotesque shapes, and the wires slacked into inextricable entanglement. . . ."

* * *

In a characteristic letter criticising an article on Electricity and Magnetism, Mr. Oliver Heaviside propounded for "this festive season" some "conundrums" for juvenile readers. They included (1) Why will not iron filings stick to the sides of a uniformly and longitudinally magnetised bar? (2) What connection has the last to the question about the fish propounded by King Charles to the Royal Society?

Books Received.

"Mechanical World" Year Book. (London: Emmott and Co.) Pp. 170. 1s. 6d. net.

"Journal of the Institution of Electrical Engineers." Vol. 65. No. 360, December. (London: E. and F. N. Spon.) 10s. 6d. net.

"Questions and Solutions in Telegraphy and Telephony." Solutions by H. P. Few. (London: S. Rentell and Co.) Pp. 350. 6s. 6d. net.

"Electric Circuit Theory and the Operational Calculus." By J. R. Carson. (London: McGraw-Hill Publishing Co.) Pp. ix+197. 15s. net.

"Données Numériques d'Electricité, Magnétisme et Electrochimie." Extract of Vol. V. (Paris: Gauthier-Villars et Cie.) Pp. 135. 56 fr.

"Whitaker's Almanack," 1927, Abridged Edition. Pp. clxxxv+240. 1s. 6d. net; "Whitaker's Almanack," 1927. Complete Edition. Pp. clxxxiii+896. 6s. net. (London: J. Whitaker and Sons.)

"Science Abstracts." Secs. A and B. November 25th. No. 347. Vol. 29. Issued by the Institution of Electrical Engineers. (London: E. and F. N. Spon.) Single numbers, 3s.; annual subscription, 30s., or 40s. for both sections.

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IN LIGHTER VEIN.

Aims and Objects of the Odd-Job Electrical Society.

FOLLOWING the publication in this column of a coat of arms for the "odd-job men" who do electrical contracting, several inquiries have been received about the aims and objects of the society, and its rules and regulations. We have been unable to gather much reliable information on the subject, but in an interview with Mr. Crammer, the secretary, we secured a copy of particulars of the entrance examination, which is given below :—

ENTRANCE EXAMINATION TO THE ODD-JOB ELECTRICAL SOCIETY.

The marks allowed for any or all the questions are equal. One question (almost) correctly answered will secure a pass, whilst honours men must attempt at least two. A time limit of three weeks is fixed for each question. Use white paper; not brown or any other colour. Canvassing the examiners, whilst not forbidden, should be done quietly (and quickly).

NOTE.—The examiners may be interviewed at headquarters between the hours of 12 noon and 2.30 p.m. and 6 p.m. and 10.30 p.m.

(1) How would you make a tee joint (tha is, one shaped like a letter tee) between cab-tyre, lead-covered wire and wire in a tube ? Assume that you have only a piece of black tape (sticky stuff), and that you have left your pliers at home.

(2) Explain why four lights on flexible wire from one point, and fastened in position with string, are more efficient and adaptable than fixed lights.

(3) Show how leaving the work not earthed or continuous prevents the trouble due to fuses blowing.

(4) Explain how a consumer can get free heating of rooms by using small size cable, and show any other advantage to both parties.

(5) What is meant by the "hit and miss" system ?

(6) Do you consider the I.E.E. (if you've heard of it) to be a celestial body ?

(7) Show the advantage of having only one fuse in a circuit, however large.

(8) You have just finished a job in tubing, and find that you are 30 ft. of tube short. You have 20 ft. of lead-covered wire, 3 ft. of cab-tyre and 7 ft. of V.I.R. left over from another job, together with a few cleats. State exactly how you would act.

Anyone possessing working knowledge of at least seven other trades will be exempted from the examination. Anyone who has "served his time" will not be admitted to membership, but the fact that an applicant has "done time" is no bar.

* * *

The following is a copy of a letter received from West Africa by a London firm of exporters :—

"Yours name has been admired to me by one of my favourite comrades that you are one of the most manufacture here, and this dawned upon my heart with gladness. I had wrote you about some list. But in order you failed. Why you done so. Even at all. You don't remember Our Lord or think about St. Matthew Chapter 7 verse 6 to reply to my letter. Because you see that I am a black man therefore you disobey me. Why you done so. But I got nothing to say to you. But only my best charity to you & your company. God save us in the world, God bless your company too. Oh Dear how sweet is in the world & when we meet we shall meet in Heaven. Good morning too to you my Dear brother in the world. God save the King too."

* * *

The staff of Erlco, Ltd. (Electrical Services), of Friar Street, Reading, celebrated Christmas with a supper at the Vine Hotel, Reading. The menu was as follows :—*Hors d'œuvre*—Volts and amps assortis. *Soup*—Oxide of exide, eau distillé. *Fish*—Filet de magneto, cutlets de cut-outs. *Entrée*—Roasted cell-tops. *Joint*—Undercut of mica. *Vegetables*—Baked armatures, ball-bearing frites. *Sweets*—Sludge pudding, paste Melba, lead nuts with crême sealex. *Wine*—Acid sulph (vintage 1250), in coupled tumblers. *Beer*—Chloride 3XC in D.T.G. cells. *Whisky*—Acton's W. J. and W. H. in hydrometer tubes.

Points of View.

ITALY is now covered with a network of electrical transmission lines.—*Sir Leo Chiozza Money.*

* * *

Where will you find two engineers gathered together who are not talking shop ?—*Miss Margaret Partridge.*

LEGAL INTELLIGENCE.

National Wireless Corporation, Ltd., to be Wound Up.

A PETITION by P. H. Camp for a compulsory order to wind up National Wireless Corporation, Ltd., was granted by Mr. Justice Eve in the Chancery Division on December 23rd. Mr. Lavington, for petitioner, said he was a judgment creditor, and the company did not appear.

Electric Holdings, Ltd.

Mr. Justice Eve, in the Chancery Division on December 23rd, confirmed an alteration of the memorandum of association of Electric Holdings, Ltd., and also confirmed a reduction of capital. Mr. Gordon Browne, for the company, said it was only a slight alteration of the objects that was proposed. The reduction of capital was to be effected by cancelling 575 000 ordinary shares which were all owned by Vickers.

In Parliament.

Electricity Special Orders Approved by House of Commons.

THE House of Commons has approved Special Orders in respect of (1) Llanfrechfa Upper urban district, (2) Prudhoe urban district and part of Hexham rural district, (3) part of the city of Truro, (4) North Walsham urban district, and parts of Aylsham, Blofield, Forehoe, Henstead, Loddon and Clavering, Mitford and Launditch, St. Faith's, Smallburgh and Wayland rural districts (with modifications to omit certain parts of North Walsham), and (5) an Order authorising the London Electric Supply Corporation, Ltd., to supply electricity to be used for purposes incidental to the working or lighting of certain railways.

Beautiful Power Stations.

The Alliance of Art with Utility in Italian Hydro-Electric Plants.

DESCRIBING in the "Observer" a tour of Italian hydro-electric stations, Sir Leo Chiozza Money refers to the power station at Paderno as a splendid building and a fine example of traditional Lombardian architecture which "might well pass for the palace of a prince."

"The interior," he says, "is finished artistically, down to the smallest details. The floor is of patterned mosaic, the walls decorated with sgraffito, that beautiful scratched plaster work which might so well be used freely here, the lamp-holders of wrought metal." He found that the Paderno electric palace was not an exceptional case. "Indeed," he adds, "there are many far more beautiful."

Ontario Water Resources.

THE Dominion Water Power and Reclamation Service of Canada has published a new volume of that portion of the series of water resources papers which deals with the surface water supply of Canada. This report is number 49 of the series, and gives details of stream measurements made in the province of Ontario during the climatic year from October 1st, 1923, to September 30th, 1925. It contains a short explanation of the purpose and scope of the work and 110 pages of tables and descriptions of gauging stations, with an index map of Ontario showing their location. This report will be supplied free of charge on application to the Natural Resources and Industrial Information Branch, Canadian Building, Trafalgar Square, London, S.W.1.

Interchangeable H.T. Batteries.

TWO new types of "Gecophone" high tension batteries, with interchangeable units, designed specially for wireless work, have been placed on the market by the General Electric Co., Ltd.

Each of these 66 V batteries consists of 48 cells, which in the standard type are arranged in series of twelve in one unit, and in the super-capacity type, eight in one unit, so that the units can be simply interchanged. Spring clip terminals are provided for facilitating intermediate tappings.

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WIRELESS TELEGRAPHY.

Commission Reports Successful Working of the Rugby Station.

THE Wireless Telegraphy Commission gives, in its second report, some particulars of the buildings and plant at the Rugby high power wireless station, and states that up to the present the smaller section of the aerial has been reserved for use with an experimental telephony transmitter, and good and reliable conversation across the Atlantic has been obtained repeatedly for many hours of the day. The telegraph system has been worked on the eight-mast aerial, and the signals have been heard all over the globe. Experiments will shortly be made to determine whether simultaneous telegraph and telephonic operation is possible. There are also in contemplation short and medium wave plants utilising the existing masts.

Electricity in Penang.

Linking up Power Stations with Submarine Cables.

THE report on the working of the George Town, Penang, Municipal Electricity Department for 1925 states that at the close of the year the Prai power station was practically completed. Erecting work on No. 1 Parsons turbine was commenced in October, and was well in hand at the end of the year. No. 2 English Electric turbine was completed by the end of the year, with the exception of the condensate extraction pumps, which had not arrived from England. The new Prai station has been linked up with the new main distributing station at Dato Kramat by means of a duplicate 6-core split-conductor cable. The distance between these two points is about 10 miles, of which the submarine section is about 4½ miles. The cables were manufactured by Siemens Bros. and Co., and the work of laying them was superintended by Mr. Bicknell. The Hiring Department, which commenced in 1924, has been very much enlarged during the year, and is hardly able to cope with the demand. It is hoped to have a fully equipped showroom, with a lady demonstrator in charge, and a departmental cook in the coming year. Demonstrations of electric cooking, washing, ironing, etc., will be given both at the showroom and at consumers' premises. Automatic self-freezing cabinets can be seen at work at the showroom. It is anticipated that these will fill a long felt want in all households in the tropics.

Revenue was £105 396, compared with £91 555 for 1924, and working, distribution and administration costs amounted to £63 553, against £63 462. Electricity sold was 6 564 011 kWh, against 5 284 501 kWh, and the net profit was £16 921.

Physical and Optical Societies.

Arrangements for the Seventeenth Joint Annual Exhibition.

THE seventeenth annual exhibition of the Physical Society and the Optical Society will be held on January 4th, 5th and 6th, at the Imperial College of Science and Technology, Imperial Institute Road, South Kensington, and will be open in the afternoons (from 3 to 6 p.m.) and in the evenings (from 7 to 10 p.m.).

On January 4th, at 8 p.m. Prof. E. N. da C. Andrade will reproduce with contemporary apparatus a physical lecture of the early eighteenth century. On January 5th, at 8 p.m., Dr. C. V. Drysdale will lecture on "Progress in Electrical Instrument Design and Construction," and on January 6th, at 8 p.m., Mr. J. L. Baird will give a lecture on "Television." These lectures will be illustrated by lantern slides and experiments. Some 70 firms will exhibit scientific apparatus, and in addition there will be a group of non-commercial exhibits by fellows of the Societies and others, including demonstrations of famous historical experiments in physics, recent research, and effective lecture experiments.

It has been decided to open the exhibition to the general public without tickets on the third day, January 6th. On January 4th and 5th tickets of admission will be required. Invitations for January 4th and 5th have been given to the Institution of Electrical Engineers and other bodies, and members of such societies should apply for tickets to the secretary of the society to which they belong. Others interested should apply direct to Prof. A. O. Rankine, Imperial College of Science and Technology, South Kensington, London.

GIFT ADVERTISING.

Electrical Home Comforts Offered at Christmas by Contractors.

EVERY December, retailers in the large majority of trades spend considerable sums in advertising in their local newspapers the advantages of their particular goods as Christmas presents. In past years, electrical contractors have rather neglected this proved method of sales promotion, but this year they seem to have made a better show.

J. Mackersie and Co., of Dundee, in a well-designed announcement, drew attention to a number of "Useful Electrical Gifts," three of which (a standard lamp, an electric heating pad and a suction cleaner) were clearly illustrated.

Wippell Brothers and Row, of Exeter, described as an "Ideal Xmas Gift" a new model portable battery lamp for ladies, and Mr. W. Hampton, of Stafford, in a full column of "The Staffordshire Advertiser," gave illustrations of several electrical presents. "If you cannot get coal, why not install electric fires in your home?" was the caption accompanying a picture of a fire.

One novelty which should appeal to people with well-lined purses, was a grandmother clock with a self-contained 5-valve wireless installation, said to serve the three-fold purposes of supplying the correct time, affording a delightful means of entertainment and enlightenment, and exercising "a great ministry of refinement as a piece of beautiful furniture." The offer was not made by an electrical contractor, but by a firm of pearl and diamond merchants!

Radio Telephone Service.

Public Facilities Between London and New York Open Next Month.

ONLY a very short time has elapsed since a representative of THE ELECTRICIAN was able, during one of the Post Office engineers' experimental Sunday morning transmissions, to carry on conversations by wireless telephone with fellow journalists in New York. At that time (March, 1926) this means of communication was much subject to interference, although, on the occasion of which we had experience, speech in both directions was, if anything, more audible than is usually the case with an ordinary trunk call between distant places in this country.

Now it is officially announcedt hat early next month it is hoped to open a preliminary public radio-telephone service between London and New York.

The charge will be £15 for a conversation of three minutes, with an additional charge of £5 for each minute beyond that time. Allowance will be made in charging for individual calls when the conditions have been difficult.

All that a London telephone sub-station will have to do to speak to a New York subscriber will be to ask the exchange operator for the "American Service," giving the name, address, and telephone number of the New York subscriber. Should the person called not be available, every effort will be made to find him. If he cannot be found, and no substitute is available to take the message, the caller will pay only £2 as a "report" charge.

Decorative Lighting.

A Novel Installation on a Regent Street Business Building.

WHEN we described the electrical equipment of the new Austin Reed building in Regent Street, London, the decorative lighting scheme was not in use, owing to the lighting restrictions then in force. Now the installation is in operation some reference may be made to it here.

The building, it should be explained, does not lend itself in any way to flat lighting, and the ground landlord's regulations did not permit of other schemes of outside lighting. The scheme adopted comprises small B.T.-H. trough reflectors for every window. Each window has small curtains with blinds behind, and the reflectors are fitted at the bottom of the window, below the curtain and the blind.

The whole installation is entirely independent of the general lighting scheme of the building, and is controlled by independent time switches. The work was carried out entirely to the design of Mr. E. H. Freeman (of Messrs. Tyler and Freeman) under the instructions of the architects, Messrs. Westwood and Emberton.

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BUSINESS OPENINGS.

Latest Particulars of Electrical Engineering and Wiring Installation Contracts for which Tenders are being Invited at Home and Abroad.

WE give below the latest particulars of contracts for which tenders are invited, with the closing date, if available.

ABERDEEN CORPORATION.—Electric light installation work, in connection with the erection of a pavilion, shops, dance hall, restaurant and lounge, the main features of the beach improvement scheme. Intending offerers should send in their names to the Director of Housing, Town House, Aberdeen.

HYTHE PAROCHIAL CHURCH COUNCIL.—Electric light installation in Parish Church. Particulars from the vicar, the Rev. C. W. Chastel de Boinville.

TORQUAY CORPORATION.—Railway siding to power station, rotary wagon tipper, railway wagon weighbridge, electric capstan and fairleads, coal conveying plant and coal storage bunker. Specification from Mr. H. F. G. Woods, borough electrical engineer, Electricity Offices, Upton Valley, Torquay; deposit £1 1s.

MELTHAM PARISH CHURCH, HUDDERSFIELD, December 31st.—Electric light installation. Particulars from Mr. W. R. Carter, secretary of the Church Council, Birchfield.

NOTTINGHAM CORPORATION, December 31st.—Two 30-inch electrically-driven centrifugal pumps (section F.F.); one motor-driven twin booster; each for an output of 10 kW (section K.K.); and one storage battery of 256 cells, capacity 275 Ah at one-hour discharge rate (section M.3), for North Wilford power station. Specifications, etc., from Preece, Cardew and Rider, 8, Queen Anne's Gate, Westminster, S.W.1; deposit £2 for each section.

ROYAL WELSH NATIONAL EISTEDDFOD, HOLYHEAD, December 31st.—Electric light wiring of pavilion. Plan can be inspected at the office of Mr. T. E. Thomas, Central Chambers, Holyhead.

EAST HAM CORPORATION, January 1st.—Supply of 10 double-deck bogie tramcars, complete, or supply of: (*a*) car bodies and top covers; (*b*) motor equipment; (*c*) controller equipment; and (*d*) bogie trucks and brake equipment. Specifications, etc., from Mr. W. R. Elliott, Tramway Offices, Nelson Street, East Ham, London, E.6.

KEIGHLEY EDUCATION COMMITTEE, January 1st.—Electric light installation at Worth Village Council School. Specification, etc., can be obtained from Mr. E. Ratcliffe, Education Office, Keighley.

MANCHESTER CORPORATION, January 3rd.—Supply and erection, at Barton power station, of 33 000 V, 420 V, and 240 V switchgear. Specification (B.52) from Mr. H. C. Lamb, Electricity Department, Town Hall, Manchester; deposit £1 1s.

DUBLIN BOROUGH COMMISSIONERS, January 4th.—Surface condenser with auxiliary plant for 5 000 kW steam turbine. Specification, etc., from the City Electrical Engineer, Fleet Street, Dublin; deposit £2 2s.

INDIA STORE DEPARTMENT, January 4th.—Supply of about 264 650 copper bonds for track rails. Specifications (5s.) from the Director-General, Branch No. 36, Belvedere Road, London, S.E.1.

HUDDERSFIELD CORPORATION, January 5th.—Electric light installation at open-air school, Woodhouse Hall. Particulars from the Borough Architect, 26, Ramsden Street, Huddersfield.

SOUTH INDIAN RAILWAY CO., January 7th.—Overhead transmission line materials and cables. Specifications, etc. (10s.), from the company's offices, 91, Petty France, Westminster, S.W.1.

SALFORD CORPORATION, January 8th.—Re-wiring of premises, 143 and 147, Regent Road, Salford. Specifications from the Medical Officer of Health, 143, Regent Road, Salford.

CAMBERWELL (LONDON) BOROUGH COUNCIL, January 10th.—Maintenance of electric lighting, heating and power installations, telephones, etc. (section H.); supply of electric lamps (section S.). Forms of tender from the Borough Engineer and Surveyor, Town Hall, Camberwell, S.E.5.

PORT OF BRISTOL AUTHORITY, January 10th.—Grain-handling machinery at Royal Edward Dock, Avonmouth, including motors and switchgear. Specifications can be obtained from Mr. T. A. Peace, engineer, Avonmouth Docks; deposit £5.

ROMFORD GUARDIANS, January 10th.—Intercommunicating telephone system in the Institution. Particulars from Harrington and Evans, architects, 10, High Street, Romford.

BOMBAY, BARODA AND CENTRAL INDIA RAILWAY CO., January 11th.—Crude oil engine generator sets. Specification (10s.) from the Secretary, 91, Petty France, Westminster, S.W.1.

MANCHESTER CORPORATION, January 11th.—Electrolytic and cadmium copper trolley wire. Specifications from Mr. Henry Mattinson, Corporation Tramways, 55, Piccadilly, Manchester.

AMPTHILL URBAN DISTRICT COUNCIL, January 12th.—Electric wiring in connection with alterations to fire station; at the depot and stores; and in public conveniences in Bedford Street, Ampthill. Specifications from Mr. F. W. Walker, 105, Dunstable Street, Ampthill; deposit £2 2s.

BOOTLE CORPORATION, January 18th.—Electricians' work in 16 lock-up shops with flats above. Specification from the Borough Engineer, Town Hall, Bootle; deposit £2 2s.

WEST RIDING EDUCATION COMMITTEE, January 18th.—Electric light installation at Askern Sutton Road new school. Specifications, etc., from the Education Department, County Hall, Wakefield.

HULL CORPORATION, January 20th.—Two 12 500 kW M.C.R. turbo-alternators and condensing plant. Specification, etc., from Mr. H. Bell, Electricity Works, Sculcoates, Hull; deposit £2 2s. to City Treasurer, Guildhall, Hull.

ISLINGTON (LONDON) BOROUGH COUNCIL, January 21st.—One year's supply of cables, electricity meters, oil circuit-breaker switches, transformers, etc. Specification, etc., from the Town Clerk, Municipal Offices, Upper Street, N.1.

NORTH BRITISH ALUMINIUM CO., LTD., February 1st.—Construction, delivery and erection at the company's power house, near Fort William, Inverness-shire, of (1) water turbines (impulse type) (specification No. 100); and (2) direct-current generators (specification No. 101). Specifications, etc., from the company's offices, Adelaide House, King William Street, London, E.C. Preference will be given to contractors on the King's Roll.

STOKE AND WOLSTANTON GUARDIANS, February 8th.—Central heating and hot water services, including two electric generating sets. Specifications from the Clerk, Union Offices, Stoke-on-Trent; deposit £5 5s.

Overseas.

UNLESS otherwise stated, particulars of overseas contracts are to be had from the Department of Overseas Trade (Room 52), 35, Old Queen Street, Westminster, London, S.W.1.

Note.—An asterisk against the reference number of an overseas contract denotes that local representation is essential.

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 1st.—Supply and erection at site of Seru pumping and power station of four Diesel engine alternator groups, three pumps and accessories. Specification (10s. 6d.) from Chief Inspecting Engineer, 41, Tothill Street, London, S.W.1.

INDIA STORE DEPARTMENT, January 4th.—Supply and erection of overhead equipment (1 500 V) and steel structures for about 140 miles of railway route, in connection with the Great Indian Peninsula Railway electrification. Specification (£2) from the Director-General, Branch No. 10, Belvedere Road, London, S.E.1.

NEW ZEALAND PUBLIC WORKS DEPARTMENT, January 4th.—Supply of switchgear and transformers for Waikaremoana electric power scheme. (Reference B.X. 2 872.)

POSTMASTER-GENERAL'S DEPARTMENT, MELBOURNE, January 4th.—Bells and buzzers (schedule C. 147). (Reference B.X. 2 984.)

EGYPTIAN MINISTRY OF PUBLIC WORKS, January 10th.—Electrical generating plant, for the Survey Department, Giza, Cairo. (Reference B.X. 3 079.)

SYDNEY CITY COUNCIL, January 10th (extended date).—High and low tension cables (contract 1 057). (Reference B.X. 2 959.)

JOHANNESBURG MUNICIPALITY, January 13th.—Supply of 10 miles of 4/0 s.w.g. round section h.d. copper trolley wire. (Reference A.X. 3 938.)

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China, January 15th.—Turbo-generators, condensers, boilers, switchgear, transformers, etc. Tenders are invited by a Chinese company holding a concession for water and electricity supply. (Reference B.X. 2 998.)

New Zealand Government Railways, January 17th.—Switchgear, cables, motor-generators, lamps, etc. (Specification E.14.) (Reference B.X. 3 020.)

New Zealand Public Works Department, January 18th.—Transmission line steel towers for Waikaremoana electric power scheme (section 31). (Reference A.X. 3 732.)

Postmaster-General's Department, Melbourne, January 18th.—Switchboard cable (schedule C.151). (Reference B.X. 3 013.)

New Zealand Post and Telegraph Department, January 19th.—Electric bells and tumbler switches. (Reference B.X. 3 011.)

State Electricity Works, Montevideo, January 19th.—Supply of 100 500 metres of 250 V wires and cables. (Reference B.X. 3 042.)

Johannesburg Municipality, January 20th.—Supply of electric lamps. (Reference B.X. 3 112.)

New South Wales Government Railways, January 20th.—Electric railway car equipments, including motors, control equipment, air compressors, etc. Specification (No. 1 065) from the Chief Mechanical Engineer, Wilson Street, Redfern, N.S.W.

State Electricity Works, Montevideo, January 24th.—Supply of 220 V cables, telephone cables (20-pair) and branch and terminal boxes.

Postmaster-General's Department, Melbourne, January 25th.—Telephone transmitters and parts. (Reference B.X. 3 012.)

Posts and Telegraphs Department, Melbourne, January 25th.—Telephone receivers and associated parts (schedule No. C.153). (Reference B.X. 3 041.)

New South Wales Government Railways and Tramways, January 26th.—Manufacture and supply of electric train equipment for 105 motor cars and 100 trailer cars. (Reference A.X. 3 810.)

State Electricity Works, Montevideo, January 28th.—Supply of 923 000 metres of special wires and cables for outdoor use.

New Zealand Government Railways, January 31st.—Electrical equipment for Otahuhu car and wagon workshops. (Reference B.X. 3 038.)

New Zealand Public Works Department, February 1st.—Storage battery and booster for Waikaremoana Electric Power Board (section 28). (Reference B.X. 2 937.)

New South Wales Government Railways, February 2nd.—One 30-ton five-motor electric overhead travelling crane.

Pretoria Municipality, February 3rd.—Cable and accessories, switches and cut-outs. (Reference B.X. 3 097.)

South African Railways and Harbours, February 3rd.—Supply of motor-driven air-compressor.

State Electricity Works, Montevideo, February 11th.—Supply of 37 500 filament lamps. (Reference B.X. 3 117.)

New Zealand Government Railways, February 14th.—Switchgear, armoured cable and accessories, motor-generator sets, incandescent lamps and reflectors. (Reference B.X. 3 078.)

New Zealand Public Works Department, February 15th.—Transformers for Waikato (section 207). (Reference B.X. 2 985.)

State Electricity Works, Montevideo, February 15th.—Supply of 55 500 iron pieces to form supports for overhead electric lines. (Reference A.X. 4 018.)

State Electricity Works, Montevideo, February 18th.—Supply of 65 000 kilogs of unvarnished black iron wire and 10 000 kilogs of galvanized iron wire. (Reference A.X. 4 019.)

Dunedin (N.Z.) Municipality February 19th.—Motor-generator, with control board and accessories, for the Gas Department. (Reference B.X. 3 095.)

Sydney City Council, February 21st.—Supply and erection of coal-handling plant at Bunnerong power station, Botany Bay.

Tenders Accepted.

Lichfield City Council.—J. Richards and Co., electric wiring of 44 houses, £355.

Hamilton Corporation.—R. J. Sinclair, electric light installation at all-electric houses.

Huddersfield Corporation.—English Electric Co., Ltd., 5 000 kW turbo alternator, with condenser.

Barnes Urban District Council.—Stirling Boiler Co., boiler-house plant, for the electricity works.

Wakefield Corporation.—Burnley Components, Ltd., Burco electric wash boilers for new Wakefield housing scheme.

Cardiff Corporation.—Cargo Fleet Iron Co., Ltd., manufacture and supply of about 100 tons of steel tramway rails (B.S. section No. 7).

Lambeth (London) Guardians.—Metro-Vick Supplies, Ltd., "Cosmos" vacuum metal filament, gasfilled and carbon lamps for 12 months.

Milnrow Urban District Council.—Burnley Components, Ltd., Burco electric wash boilers in connection with No. 3 housing scheme.

Barclay, Perkins and Co. (Anchor Taverns Department).—F. Wingfield, electric lighting installation at "Greyhound" Theatre and Hotel, Croydon.

Southend-on-Sea Corporation.—Brush Electrical Engineering Co., Ltd., five top covers for tramcars, £325 each; Smith and Co., 3-ton electric crane, £1 190.

Leicestershire and Warwickshire Electric Power Co.—Worthington, Simpson, Ltd., surface condensing plant, in connection with power extensions at Spondon.

London and North-Eastern Railway Co.—Siemens and English Electric Lamp Co., Ltd., twelve months' supply of Siemens gasfilled and vacuum train lighting lamps.

Eastbourne Corporation.—Vickers Boiler Co., Ltd., supply and erection of water-tube boiler, economiser, feed heaters, two steel chimneys, with induced draught plant and pipe work, at the electricity works, £18 915.

Woodford Urban District Council.—County of London Electric Supply Co., Ltd., electric light installation at the Council Offices and Fire Station, £129 10s., subject to trade discount upon all fittings and lamps supplied.

Prestatyn Urban District Council.—Callender's Cable and Construction Co., Ltd., supply, etc., of underground cables, £9 146; English Electric Co., Ltd., Queen's House, Kingsway, London, W.C.2, supply, etc., of complete equipment of sub-station, £1 393.

Worcester Infirmary Committee.—British Telephone Supply Co., installation of telephone system in the Infirmary, £15 per annum for five years, with option of further four years' similar payment, after which the system will become the property of the Infirmary.

Cleethorpes Urban District Council.—Standard Telephones and Cables, Ltd., supplying and laying e.h.t. feeder cables and l.t. distribution cables, with section pillars and disconnecting boxes; supply and erection of transformers and switchgear equipment for feeders and sub-stations; and house services, including meters, £19 103 (accepted).

Sittingbourne and Milton Regis Joint Hospital Board.—Tenders accepted in connection with installation of electricity plant at the Hospital:—Campbell Gas Engine Co., Ltd., 20 kW vertical engine, £1 088; J. H. Holmes and Co., Ltd., dynamo, booster, main switchboard, etc., £453; Brunswick Engineering Co., Ltd., wiring, £821 10s.; Alton Battery Co., accumulators, £544 13s.

Richmond-on-Thames Corporation.—A. Hayes (Richmond Electric Installations), overhauling fire alarm system, £49, and maintenance fire alarm posts, etc., £69 per annum; additions or alterations of position of bells and overhead wires, £7 per single wire; wires, cells, etc., to residences of new members of the Brigade, £9; maintenance of additional alarm posts, etc., £1 5s. each per annum.

Croydon Corporation.—Hurst, Nelson and Co., Ltd., 10 double-deck roof-covered tramcar bodies, £15 800, and 10 sets of centre-bearing swing bolster tramcar bogie trucks, £2 520; Electro Mechanical Brake Co., Ltd., 10 magnetic track and wheel brake equipments, £550; British Thomson-Houston Co., Ltd., 10 sets of electrical equipments, and assembly of 10 tramcar bodies, etc., complete for service, £8 430.

Dublin Borough Commissioners.—Oerlikon, Ltd., supply and erection of one 5 000 kW steam turbo-alternator, with condensing plant, etc., £16 073. Dr. P. Meyer A.G., single phase meters—5 A, 18s. each, 10 A 18s., 20 A 24s., 30 A 27s., 50 A, 33s.; slot meters, 5 and 10 A 1d. and 1s. slot meters, 55s. each. Photector Co., Ltd., single phase meters—80 A 42s. each, 100 A 49s., 150 A 60s.; three-phase meters—5 A 52s., 10 A 52s., 20 A 57s., 40 A, 62s., 50 A 68s., 75 A 74s., 100 A 80s. Proctor Co., Ltd., 80 lamps at £12 10s. each. Oerlikon, Ltd., supplying and erecting three air filters at Pigeon House, £674 10s., and one 5 000 kW steam turbo-alternator with condensing plant, pipework and accessories, £16 073.

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GOVERNMENT CONTRACTS.

State Orders for Electrical Machinery, Apparatus and Material.

THE following contracts have been placed recently by Government Departments:—

ADMIRALTY.—(CONTRACT AND PURCHASE DEPARTMENT.)—*Alternators, Motor:* Newton Bros. (Derby), Ltd.; W. Mackie and Co., Ltd. *Batteries:* D.P. Battery Co., Ltd.; Chloride Electrical Storage Co., Ltd. *Bells, Electric:* A. Graham and Co.; Wm. McGeoch and Co., Ltd.; Whipp and Bourne, Ltd. *Boxes, Junction, etc.:* Engineering and Lighting Equipment Co.; Hawkers, Ltd.; Pinnacle Switchgear, Ltd. *Cables, Multicore, lead covered:* Johnson and Phillips, Ltd.; Cowans, Sheldon and Co., Ltd. *Fittings, Electric Lighting:* General Electric Co.; Engineering and Lighting Equipment Co., Ltd.; Wm. McGeoch and Co., Ltd.; Player and Mitchell; Dugdill and Co., Ltd.; Dorman and Smith, Ltd. *Frameworks, W/T.:* Park Royal Engineering Co., Ltd. *Furnace, Electric:* Electric Furnace Co., Ltd. *Motors:* Harding, Churton and Co. *Note Magnifiers and Tuners:* Radio Instruments, Ltd. *Transformers:* British Thomson-Houston Co., Ltd.; Foster Engineering Co., Ltd.; Ferranti, Ltd.; English Electric Co., Ltd. *Valves, W/T.:* Mullard Radio Valve Co.; General Electric Co., Ltd.; Edison Swan Electric Co., Ltd. *Winches, Electrically driven:* Harfield and Co., Ltd.

WAR OFFICE.—*Cable, Electric:* Callender's Cable and Construction Co., Ltd.; British Insulated Cables, Ltd.; Johnson and Phillips, Ltd.; Siemens Bros. and Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd. *Generating Sets, Spares:* Douglas Motors, Ltd. *Turbo Alternator:* 1 000 *kW:* Richardsons, Westgarth and Co., Ltd., *Installations:* Richmond Barracks, Electric Lighting: Gray Bros. (Newcastle), Ltd.

AIR MINISTRY.—*Buildings and Works Services:* Generating Sets (Hinaidi): Vickers Petters, Ltd.; Underground Mains (North Weald): Malcolm and Allan, Ltd. *Clutches, Generator:* G. E. Mortley, Sprague and Co., Ltd. *Control Resistance and Voltmeters:* British Radio Corporation, Ltd. *Generators:* W. Mackie and Co., Ltd.; G. E. Mortley, Sprague and Co., Ltd.; Small Electric Motors, Ltd. *Receivers, T.F., Modified:* Siemens Bros. and Co., Ltd.

POST OFFICE.—*Telephone Exchange Equipment:* Blackburn: Automatic Telephone Mfg. Co., Ltd. Willesden: General Electric Co., Ltd. Cambridge: Bradford; Reigate (Surrey); Palmers Green; Sevenoaks; Standard Telephones and Cables, Ltd. Bury Corporation; Greenock Corporation; Earl of Dudley's Round Oak Works, Ltd. (Staffs); Moss Gear Co., Ltd. (Birmingham): Relay Automatic Telephone Co., Ltd. Museum: Ericsson Telephones, Ltd. *Telephonic Repeater Station—2 Wire Repeater Equipment—Installation, etc:* Canterbury: General Electric Co., Ltd. *Apparatus, Telephonic:* Automatic Telephone Mfg. Co., Ltd.; Ericsson Telephones, Ltd.; International Electric Co., Ltd.; Standard Telephones and Cables, Ltd.; Telephone Mfg. Co., Ltd. *Apparatus, Testing, Protective and Miscellaneous:* Phœnix Telephone and Electric Works, Ltd.; T. Watson. *Apparatus, Wireless:* Standard Telephones and Cables, Ltd. *Battery Stores:* C. A. Vandervell and Co., Ltd. *Cabinets, Telephone.* Siemens Bros. and Co., Ltd. *Cable, various:* British Insulated Cables, Ltd.; Callender's Cable and Construction Co., Ltd.; Connollys (Blackley), Ltd.; Enfield Cable Works, Ltd.; W. T. Glover and Co., Ltd.; Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson and Phillips, Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. and Co., Ltd. *Cords for Telephones:* British Insulated Cables, Ltd.; Siemens Bros. and Co., Ltd. *Switches, Electric Light:* H. Incledon and Co., Ltd. *Wire, Cadmium Copper:* R. Johnson and Nephew, Ltd.; F. Smith and Co., incorporated in London Electric Wire Co. and Smiths, Ltd. *Wire, Switchboard:* General Electric Co., Ltd. (Peel-Conner Telephone Works).

CROWN AGENTS FOR THE COLONIES.—*Signalling Materials:* Westinghouse Brake and Saxby Signal Co., Ltd.; Tyer and Co., Ltd. *Switchgear:* British Thomson-Houston Co., Ltd.; Ferguson, Pailin, Ltd. *Telegraph Line Materials:* J. Spencer, Ltd. *Telephone Materials:* Ericsson Telephones, Ltd. *Train Lighting Equipment:* J. Stone and Co., Ltd. *Valve Transmitter, etc.:* Marconi's Wireless Telegraph Co., Ltd. *Wireless Apparatus:* Radio Communication Co., Ltd.

AIR MINISTRY.—*Armatures, Generator:* Newton Bros. (Derby), Ltd. *Magnetos:* British Thomson Houston Co., Ltd. *Transmitters, Coils, Aerial and Grid Leaks:* Gambrell Bros., Ltd. *Wavemeters:* H. W. Sullivan, Ltd.

WORK IN PROSPECT.

Trade Possibilities for Electrical Installation Contractors.

ADWICK-LE-STREET.—Houses (180), for Brodsworth Colliery Co.

BECONTREE.—Additional 2 137 houses, for London County Council.

BEDFORD.—Additional housing scheme, London Road Estate. Particulars, Borough Surveyor. Extensions to Girls' Modern School, for Governors of the Harpur Trust. Particulars, the architect, Mr. George P. Allen, 81, High Street.

BELLINGHAM.—Extensions to Athelney Street Schools, (£9 700), for London Education Committee. Particulars, the Clerk.

BURTON-ON-TRENT.—Houses, for Town Council. Particulars, the contractor, Mr. F. Caulton, Bearwood Hill Road.

CARLISLE.—Additional 100 houses, Long Sowerby Estate. Particulars, city engineer, Mr. Percy Dalton, 18, Fisher Street.

CHATHAM.—Houses (16). Particulars, borough engineer, Mr. R. L. Honey.

CHELMSFORD.—School, Boarded Barns Estate, (£22 167), for Borough Education Committee. Particulars, the contractors, G. Hawkes and Son.

COLCHESTER.—Schools, Lexden, for Borough Education Committee. Particulars, the clerk, Mr. E. G. Bultitude, 3, Trinity Street.

COULSDON.—Secondary School for Surrey Education Committee. Particulars, the secretary, Mr. W. W. Finny, Kingston-on-Thames.

ECCLES (LANCS).—Extensions to Winton Parish Church, (£4 000). Particulars, the vicar, Rev. S. B. Farbridge.

ELTHAM AND SHOOTERS HILL. Three schools (2 280 places), for London Education Committee. Particulars, the Clerk.

GRAVESEND.—Extensions to hospital, (£60 000). Particulars, the secretary, Mr. C. T. Chapman.

HAWICK.—Housing scheme (48), Thorterdykes. Particulars, the architects, Alison and Hobkirk.

HORDEN (Co. DURHAM).—Billiards saloon, Cotsford Lane, for Mr. Pontone.

HURST GREEN (CAKEMORE).—Church, (£2 000), for Primitive Methodist Trustees. Particulars, the Secretary.

ISLE OF THANET.—Housing scheme (44), Birchington and Westgate-on-Sea. Particulars, the Surveyor, Station Road, Birchington.

LANGOLD.—Cinema theatre, for Mr. Frederick Shaw, Empire Super Cinema, Rotherham. Particulars, the architect, Mr. George Handley Johnson, Maltby, Doncaster.

LEXDEN AND WINSTREE.—Housing scheme. Particulars the architect, Mr. E. Fincham, Marks Tey, Colchester.

LINCOLN.—Secondary school, (£25 000). Particulars, Director of Education.

MALDON.—Houses (14), Fanbridge Road, for Crittall Housing and Investment Society.—Houses (12), for Town Council. Particulars, the contractor, Mr. P. C. Sayer, Great Totham.

NEWMARKET.—Housing scheme (11). Particulars, Mr. A. E. Austin, 4, Hills View, Great Shelford, Cambs.

NORTHAMPTON.—Chapel at Ease, Roman Catholic Cathedral. Particulars, the secretary, Capt. L. H. Cox, 18, Coppersville, Weston Favell.

PERSHORE.—Housing scheme (94). Particulars, the architects, Francis B. F. Andrews and Son, Birmingham (36), and Mr. J. H. Williams, Worcester (58).—Additional 36 houses, for Rural Council. Particulars, the Surveyor.

PREESALL.—Additional housing scheme, Knott End. Particulars from the Surveyor.

RADLETT (HERTS).—Development of Beeches Estate (216 houses). Particulars, Mr. E. N. Grace.

RUGBY.—Art and classrooms. Particulars, the architect, Mr. W. T. Loveday, or the contractors, Henry Martin, Ltd., Northampton.

SHREWSBURY.—Housing scheme (51) Particulars, the Borough Surveyor.

SLOUGH.—Factory extensions for Naylor Bros.

STALYBRIDGE.—Schools (220 places), Waterloo Road. Particulars, Mr. Frank H. Worsley, clerk to Education Committee.

WELSHPOOL.—County offices (£10 000), for Montgomeryshire County Council. Particulars, the Clerk.

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RAILWAY EQUIPMENT.

Important Contract for the Southern Railway Suburban Electrification.

AS briefly announced in THE ELECTRICIAN last week, one of the largest contracts for complete electric railway equipments ever placed in this country has been obtained by the Metropolitan-Vickers Electrical Co., in connection with the extension of suburban electrification on the Southern Railway. It covers the supply of motors, control gear, lighting, heating and braking equipment for 116 three-coach trains and 47 two-coach trailer units for passenger service on the central section of the suburban system. The value of the contract, over £600 000, is approximately the same as that of the recent contract placed with the same firm for forty-one 2 600 H.P. locomotives for the Great Indian Peninsula Railway. The whole of the electrical equipment will be manufactured at the Metropolitan-Vickers works at Trafford Park and Sheffield.

The new equipment will be identical with that supplied on previous contracts carried out by this firm for the Southern Railway. Each motor coach will be equipped with two 275 H.P. motors of the totally-enclosed, self-ventilating type. These machines, which are of the largest size used for motor coach service in this country, are arranged in pairs on the bogies underneath the driving compartments at the two ends of the train unit. As with most axle-mounted motors, they are four-pole machines, and have also four commutating poles and two sets of brushes. They are series wound for operation at 600 V d.c.

The control gear is of the Metropolitan-Vickers all-electric type, with automatic acceleration, and arranged for multiple unit working. The main contactors are operated by solenoids energised from the line, and controlled through train lines connected to the master controller in the driver's cab. The master controller incorporates the " dead-man handle " which automatically shuts off the power and applies the emergency brakes should the driver's hand be removed.

Installing Fittings.

Objections to Proposed Extension of Municipal Trading at Leeds.

AT a recent meeting of Leeds City Council Mr. J. Lambert moved to refer back a proposal to call for a report on the question of the proposed installation of electrical fittings. He objected to a further extension of municipal activity. So far, he said, there had been a small department for the hiring of electric stoves, and its activities had very fortunately been restricted to this. Municipal installations would mean the setting up of a new department with a large number of officials. There were 175 business people in Leeds whose living wholly depended on the sale of electrical fittings. To the Committee " doing the whole job from the meter to the light," he (Mr. Lambert) took strong objection. Consideration ought to be given to tradesmen who were paying heavy rates and employing a large number of people.

Sir Charles Wilson asked for the proposal to be withdrawn. He pointed out that under the Electricity Act power was given to local authorities to deal in electrical fittings, provided that the prices charged were not less than the scale recognised in the retail trades. If the Electricity Department could not sell at below retail prices, and were compelled to add sinking fund and interest charges, they could not compete with the local people in the business.

Ald. Foster (chairman of the Electricity Committee) said his committee were anxious to remove the restrictions which Mr. Lambert approved. At present when people came to the department and fancied an electric stove they were asked for the name of their electrical contractor. The contractor must have his profit on the stove sent to be fixed, and such a state of things made him impatient. Why should not the Electricity Department have the same rights as the Gas Department ?

The amendment was rejected, and the committee's proposal adopted.

Arnold Goodwin and Son, Ltd., Sumner Street, Southwark Bridge, London, S.E.1, are prepared to quote for the overhaul and repair of electrical and other machinery and plant. Their list No. 39 contains illustrations of machines supplied or repaired by them.

CALENDARS FOR 1927.

Electrical Firms' Seasonable Reminders to Friends in the Trade.

ONCE more it is our pleasant duty to record the receipt of a variety of attractive calendars, diaries, etc., sent out by electrical firms to their friends in the trade. This year there is an increase in the number of cards of greeting. These include the familiar card of the Commercial Cable Co., New York, one from the President and Council of the Electrical Contractors' Association, and another from the St. Helens Cable and Rubber Co., Ltd. Two well-known advertising figures, " Tone and Power," accompany Santa Claus as " bearers of good tidings," from the General Electric Co., Ltd., and J. H. Tucker and Co., Ltd., are sending an original card bearing a die-stamped reproduction of one of their switches.

A useful desk blotter is to hand from the Hart Accumulator Co., Ltd. As each sheet of blotting paper is printed with a calendar for the whole year the pad is doubly useful. Another blotter of attractive form comes from W. T. Henley's Telegraph Works Co., Ltd. It is bound in book form, each sheet of blotting paper being printed with one month's calendar. On the cover is a handsome coloured drawing showing how harmoniously the firm's unit pillars take their place in residential streets.

Wall Calendars.

Wall calendars include one with a river scene reproduced from a water colour and tear-off monthly sheets from the Liverpool Electric Cable Co., a " Christmassy " wall card from S. G. Brown and Co., Ltd., showing a juvenile radio " fan " listening in " for the good things of 1927," and a large, valve-shaped card depicting a Marconi valve from Marconi's Wireless Telegraph Co. The tear-off date sheets are numbered with a week to a page, with a small calendar for the two following months at the foot. Another " valve " calendar, and one that deservedly ranks high in the " beauty gallery " series, is issued by the Mullard Wireless Service Co., Ltd. One can only wonder where the company finds the charming subjects which take the place of the filament on these cardboard valves. The tear-off date pad is, as usual, commendably clear.

An artistic coloured lithographed picture, " The First Breath of Spring," admirably reproduced on a satin-finished fabric, is the *pièce de résistance* of the calendar sent out by G. Nobbs, Ltd.

The Taj Mahal, in any event a most attractive subject for pictorial treatment, appears to special advantage on a beautiful wall card produced by Callender's Cable and Construction Co., Ltd., as the Taj Mahal has been wired with Callender Cable. Done by the Forman offset process, this calendar is a very beautiful production.

The Douglas Electric Lighting and Power Co., electrical engineers and contractors, have chosen a gaily coloured cut-out parrot as the main feature of their calendar. Subjects of a more utilitarian character figure on the calendar of British Brown Boveri, Ltd., which has large monthly sheets which bear excellent illustrations of actual applications of electricity in Switzerland. In addition to the desk blotter previously mentioned, the Hart Accumulator Co. have distributed a large lithographed wall calendar with monthly tear-off sheets and large figures.

Christmas Windows.

Striking Displays in a London Company's Showrooms.

SOME striking and topical displays have been staged in the windows of the Brompton and Kensington Electricity Supply Co., Earl's Court Road, London, S.W.5.

One window represents a country scene. In the centre is a Christmas tree hung with all manner of trinkets and coloured lights. On one side a miniature pond, upon which ducks are floating, is represented. On a bush near by is perched an electrically illuminated parrot. At the other side of the Christmas tree are shrubs with large illuminated flowers. Other illuminated features include toadstools, owls, and a large plant of unique appearance with a pixie seated on it. The other window represents a completely furnished dining room with the table ready laid for dinner. The main lighting is from a floor standard and four table lamps lighted from the table; the shades are round and of flounced silk, shading from dark red at the lower edge, to pale pink at the top. An electric radiator, and lamps concealed in flowers and bird-cages, complete this attractive window.

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E.T.B.I. SUBSCRIBERS.

Further List of Contributions to Fund by Electrical Firms.

PUBLICATION is continued of the list of subscribers in connection with the annual festival dinner of the Electrical Trades Benevolent Institution:—

Willing and Co., £2 2s.; Wholesale Fittings Co., Ltd., £5 5s.; R. F. Winder, Ltd., £1 1s.; W. E. Warrilow, £5 5s.; F. C. White, £2; J. Williams, £1 1s.; R. Whiffen, Ltd., £5 5s.; J. Whittaker and Co., 5s.; W. H. Willcox and Co., £2 2s.; A. A. Williams, 10s.; H. Wilson, 10s.; R. C. Walker, 5s.; Wellman, Smith, Owen Engineering Corporation, Ltd., £2 2s.; W. Wildman, £1 1s.; Watson and Sons (Electro Medical, Ltd.), £3 3s.; Wireless Apparatus, Ltd., £1 1s.; R. and W. Watson, Ltd., £10; Geo. Walker and Co., Ltd., £1 1s.; A. Watson and Co., £1; W. W. Warren, £1 1s.; Walker and Sons, Ltd., £1 1s.; J. Warriner, 1s.; F. T. Wordley, £10; Western Union Telegraph Co., £2 2s.; Wathes and Co., Ltd., £5; Wild, Collins and Crosse, £21; Alfred B. Willis, £5; Arthur Wheeler and Co., £5 5s.; Wheeldon, £1 1s.; H. Wheeler, £2 2s.; S. Wolf and Co., Ltd., £2 2s.; Whittall, W. J., and Son, £5 5s.; G. Workman, £1 1s.; H. Wiggins and Co., Ltd., £5 5s.; Willetts and Cobb, Ltd., £1 1s.; Wilkins and Wright, Ltd., £10 10s.; S. Wheeler, Ltd., £1 1s.; Wingrove and Son, Ltd., £1 1s.; Lord Weir, £5 5s.; Watson, Saville and Co., Ltd., £5 5s.; Whitlay Tool Co., Ltd., £1 1s.; A. V. Willmott Son and Phillips, £2 2s.; H. C. Wheatland and Co., 10s. 6d.; Waygood-Otis, Ltd., £10 10s.; S. D. White, £10 10s.; P. Whyman, 10s. 6d.; G. and J. Weir, Ltd., £10 10s.; J. M. Watt, £2 2s.; F. Winstanley, £2 2s.; E. Wilson, £3 3s.; Geo. Whitehead and Chown, £5 5s.; Willis and Bates, £5 5s.; J. Wilkins and Co., Ltd., £26 5s.; Wood Electric Fittings Co., Ltd., £5 5s.; M. W. Woods, £10 10s.; L. Weekes (Luton), Ltd., £1 1s.; H. Williams, 10s. 6d.; Wm. White and Co., £2 2s.; L. D. White, 10s. 6d.; Whitehead Iron and Steel Co., Ltd., £2 2s.; B. C. Whitfield, £1 1s.; J. Williams, 10s.; A. Wilde, 10s.; Ward and Goldstone, £3 3s.

Ynille-Our, £1 1s.; Tom Yorke, £1 1s.

"Z" Electric Lamp Co., £3 3s.

SUPPLEMENTARY LIST.—R. Alger and Son, Ltd., £1 1s.; Belco, Ltd., £1 1s.; W. E. Budding, 10s.; W. M. Boag, 10s. 6d.; J. H. Bower, 5s.; A. Binfield, £1 1s.; Braithwaite and Co., Engineers, Ltd., £5 5s.; W. A. Chamen, £3 3s.; Cooper and Co., Ltd., £10; A. E. Camp, 10s.; Clements, 10s.; Hunt Clark, £1 1s.; J. H. Collings, £1 1s.; Clarke, Chapman and Co., Ltd., £5; Cable Accessories Co., Ltd., £1 1s.; J. T. Cartwright, £2 2s.; H. W. Chapman, Ltd., 10s.; Executors of John Clayton, £2 2s.; Downes and Davies, £5 5s.; T. W. Fox, 10s.; J. G. Freeman, £1 1s.; Guest, Keen and Nettlefolds, Ltd., £5 5s.; G.E.C. Manchester Branch, £1 1s.; W. L. Giller, 10s. 6d.; T. R. Hughes, 10s.; Sir Laurence Halsey, K.B.E., £52 10s.; The Hayward Co., £1 1s.; Holloway Bros. (London), Ltd., £3 3s.; H. Hope and Sons, Ltd., £5 5s.; A. V. Jenkins, 10s.; A. E. Jenkins, 10s.; Kleine Patent Fire Resisting Flooring Syndicate, Ltd., £5 5s.; Lamlok, Ltd., £2 2s.; Lamp Caps, Ltd., £2; Limmer and Trinidad Lake Asphalt Co., Ltd., £3 3s.; Geo. Lewis, £2 2s.; A. Nichols Moore, £2 2s.; W. Maddams, £2 2s.; Mitchells and Butlers, Ltd., £5; M. O. Valve Co., Ltd., £21; Mellowes and Co., Ltd., £5 5s.; F. C. Mayes, £1 1s.; Newport Corporation Electricity Dept. (Technical Staff), £1 1s.; North Metropolitan Electric Supply Co., Ltd. (Brimsdown Technical Staff), £1; Page and Stibbs, £1 1s.; R. E. Possart, 10s.; J. Poole and Sons, £5 5s.; T. Petersen, £3 3s.; D. Ross, 10s.; W. T. Rogers, 10s.; Rainsford and Lynes, Ltd., £3 3s.; S. C. Russell Castle, £5 5s.; Thos. Rowbotham, £2 2s.; South Wales Power Co. (Electrical Staff), £1 11s.; Simpson and Walkins, Ltd., 10s. 6d.; J. Scrivener, £10 10s.; A. B. Strachan, £2 2s.; W. C. Skinner, £2 2s.; C. Thain, £5 5s.; Union-Castle Mail Steamship Co., Ltd., £5 5s.; Venner Time Switches, Ltd., £2 2s.; Waterlow and Sons, Ltd., £2 2s.; Chris. Wilson, £10 10s.

G.E.C. CARD COLLECTIONS.—G.E.C. Steel Conduit Co., per A. S. Goodman, £1 6s. 6d.; G.E.C. Belfast Branch, per J. L. Dawson, £4 15s.; G.E.C. Ileene Works, per G. H. Ide, £2; G.E.C. Sheffield Branch, per A. E. Jepson, 10s.: G.E.C. Salford Instrument Works, per H. Cobden Turner, 2s. 6d.; G.E.C. Research Laboratories, per C. Wilson, £1 9s.; G.E.C. Wires and Cables Dept., Head Office, per Mr. Cass, £1 7s. 6d.; Osram-G.E.C. Lamp Works, per Hammersmith, £2 5s.; G.E.C. Despatch Dept., Head Office, per C. E. Haken, £2 5s.; G.E.C. Swansea Branch, £1 10s.; G.E.C. Engineering Dept., Head Office, £2 2s.; G.E.C. Dundee Branch, £2 15s.; G.E.C. Wembley Works, £8 1s.; G.E.C. Fittings Dept., Head Office, £3 7s. 6d.; G.E.C. Invoice Dept., Head Office, £1 5s.; G.E.C. Illuminating Engineering Dept., Head Office, £3 3s.; G.E.C. Manchester Branch, £35 11s.; G.E.C. Fittings Dept., Head Office, £2 12s.; G.E.C. Publicity Organisation, Head Office, £3 2s. 6d.; Osram Lamp Dept., Head Office, 15s.; G.E.C. Glass Works, Wembley, 12s.; Osram-G.E.C. Lamp Works, £1 5s.; G.E.C. Audit Dept., Head Office, £4 18s.; G.E.C. Shipping Dept., Silvertown, £1 3s. 3d.; G.E.C. Ileene Works, Birmingham, £1 11s.; G.E.C. Steel Tube Works, £5; Peel-Conner Telephone Works, Coventry, £57 0s.; Chamberlain and Hookham, Birmingham, £16 5s.; G.E.C. Sheffield Branch, £0 3s.; G.E.C. Traction Dept., Head Office, £3 13s. 6d.; G.E.C. Osram Dept., Head Office, £1 7s.; G.E.C. Newcastle Branch, £17 15s. 0d.

(To be continued.)

TRADE PUBLICATIONS.

Details of Catalogues and Dealer-Helps Issued by Manufacturers.

THE Super Cut-Out is the subject of a small illustrated pamphlet, "W.L.B.," issued by W. T. Henley's Telegraph Works Co., Ltd.

John Dugdill and Co., Hazel Grove, near Stockport, send us a card of illustrations, prices etc., of many types of their patent movable electrical fittings.

Hopkinson Induction Motors, Willesden Lane, North Acton, W.3, will send, on application, their monthly stock list of single phase and three-phase induction motors.

The A.C.E.C., 56, Victoria Street, London, S.W.1, send us a list of motors and dynamos in stock in the company's shops at Charleroi. Voltages, frequencies, speeds, etc., are stated.

A large mailing card bearing an illustration of a Marshall oil driven generating set is issued by Marshall, Sons and Co., Ltd., Gainsborough. The firm's oil engines range from 8 to 450 B.H.P.

Lamp Lists.

Philips Lamps, Ltd., 145, Charing Cross Road, London, W.C.2, will send, on request, a new leaflet giving particulars of Argenta opal lamps. Dealers' names and addresses will be overprinted.

The Hendon Electric Lamp Co., Ltd., 104, Southampton Row, London, W.C.1, will supply, on request, copies of their 1926-7 Lamp List, with their customers' names and addresses printed thereon. A leaflet on electric irons is also available.

The Athol Engineering Co., Seymour Road, Crumpsall, Manchester, will send to the trade, on application, illustrated folders giving details of their wireless components, including the Athol porcelain valve holder, aerial earthing plugs, baseboard coil holders and porcelain coil mounts.

A new book (No. 114) is to hand showing many applications of the time-saving runways supplied by Herbert Morris, Ltd., Loughborough. Morris electric lifts and portable conveyors are illustrated and described on leaflets which, like the runway book, can be obtained on application.

The Bastian Meter Co., Ltd. (incorporating Bastian and Allen), 58, Haymarket, London, S.W.1, are sending out leaflet No. 14/50, which gives prices and other particulars of new pattern Bastian d.c. meters. Leaflet 12, issued by the same company, gives information regarding the "Super Imp," "New Imp" and "Imperator" electric fires.

Leaflet 69/1, issued by the Stonebridge Electrical Co., Ltd., Victoria Road, North Acton, sets out the characteristics of the firm's electrostatic voltmeters, some of which have a range up to 400 000 V. Attention is also called to the advantages of using three-phase earth leakage indicators, also supplied by the Stonebridge Electrical Co.

Radio Components.

Radio Instruments, Ltd., 12, Hyde Street, New Oxford Street, London, W.C.1, are prepared to supply dealers with quantities of a new folder containing descriptions and illustrations of five of their specialised components, viz., the R.I. retroactive tuner, reactive anode unit, multi-ratio transformer, permanent mineral detector and low frequency choke.

An attractive leaflet (No. 1047) calling attention to the electric switches supplied by J. A. Crabtree and Co., Ltd., Lincoln Works, Walsall, and 116, Charing Cross Road, London, W.C.2, will be sent to applicants. A Faraday House report quoted in the leaflet testifies to the great overload capacity of the Crabtree patent double-pole movement. Illustrations and prices are given of several designs of switch sockets and covers.

The Engineering and Lighting Equipment Co., Ltd., Sphere Works, St. Albans, Herts, have issued a folder giving particulars of the firm's new range of "S.L.R." (standard lamp reflectors) which have been designed to comply with B.E.S.A. specification No. 1, of Industrial Lighting Fittings, and are licensed under B.E.S.A. 232/26; folder P.1225 giving details of the "Lunax" diffusing unit (a feature of this fitting being that the globe is held by means of a spun copper band on to which the fixing screws bear, which, it is claimed, is an advantage over the method of fixing the globe by means of three screws bearing on the glassware); and folder P1223 containing particulars of a selection of lantern and cast iron fittings.

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ELECTRICITY SUPPLY.

Coventry Mains Programme—Opposition to Yorkshire Co.'s Bill—Chester's Rural Growth—£3 200 000 Station for Birmingham.

THE electricity supply at Holywell was inaugurated last week.

Aldbourne, Wilts, is to have its streets lighted electrically, by 21 lamps.

Ticehurst ratepayers have decided to adopt electricity for street lighting.

Saffron Walden T.C. has received sanction to a loan of £1 309 for laying feeder mains.

Coventry Electricity Committee recommends application for a loan of £30 000 for mains, etc.

Lyme Regis T.C. is to consider the question of borrowing £16 065 for the electricity undertaking.

Glossop T.C. is considering in committee the question of purchasing the electricity and tramway undertaking.

Aylesbury T.C. has applied for a loan of £3 000 for cookers and other electrical apparatus to be let on hire.

Huddersfield T.C. has decided to petition against the Parliamentary Bill of the Yorkshire Electric Power Co.

Municipality to Buy Undertaking.

Walton-on-Thames U.D.C. has applied for a loan of £100 000 for the purchase of the local undertaking of the Urban Electric Supply Co., Ltd.

Whitehaven R.D.C. has received sanction to a loan of £450 for electric street lighting at Moresby. The electricity will be supplied by the Moresby Colliery Co.

St. Neots R.D.C. has given permission to the Beds., Cambs., and Hunts Electricity Co. to erect overhead wires for the transmission of electricity on roads in its area.

East Grinstead U.D.C. has applied for a loan of £4 300 for carrying an overhead line to Sunnyside pumping station, and for £300 for alterations to the switchboard.

To meet the cost of services for connecting new consumers, Chester Corporation has decided to apply to the Electricity Commissioners for sanction to borrow £5 000.

Since it obtained an Order to supply Glazebury, the Lancashire Electric Power Co. has approached Leigh Corporation for terms for a supply at the borough boundary.

The new plant at the Worksop electricity works was officially inaugurated on December 16th. The principal contractors for the plant were Vickers-Petters, Ltd.

West Ham T.C. has received sanction to the extension of its plant by the installation of one 10 000 kW 2-phase 50-cycle turbo-alternator, a 60 000-lb. boiler, and auxiliary plant.

Owing to the growth of the supply system in the outside parts of the Chester electricity area, the Corporation has decided to appoint an additional assistant mains engineer.

It is reported that the Wallingford Electric Light Co. will postpone its application to the Electricity Commissioners for powers to supply the Didcot parishes and surrounding district.

Bury Replacement Scheme.

Bury (Lancs) T.C. has asked the Electricity Commissioners' approval of the first portion of a scheme for the replacement of certain plant at the generating station at an estimated cost of £99 000.

Duns T.C. has passed a resolution deciding to approach one or more firms with a view to ascertaining whether they would be prepared to introduce and operate an electricity supply for the town.

Edmundson's Electricity Corporation is applying, on behalf of the Whitchurch and Pangbourne Electricity Supply Co., for an Order extending its area to the villages of Purley, Sulham and Tidmarsh, Berks.

Goring and Streatley Electric Light and Power Co. is applying to the Electricity Commissioners for an Order extending its area to include Basildon, Streatley, and other Berkshire parishes.

The Ayrshire Electricity Board has applied for a Special Order to extend the area of supply so as to include the burghs of Girvan, Maybole and Largs. The Girvan Council has accepted the draft agreement for the supply to the borough.

Sir William F. Marwood, of the Ministry of Transport, held an inquiry on December 17th relative to the refusal of Raunds U.D.C. to allow the Rushden and District Electric Supply Co. to erect overhead h.t. cables across the Raunds-Ringstead Road.

The Abingdon Electric Supply Co. has submitted a scheme for supplying Didcot and Northbourn, and has arranged to take a bulk supply from Oxford for distribution in Abingdon, Wantage, etc. Wallingford R.D.C. agrees to the company's application for powers.

Col. T. C. Ekin (for the Electricity Commissioners) recently held an inquiry into the application of the Leatherhead Electricity Co., Ltd., and Edmundson's Electricity Corporation, Ltd., for Orders to supply electricity in the parishes of Betchworth, Buckland, Dorking Rural, and parts of the parishes of Wotton and Abinger.

At a meeting of Hull Electricity Committee last week it was mentioned that within the next five years, or probably less, a big new power station would be required at Hull. The electrical engineer (Major H. Bell) said it would take five years for the scheme to materialise. Already he had in view a number of suitable sites for the station.

Hastings T.C. has decided to extend the mains to supply new wells at Sedlescombe and Kent Street, at an estimated cost of £14 478, and to give a supply to the Palace Hotel, comprising 16 flats, suite of offices, and lifts, and to Drapers' flour mill. A loan of £30 800 over-spent on the erection of a power station at Broomgrove has been applied for. The sanctions in respect of this work totalled £131 373.

Wallingford T.C. has rejected a resolution expressing the opinion that it is undesirable that the Gas Co. should be subjected to serious competition from a privately owned electric light undertaking. At a public meeting held in 1923 the ratepayers passed a resolution urging the Council to provide a municipal supply of electricity, and the council has now decided that a committee should be appointed to reconsider the whole matter.

Birmingham's New Station.

Preliminary steps are being taken in connection with the erection of Birmingham Corporation's new power station at Hams, near Coleshill. The aggregate power of the initial plant will be 60 000 kW, and the cost up to that stage will be £1 336 400. The ultimate capacity of the station is expected to be 210 000 kW, and the total cost £3 200 000. It is hoped that Birmingham Corporation and the Shropshire Co. will be allowed to continue on the 25 cycle system.

Chester Electricity Committee has received from the Electricity Commission a communication on behalf of the Gwynedd Trust, suggesting that if the necessary steps were taken to exclude the remaining part of the rural district of Tarvin and the urban district of Tarporley (i.e., any area which was or might be vested in the Corporation for distribution purposes) from the area of the North Wales and South Cheshire Joint Electricity Authority, they would be prepared to withdraw their application for a Special Order in respect of the proposed extended area, and allow the application of the Corporation in respect of the same to go unchallenged. A joint conference, under the chairmanship of a member of the Electricity Commission, is to be held to discuss the proposition.

Torquay T.C. has decided to promote a Bill in Parliament to confer further powers upon the Council in respect of the electricity and other undertakings. The Town Clerk has reported that the Electricity Commissioners have not yet issued their Order giving the council power to lay ring mains from Newton Abbot power station through Ippolepen and Marldon to Paignton, and that it is absolutely necessary for the new ring main to be in commission by next winter. He has therefore applied to the highway authorities for their consent to the laying of the cable, pending the issue of the Order, and some of them have already given permission. The engineer (Mr. H. F. G. Woods) advises that the conducting section of the cable should be increased from 0·15 sq. in. to 0·20 sq. in., which would deliver 5 000 kVA into Paignton and Torquay, against 4 000 kVA, making the cable cost, at present prices, £22 265 17s., against £18 650 5s., for a 0·15 sq. in. cable, plus cost of erecting the necessary stations and providing switchgear, amounting to £3 150, or a total of £24 415 7s. The action of the Town Clerk and Engineer has been confirmed, and they have been instructed to carry out the scheme as recommended, and apply for sanction to the necessary loan.

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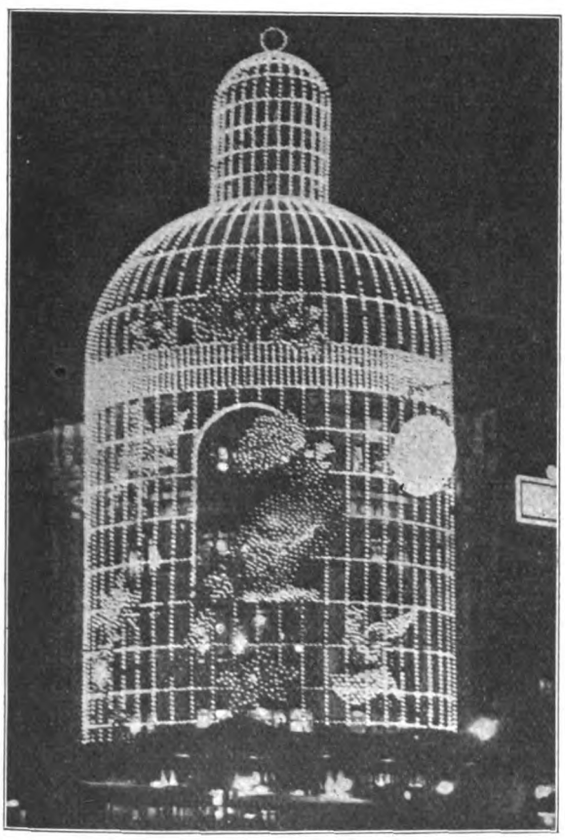
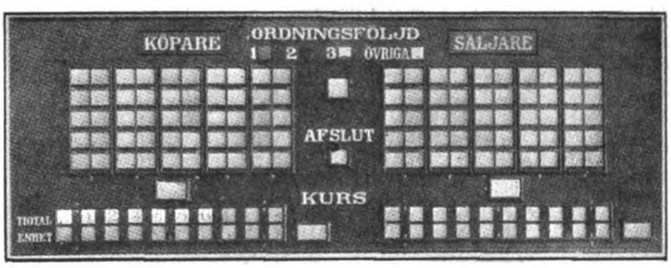
ELECTRICAL NEWS IN PICTURES

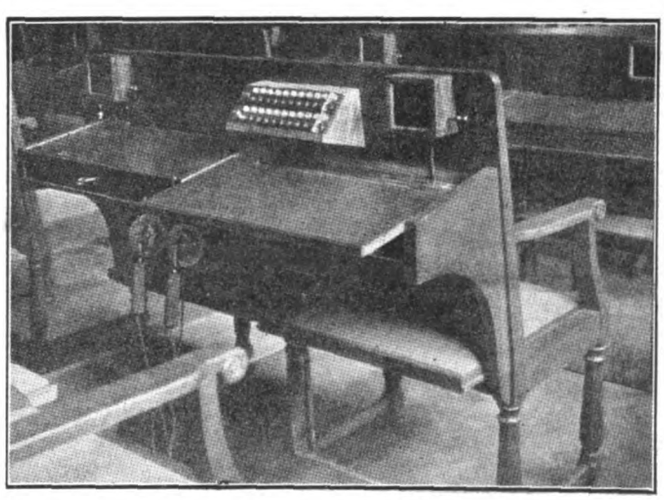
To test the strength of a British-made radio valve, twelve valves packed in the usual cartons were taken up by an aeroplane and dropped from a height of 600 ft. The experiment seems to have afforded evidence as to the robustness of the valves, as only one had the glass broken, while the remainder were intact.

Following the lead of the cinemas, this Baptist Church at Des Moines, Iowa, has installed an electric sign with the object of increasing the congregation. ("Electrical World" photo).



Electricity is in considerable demand for advertising purposes in the larger centres of population in France. The vogue for the mammoth electric sign for exhibition outside the big stores during the Christmas shopping season shows no signs of diminution in Paris, where the picture seen above was secured.





Some time ago THE ELECTRICIAN illustrated the first electrical "bid-recorder" used in a Dutch vegetable market. The above pictures show another installation used at the Stockholm Stock Exchange. The first picture shows the electric sign board which registers the bids, while below is seen the equipment attached to the desk of each member.

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WIRELESS NEWS.

Officers Elected for the New Radio Manufacturers' Association.

AT the first meeting of the Executive Council of the Radio Manufacturers' Association, held at Astor House, Aldwych, London, Mr. W. H. Goodman (Dubilier Condenser Co. (1925), Ltd.) was elected chairman of the Association, and Mr. A. E. Bowyer-Lowe (Bowyer-Lowe Co., Ltd.), who has played a prominent part in the preliminary work of the Association, was selected to fill the office of vice-chairman.

Other officers appointed were : TRUSTEES—Mr. W. H. Goodman, Mr. J. Joseph (Radio Instruments, Ltd.), and Mr. J. T. Mould (Igranic Electric Co., Ltd.). SECRETARY—Mr. D. Grant Strachan.

To fill the three vacancies on the Council, the Chloride Electrical Storage Co., Ltd., the Marconiphone Co., Ltd., and the Radio Communication Co., Ltd., were co-opted.

As an outcome of recent negotiations for the tenancy of the New Hall, Olympia, London, for wireless exhibitions, it was announced that the building had been booked for the following inclusive dates : September 21st to October 2nd, 1927 ; September 19th to 30th, 1928 ; September 18th to October 6th, 1929 ; September 17th to October 5th, 1930 ; and September 16th to October 4th, 1931.

It was decided that arrangements be made for the issue to members of a monthly bulletin containing information on various topics of a confidential nature.

The following is a list of the complete Executive Council, the name of each member firm being following by the name of its executive representative and/or deputy.

The Bowyer-Lowe Co., Ltd. (A. E. Bowyer-Lowe, H. W. Widgery, deputy) ; Brandes, Ltd. (W. A. Bartlett, W. J. Holland, deputy) ; Brownie Wireless Co. of Great Britain, Ltd. (J. W. Barber, H. L. Kirby Johnson, deputy) ; Burndept Wireless, Ltd. (W. W. Burnham, Eric Ball, deputy) ; Chloride Electrical Storage Co., Ltd. (L. A. Darby) ; Climax Radio Electric, Ltd. (R. M. Ellis) ; Dubilier Condenser Co., (1925), Ltd. (W. H. Goodman, Chairman ; A. M. Kennedy, D. F. Bates, deputy) ; Graham Amplion, Ltd. (W. H. Lynas, W. G. Davies, deputy) ; Igranic Electric Co, Ltd. (J. T. Mould) ; L. McMichael, Ltd. (L. McMichael) ; Marconiphone, Co., Ltd. (F. W. Perks) ; Metro-Vick Supplies, Ltd. (H. G. Aytoun-Kay) ; Mullard Radio Valve Co., Ltd. (S. R. Mullard, J. C. Hodson, deputy) ; Radio Communication Co., Ltd. (R. Ferguson) ; Radio Instruments, Ltd. (J. Joseph. C. B. Gresham, deputy).

Wireless News in Brief.

The Australian Commonwealth Government has appointed a Royal Commission on broadcasting.

A Belgian Royal Decree for the creation of a School of Wireless Telegraphy has been issued.

To enable Santa Claus's juvenile recipients of wireless sets to test their gifts, the Schenectady broadcasting station (WGY) began broadcasting at 6.30 on Christmas morning.

An intensive campaign against unlicensed listeners is to be launched. There are 2 130 000 licence holders in this country, and it is estimated that there are about 500 000 unlicensed listeners.

The British Broadcasting Co. announces that the Gloucester line relay station, which is part of an extensive scheme to improve the simultaneous broadcast system, and is similar to the installation already existing at Leeds, is now in service.

The directors of Marconi's Wireless Telegraph Co. state that Australian beam tests so far carried out have been highly satisfactory, and it is anticipated that the stations will be handed over to the P.O. for official tests early in the new year.

The Board of Trade has given the Humber Conservancy Board permission to proceed with the installation of a wireless direction finding apparatus on the new Spurn Lightship, to be used as a fog signal to enable vessels to take a bearing of the lightship.

Mr. T. Thorne Baker recently delivered at Leeds a public lecture on his system of transmitting pictures by wireless. By his system (which is based on the work of Bakewell 24 years ago), Mr. Baker said we should be able to transmit, in two or three months' time, by wireless pictures in natural colours.

It is reported that Mr. Victor Muller, Mayor of St. Louis, by speaking into a telephone transmitter at St. Louis recently, communicated with a broadcasting station in Pennsylvania, 700 miles away and subsequently through five relays and back to a station in St. Louis where the wireless impulse switched on 3 579 lamps, the first instalment of a new lighting system.

Dr. Alexanderson, consulting engineer of the General Electric Co. and Radio Corporation of America, announced recently that television across the Atlantic Ocean would supplement wireless and the telephone when he had perfected his apparatus. "Telephote," as the new process is called, projects the vision in somewhat the same manner as the telephotograph, but instead of requiring from two to twenty minutes to transmit the picture, it is said to operate 20 000 times as fast.

The French Minister of Commerce (M. Bokanowski), recently submitted to the Superior Council of the Post Office a scheme to remedy the present conditions under which broadcasting is carried on in France, and which Mr. Bokanowski recently described as anarchic. The Superior Council of the Post Office has decided not to discuss the details of the proposal at present. Mr. Bokanowski proposed that for a transitional period of five years authorisations would be given to private or semi-public organisations ; that these organisations should be controlled, especially for the safeguarding of State rights, and that the State would share in the gross proceeds of advertising contracts.

ELECTRIC TRACTION.

News of Latest Tramway and Electric Railway Developments.

MR. F. S. Eckersley, Clerk to the Selby U.D.C., suggests that the railways from Leeds and Bradford into Wharfedale should be electrified.

The first section of the new electrical underground railways in Sydney, N.S.W., between the Central and St. James' stations, was opened on December 20th.

The Minister of Transport has granted an order authorising the Mansfield and District Light Railway Co. to construct tramways to Rainworth, Blidworth, etc.

The French Minister of Public Works (M. Tardieu) opened, last week, the electrified section of the railway from Paris to Vierzon, 127½ miles in length. This is the longest section of electric railway in France.

The development of Vancouver and the Fraser River Valley will be such in the next five years that the British Columbia Electric Railway Co. is already planning to duplicate the first unit of the Bridge River hydro-electric scheme of 60 000 H.P. within three years of the opening of the initial section which will cost $12 000 000.

The Prague correspondent of the "Observer" reports that a scheme for the establishment of a system of underground electric railways for Prague and its suburbs has been given to the municipality free of charge by the originators. The cost is estimated at about 110 million Czech crowns. One of the four suggested lines will be laid under the river Moldau ; another is expected to link up the three large railway stations, Mosaryk, Denis, and Wilson.

Unless reasonable conditions are set up by co-ordination of traffic facilities, the directors of the Metropolitan Electric Tramways Co. have decided not to renew the lease expiring in 1930 for operating the Middlesex County Council tramways. Over a million passengers a year are carried in the North London districts by 23 routes, which traverse 43 miles in Middlesex and several miles in Hertfordshire. Increased 'bus competition is the reason for the decision. The company is of opinion that a profit could be earned by all three classes of transport (tubes, tramways and omnibuses) if the services were properly co-ordinated and regulated.

A return has been issued by the Ministry of Transport giving particulars of the accounts and statistical returns of the tramways and light railways undertakings in Great Britain for the year ended December 31st, 1925, for companies, and March 31st, 1926, for local authorities. The tables show that the total route mileage open for traffic at the end of the period was 2 602 miles, of which 1 888 miles were worked by local authorities and 714 miles by companies. The total capital expenditure at the end of the period amounted to £96 660 086. The total gross receipts for 1925-26 were £28 211 355, and working expenses were £22 598 617, leaving net receipts £5 612 738. Passengers numbered 4 668 812 206, increase 48 310 685 ; car-miles run were 387 812 970, of which 99·63 per cent. were electric car-miles.

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COMPANY NEWS.

Few Changes in Prices of Electrical Companies' Shares—Rise in Metropolitan-Vickers Ordinary—Edison Swan Dividend again 10 per cent.

AS compared with quotations before the commencement of the Christmas holiday, our usual list of electrical share prices—supply, transport, equipment and telegraph—shows very few changes. Marconi's Wireless shares remain at the lower figure of 13s. 9d. to which they recently fell, and Eastern Telegraph stock at 177½ is another point down. Eastern Extension £10 shares have shed half a crown. Two more electricity supply shares are quoted ex share bonus: County of London at 26s., and London at 24s. The only real activity has been in Metropolitan-Vickers ordinary shares, which, on the report of a contract for electrification of the Southern Railway's suburban system, have risen from 23s. 9d. to 25s. 7½d.

Last Annl. Divd	Description.	This Week.	Last Week	1912 to 1925. Highest.	Lowest.
%	**Electricity Supply.**				
10	Brompton & Kensington Ord. ..	30/-	30/-	45/-	24/-
4	Central Elec. Supp. 4% Deb. ..	89	89	100	67
15	Charing Cross Elec. Ord. (£1) ..	25/-	25/-	60/-	10/-
4½	,, ,, 4½% C.P. (£1) ..	17/6	17/6	19/6	10/-
12	Chelsea Elec. Sup. Ord. ..	25/-	25/-	39/6	10/-
15	City of Lon. Elec. L'ting Ord.	42/6	42/6	52/6	20/3
6	,, ,, 6% C.P. ..	23/-	23/-	40/-	15/6
15	County Lon. Elec. Sup. Ord. ..	26/-†	62/6	61/3	14/6
6	,, ,, 6% C.P. ..	23/-	23/-	24/9	15/3
15	Kensington & K'bridge. Ord. (£1)	24/-	24/-	104/6	3/-
10	Lon. Elec. Sup. Ord. (£1) ..	24/-†	34/-	35/-	5/-
11	Metro. Elec. Sup. Ord. ..	39/4½	39/4½	41/6	8/-
4½	,, ,, 4½% C.P. ..	17/6	17/6	18/6	9/6
7	N'castle & Dist. Elec. Ltg. Ord.	20/-	20/-	21/10½	7/9
7	,, Elec. Sup. Ord. ..	21/3	21/3	26/-	11/6
6	N. Metro. Elec. P. 6% C.P. ..	22/-	22/-	23/9	10/1½
6	Notting Hill 6% C.P. (£10) ..	10	10	9/18/9	6/13/
17½	St. James' & P.M. Ord. (£1) ..	24/-	24/-	62/-	22/-
15	W'minster Elec. Sup. Ord. (£1)	24/6	24/6	48/9	18/-
4½	,, ,, 4½% C.P. (£1)	17/6	17/6	21/6	13/-
6	Yorks. Elec. Power Ord. ..	27/-	27/-	32/6	12/6
6	,, ,, 6% C.P. ..	22/6	22/6	25/-	14/3
	Railways and Tramways.				
8	Brit. Elec. Trac. Ord. Stk. ..	144½	144½	123	24
6	,, ,, 6% Pf. Stk. ..	109	109	111	53
4	Cent. Lon. Ry. Ord. Stk. (asstd)	69	69	89½	40½
4	,, ,, 4% Deb. ..	79	79	103	56½
4	City & S. Lon. 4% Perp. Deb.	78	78	102½	50
3½	Lon. Elec. Rly. Cons. Ord. Stk.	57½	57½	73½	10
4	,, ,, 4% Pf. Stk. ..	71½	71½	84/2/6	43
4	,, ,, 4% Deb. ..	78½	78½	98½	52
5	Lon. & Sub. Trac. A. Deb. ..	76½	76½	89	65
4	Lon. Un. Trams. 1st Deb. ..	42½	42½	82	30
4½	Met. Elec. Trams. 4½% Deb. ..	65½	65½	101½	49
5	,, ,, 5% Deb. ..	66½	66½	102/17/6	53
5	Met. Rly. Cons. Ord. Stk. ..	63	63	84½	19
3½	,, 3½ Pf. Stk.	63½	63½	88½	40½
3½	,, 3½% Deb.	70½	70½	92½	51½
3½	Met. Dis. Rly. Ord. Stk. ..	56½	56½	58	12½
4½	,, ,, 4½% 1st Pref. ..	77½	77½	91	45
6	,, ,, 6% Perp. Deb. ..	113½	113½	146/12/6	80
4	S. Met. Elec. Trams. 4% Deb. ..	68	68	73½	48½
5	Yorks. (W.R.) Trams. Ord. ..	12/6	12/6	27/-	1/-½
4½	,, ,, ,, 1st Deb.	69	69	87	52
	Electrical Manufacturing.				
7	Brit. Elec. Transformer 7% C.P.	18/1½	18/1½	22/1½	11/6
15	Brit. Insulated Cables Ord. ..	67/6	67/6	62/-	26/6
6	,, ,, 6% C.P.	22/6	22/6	25/6	14/6
7	British Thomson-Houston Pref.	22/3*	22/3	23/4	19/7
7	,, ,, 7% Deb.	106½	106½	107½	92
10	Brush Electrical Ord.	26/3	26/3	29/-	10/-
‡15	Callender's Cable Ord.	68/9	68/9	85/-	22/-
6½	,, ,, 6½% C.P. ..	23/9	23/9	26/6	3/-
7½	,, ,, 7½% B. Pref.	26/3	26/3	27/4	16/6
10	Edison Swan Elec. Ord. (4/-)	11/3	12/9	28/9½	1/11
7½	,, ,, 1st Pref. ..	22/6	22/6	26/-	5/-
10	Elec. Construction Ord. ..	31/3	31/3	30/4	6/7
7	,, ,, 7% C.P. ..	22/6	22/6	25/3½	16/-
—	English Elec. Ord.	15/-	15/-	29/3	7/3
6	,, ,, 6% C.P. ..	17/6	17/6	21/3	10/6
—	Ericsson Telephones 7% Pref.	21/10½	21/10½	21/-	12/7
6	Ferranti 6% Pref.	19/3	19/3	18/6	16/9
7	,, 7% 2nd Pref. ..	18/9	18/9	19/-	13/9
7½	General Elec. Ord.	31/-	31/-	59/-	13/6
20	W. T. Henley's Ord.	87/6	87/6	86/6	23/3
17½	Johnson & Phillips Ord. ..	60/-	60/-	60/3	14/6
7½	Lon. Elec. Wire & Smith's Pref.	23/1½	23/1½	27/6	17/6
8	Metro-Vickers Ord.	25/7½	23/9	37/-	13/1
8	,, ,, 8% C.P. (£2) ..	46/3	46/3	67/10	5/-
7½	Siemens Bros. & Co. Ord. ..	30/-	30/-	36/6	12/3
10	Telegraph Const. Ord. (£12) ..	29½	29½	56/2/6	19
	Telegraph.				
3½	Anglo-Am. Tele. Ord. Stk. ..	61½	61½	68½	40
4	Commercial Cable 4% Deb. ..	74	74	87½	60
10	Eastern Ord. Stk.	177½	178½	213½	113/2/6
3½	,, 3½% Pref. Stk. ..	65½	65½	84/17/6	49
4	,, 4% Deb.	77½	77½	103½	60
10	Eastern Extension Ord. (£10) ..	17½	18	21½	10/12/6
4	,, ,, 4% Deb. ..	77½	77½	97½	60
22	Gt. Northern Telegraph (£10) ..	27	27	42/12/6	19
10	Indo-European (£25)	47½	47½	59½	25
—	Marconi's Wireless T. Ord. ..	13/9	13/9	9/16/3	20/9
7½	,, Int. Mar.	22/6	22/6	5/11/3	14/11
10	Western Tel. Ord. (£10) ..	17½*	17½	23	11/6/3
4	,, ,, 4% Deb. Stk. ..	77½	77½	10	50/2/6

* Ex dividend. † Ex share bonus. ‡ Plus share bonus.

CLAUD HAMILTON, LTD.—No div. to be paid on ord. shs. Div. for yr. to be paid on pref. shs.; fwd. £6 274.

LISBON ELECTRIC TRAMWAYS, LTD.—Div. for 1926 on 6 p.c. cum. pref. shs., less tax, payable on January 1st.

CROMPTON AND CO., LTD.—Intm. div. at rate of 7 p.c. p.a. on pref. shs. for 6 mos. to Sept. 30, 1926, payable Jan. 8.

SHAWINIGAN WATER AND POWER CO.—Shareholders have approved conversion of shs. into shs. without par value, on basis of 4 shs. without par value for every $100 sh.

MONTREAL LIGHT, HEAT AND POWER CO.—Div. 33⅓ cents p. sh. for two mos. ending Dec. 31st, 1926. In future qrly. divs. will be paid on last day of April, July, Oct. and Jan.

MANN, EGERTON AND CO., LTD.—Pft. for yr. to Sept 30, 1926, £20 675; pref. div. 6 p.c., int. on funding certificates 5 p.c.; redemption of funding certificates £3 000; fwd., £6 747.

VICTORIA FALLS AND TRANSVAAL POWER CO., LTD.—Net earnings for qr. ended Sept. 30, £267 536. Div. on pref. shs. 3 p.c. for half yr. ending Dec. 31 and further div. of 3 p.c. in respect of participating rights for 1926, both less tax, and intm. div. 3 p.c., less tax, on ord.

BRITISH COLUMBIA ELECTRIC RAILWAY 30., LTD.—Pft. for yr. to June 30, £573 234, plus £60 890 brought in. Fin. div. on def. ord. stk. at rate of £3 12s. 6d. p.a., tax free, making 8 p.c. To gen. res. £40 000, pensions fund £40 000; fwd. £67 794. It is proposed to increase sh. cap. by £320 000.

SOUTHERN CANADA POWER CO.—Gross earnings for yr. ended Sept. 30, 1926, $1 389 131, agst. $1 213 665; net $913 561, agst. $713 566; surplus $573 563, agst. $432 241. To depreciation res. $138 900, agst. $121 365. After paying pfd. and common divs. carry fwd. is $166 365, agst. $117 776.

MARCONI'S WIRELESS TELEGRAPH CO., LTD.—Directors have been informed by Sir Gilbert Garnsey (of Price, Waterhouse and Co.) and Cooper Bros. and Co. (the company's auditors) that the report of their investigation into position of company and associated companies will be completed early in January.

BARBADOS ELECTRIC SUPPLY CORPORATION, LTD.—Pft. for year to June, 1926, £11 003, against £10 078. After providing for general expenses in London, debenture and loan interest and reserve of £1 000 for taxation, balance was £9 456, including £1 513 brought in. To depreciation reserve, £6 000; renewals reserve, £1 500; fwd., £1 956.

CONSOLIDATED GAS, ELECTRIC LIGHT AND POWER CO. OF BALTIMORE.—Dividend, 62½ cents per share on common shares for quarter ended Dec. 31, payable Jan. 3. An issue of new common shares is to be made to existing shareholders, at $35 per share, in the proportion of one new share to each ten old shares, and the list will close on Jan. 10.

EDISON SWAN ELECTRIC CO., LTD.—Trading pft. including interest and rents, £6 927, for yr. to June 30, 1926, £143 911, agst. £163 183. Allowed for depreciation £13 911, agst. £13 553, to res. £40 000, agst. £50 000, net pft. £71 405, a reduction of £16 939. After paying pref. div. and ord. div. (10 p.c.) carry fwd. is £29 038, agst. £24 276.

ANDHRA VALLEY POWER SUPPLY CO.—Sales for yr. to June 30th, 1926, yielded Rs58 21 006, agst. Rs53 42 150, while divs. and other receipts brot. total income up to Rs58 41 627, compared with Rs54 21 869. After meeting all expenditure and interest charges and providing Rs8 00 000 for depreciation, net pft. was Rs9 73 882, agst. Rs14 28 011. Written off deficit in blce. sheet, Rs1 00 000; set apart for depreciation of investment Rs85 000. Two yrs.' div. on prf. shs. at 7 p.c. p.a. to June 30th, 1926, is provided; fwd. Rs1 03 589, agst. Rs5 186. Total output for yr. 144 000 000 kWh, agst. 128 000 000 kWh.

TATA POWER CO.—Rept. for year ended June 30 states that special arrangements have been made for storage of water, in order to commence supply towards end of yr. In Dec. last calls on shs. to extent of about Rs.11 800 000 having remained unpaid, directors arranged a loan of Rs.115 lacs to be made by Tata Hydro-Electric Power Supply Co. on security of remaining "B" mtge. deb. stk. of co. of nominal value of £250 000 and third mtge. deb. of Rs. 115 lacs to be created by co. In consideration of Hydro Co. having come to that coy.'s aid in completing its works, it has been agreed to pay to Tata Hydro-Electric Power Supply Co. every yr.

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sum equal to one-tenth of trading pft. of Power Co. Directors had to accept terms, as money required could not be raised elsewhere on better or even equally good terms.

Company Meetings.

BOGOTA TELEPHONE CO., LTD.—Mr. Harry Kahn, at annual mtg., said company's total liabilities, apart from sh. cap., were under £4 000. On other side, land, bldgs. concession and equipment stood at £175 000, and they had deprecn. res. of over £30 000, and cash and War Loan amtg. to nearly £20 000. Receipts for subscriptions, etc., were £41 706, an increase of about £1 400, and blce. to appropn. acct. was £23 063, of which they had placed £5 000 to deprecn.; div. of 12½ p.c. had bn. paid and balce. fwd. was £8 265. Last Oct. there were 5 270 subscribers, compared with 4 942 a yr. before, and 2 030 were waiting to be connected. A resolution increasing cap. from £150 000 to £300 000 (to pay for extensions of equipment) was carried unanimously.

UNITED ELECTRIC TRAMWAYS OF MONTEVIDEO, LTD.—At a recent extraordinary meeting, resolutions were passed approving conditional agreement with Atlas Co. and making alterations to coy.'s memorandum and adopting new articles of association necessitated by extension of coy.'s bus. as holding coy. For same reason, coy.'s name was changed to Sphere Investment Trust, Ltd., and further resolution was agreed to dividing existing £5 pref. and ord. shs. into five £1 cum. pref. shs. and five £1 ord. shs. respectively. Sir George Touche said object of consolidation was to secure for public of Montevideo improved system of electric traction by unification of two systems at present operating, and to facilitate financing of further improvements by broadening basis of operating company. At subsequent mtg. of 1st deb. stockholders resolutions were passed sanctioning exchange of 1st deb. stk. for equivalent nominal amt. of new 5 p.c. deb. stk. of Atlas Light and Power Co. and approving draft supplemental trust deed.

CITY OF LONDON ELECTRIC LIGHTING CO., LTD.—Mr. J. B. Braithwaite, at annual mtg., said lateness of mtg. was due to their having awaited settlement of outstanding questions in connection with Act of 1925. They had given to consumers £495 000 up to Dec. 31, 1924, and in 1925 had made further present of £87 000, so that within last three or four yrs. they had made price reductions which resulted in consumers being £582 000 better off. Cost of coal and fuel was £112 575, compared with £134 967, decrease £22 392; despite that decrease, they had sold 6 550 000 kWh more than in previous year. In new form of accts. they carried £397 696 to net revenue acct., compared with £349 276, but that did not represent position quite clearly, and if they made necessary adjustments, real improvement in pft. was £73 065. Regarding generating arrangements between themselves and rest of companies forming eastern group under schedule to Act of 1925, they had to arrange pooling or unifying generating resources. They had suggested a committee to deal with that, but Commissioners were not quite satisfied with proposal and had asked directors to prepare figures. With regard to cap. requirements, directors thought it wise to create 5 p.c. consolidated deb. stk., £220 000 of which they had sold. In addition, they had offered the 4½ p.c. second deb. stockholders opportunity to exchange into new stock, receiving 95 p.c. of it for every £100 of their stk. Regarding the new Electricity Act, he deeply regretted the measure. The industry was at last beginning to go ahead and make satisfactory progress. Now there was introduced a new Central Electricity Board which would be a further obstruction to progress, and would only result in raising cost of electricity to consumers and checking development of the industry. A resolution authorising the directors to capitalise the reserves was subsequently passed.

VENEZUELA TELEPHONE AND ELECTRICAL APPLIANCES CO., LTD.—Mr. J. S. Austen, presiding at the annual meeting, explained the reason why the contract which was entered into for the sale of the company's property was not carried out. Owing to the increased cost of construction, for some time past the rate charged for telephones did not give them a fair return on the capital outlay, That meant that, in effect, they were losing money on every new telephone installed. It was necessary to make alterations in the rates. They were charging on a flat rate—that is, the same for every telephone—and they proposed to put their subscribers on to a category rate—that is to say, private houses to pay a certain fixed sum, business houses a larger sum, and hotels and boarding houses a still larger sum. They were about to put this scheme into operation when they received offers for their property which ultimately resulted in the signing of the contract for sale. But before the time arrived for completion, the buyers asked them to give notice of the new charges which they contemplated. Then came the bolt from the blue in the shape of an open letter from the President of the Republic to the Minister of Posts, in which he objected to the alteration in the rates, and suggested that it ought to be 20 bolivars per month, which was, in fact, less than they were already charging. They had a concession, granted many years ago, under which they had the right to charge what rates they liked. The President's action unnerved the buyers, and the result was that they were unable to complete. Apart from this trouble, the position of the company had never been better. They had had during the year an increase of 600 subscribers, and they had another 600 waiting to be connected. It was obvious, therefore, that the 1 000 automatics they had ordered would not be sufficient, and they would have at once to increase the automatic installations.

New Companies.

W. R. WALKER, LTD.—Cap., £2 043. Electricians, etc. Reg. office: 97, Mount Street, Grosvenor Square, London, W.1.

MERTON BLAKE AND CO., LTD.—Cap., £100. Electrical engineers, etc. Reg. office: 11, Warwick Street, Regent Street, London, W.1.

PAGE ELECTRICAL EQUIPMENTS, LTD.—Cap., £500. Electrical engineers, etc. Reg. office: 152, Great Charles Street, Birmingham.

J. HERBEN AND CO., LTD.—Cap., £7 000. Dealers in wireless receiving and transmitting apparatus, etc. Reg. office: 140, St. James's Street, Burnley.

EAGLE VALVES, LTD.—Cap., £100. Dealers in electric lamps, wireless valves and parts, etc. Reg. office: 19, New House, Hatton Garden, London, E.C.1.

MARK HOOKHAM, LTD.—Cap., £10 000. To acquire business of electrician, etc., now carried on by M. Hookham at Springfield Road, Eastbourne, as Mark Hookham.

PYTCHLEY (NORTHAMPTON), LTD.—Cap., £1 000. General and electrical engineers, etc. Solicitors: A. E. Hewitt and Crane, 201–3, Great Portland Street, London, W.1.

RADVACO, LTD.—Cap., £200. Manufacturers of and dealers in electrical and wireless goods and accessories, electrical and radio engineers, etc. Reg. office: 3, Lynton Road, Acton.

ALFRED NEALE AND SON, LTD.—Cap., £5 000. To acquire business of manufacturers of electrical conduits, apparatus, fittings, etc., carried on by Alfred Neale and Son, of Pool Road, Smethwick.

APEX SUN-RAY, LTD.—Cap., £2 000. To act as selling agents of Sun-Ray treatment machines, etc. Reg. office: Room No. 10, 4th Floor, Balfour House, 119/125, Finsbury Pavement, London, E.C.2.

BOLTON UNITED SUPPLIES, LTD.—Cap., £100. Dealers in, and importers, exporters and manufacturers of electrical and wireless goods, appliances, lamps, valves, etc. Reg. office: Short Street, Bolton.

WESSEX POWER PRODUCERS, LTD.—Cap., £12 000. To undertake, promote or assist schemes for the production of electricity for power, lighting, heating, traction, etc. Reg. office: 18, Austin Friars, London, E.C.2.

Metal and Chemical Prices.

TUESDAY, December 28th

		Price.	Inc.	Dec.
Copper—				
Best Selected	per ton	£62 10 0	—	5s.
Electro Wirebars	,,	£64 15 0	—	—
H.C. Wire, basis	per lb.	9¼d.	—	—
Sheet	,,	9¾d.	—	—
Phosphor Bronze—				
Wire (Telephone) basis	per lb.	1s. 0¼d.	—	—
Brass 60/40—				
Rod, basis	per lb.	7¼d.	—	—
Sheet, basis	,,	10¼d.	—	—
Wire, basis	,,	10¼d.	—	—
Pig Iron—				
Cleveland Warrants	per ton	£4 10 0	—	—
Galvanised Steel Wire, basis 8 S.W.G.	,,	£14 0 0	—	—
Lead Pig—				
English	,,	£30 15 0	5s.	—
Foreign or Colonial	,,	£29 0 0	—	2s. 6d.
Tin—				
Ingot	,,	£301 5 0	—	£6 10 0
Wire, basis	per lb.	3s. 9½d.	—	1d.
Aluminium Ingots	per ton	£112 0 0	—	—
Spelter	,,	£32 17 6	5s. 0d.	—
Mercury	per bottle	£17 12 6	—	—

Sulphur (Flowers)—Ton £12 5 0 *Sodium Chlorate*—Per lb. 2¾d.
,, (Roll-Brimstone)—,, £11 0 0 *Sulphuric Acid* (Pyrites, 168°)
Copper Sulphate— ,, £25 to £25 10s. per ton, £6 15 0
Boric Acid (Crystals) ,, £37 *Sodium Bichromate*—Per lb. 3¼d.
Rubber—Para fine, 1s. 4¼d.; plantation 1st latex, 1s. 6¼d.

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COMMERCIAL INFORMATION.

County Court Judgments.

[NOTE.—*The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for actions. But the Registry makes no distinction. Judgments are not returned to the Registry if satisfied in the Court books within 21 days.*]

GARDINER, L. A., AND CO., 58, Church Lane, Charlton, wireless dealers. £12 2s. 8d. November 5th.

GREENSMITH, Mr. A. (trading as BOULEVARD GARAGE MOTOR DEPOT), 124, Hartley Road, Nottingham, electrical dealer. £12 13s. 10d. November 15th.

RUNBAKEN (J. H.), LTD. (trading as RUNBAKEN MAGNETO CO.), 30, Tipping Street, London Road, Manchester, automobile electrical apparatus makers. £41 6s. 2d. November 15th.

VOS, Mr. L., 135, Evering Road, Stoke Newington, wireless dealer. £30 11s. 2d. November 3rd.

Bill of Sale.

CHOMSKI, Morris, 21, Vartry Road, Stamford Hill, and 18A Black Lion Yard, Whitechapel, electrical engineer. Filed December 20th. £100.

Receiverships.

ALPHA ELECTRIC AND OXY ACETYLENE WELDING CO., LTD. F. Reed, of Westgate Chambers, Newport, Mon., accountant, was appointed receiver on December 6th, 1926, under powers contained in debenture dated December 3rd, 1923.

WELCO PATENTS, LTD. E. Greenhill, of 7, Newhall Street, Birmingham, was appointed receiver on December 14th, 1926 under powers contained in debenture dated September 29th, 1923.

Mortgages.

[NOTE.—*The Companies Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its annual Summary under the Companies Act, specify the total amount of debt due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt prior to the present creation, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BRADWELL ELECTRIC WIRE AND ENGINEERING CO., LTD., New Bradwell. Reg. December 2nd, £450 debenture, to Mrs. C. Braden, Greenham Cottage, Perry Hill, Worplesdon; general charge.

BURNDEPT WIRELESS, LTD., London, S.E. Registered December 1st, £50 000 debentures with premium of 6 per cent. (the company has power to redeem at a premium of 3 per cent. on notice terminating on or prior to June 30th, 1928), to Johnson and Phillips, Ltd., 12, Union Street, E.C.; charged on properties at Willesden, etc., also general charge (subject to prior charge, etc.). *Up to £100 000. July 30th, 1926.

PERAK RIVER HYDRO-ELECTRIC POWER CO., LTD., London, S.W. Reg. December 7th, Trust deed dated November 30th, 1926, securing £1 250 000 guaranteed debenture stock; charged on a concession granted by Government of Perak, etc., also general charge ranking in priority to Trust Deed dated November 12th, 1926, securing £1 350 000 participating debenture stock.

SHOREHAM AND DISTRICT ELECTRIC LIGHTING AND POWER CO., LTD. Reg. December 11th, mortgage further securing £10 000 debenture dated March 19th, 1926, to H.M. Treasury solicitor; charged on properties at Shoreham-by-Sea, etc. *£10 000 August 2nd, 1926.

Satisfactions.

CALCUTTA ELECTRIC SUPPLY CORPORATION, LTD., London, W.C.—Satisfaction reg. December 8th, £590 000, reg. November 30th, 1920, and May 25th, 1922.

ISLE OF THANET ELECTRIC SUPPLY CO., LTD. (late ISLE OF THANET ELECTRIC TRAMWAYS AND LIGHTING CO., LTD.), London, W.C.—Satisfaction registered November 30th, £2 816, part of amounts registered January 20th, 1902, and September 19th, 1924.

NEUTRON, LTD., London, W.C., manufacturers of wireless crystals, etc.—Satisfactions registered November 25th, £250, registered April 23rd, 1926; £1 900, registered May 5th, 1926; and £400, registered November 25th, 1926.

WOKING ELECTRIC SUPPLY CO., LTD.—Satisfaction registered November 29th, all moneys, etc., registered December 10th, 1913.

Private Meetings, etc.

[*Inclusion under this heading does not necessarily imply failure. Many private meetings are called merely for the purpose of the debtor consulting his creditors as to his position when he may not be insolvent.*]

CHESHIRE POOLEY AND CO., LTD., electrical engineers, etc., St. Anne Street, Liverpool. A meeting of the creditors was held on December 21st, when Mr. G. A. Pruddah, the liquidator, presented a statement of affairs which showed liabilities of £3 892, of which £747 is due to the trade, with a bank overdraft of £2 943 and loan creditors £203. The net assets totalled £2 516, or a deficiency of £1 376. The liquidator reported that the company was formed in 1921 for the purpose of taking over an existing business. The electrical department of the company did not appear to have been run at a profit. A resolution was passed confirming the voluntary liquidation of the company with Mr. Pruddah as liquidator.

London Gazette, etc.

The following information is taken from printed reports, but we cannot be responsible for any errors that may occur.

Company Winding Up.

NATIONAL WIRELESS CORPORATION, LTD. Winding-up order, December 21st.

Companies Winding-up Voluntarily.

AUTOMATIC CO. (BRISTOL), LTD. W. L. Bate, Carlton Chambers, Baldwin Street, Bristol, Chartered Accountant, appointed liquidator, December 21st. Meeting of creditors at the offices of the liquidator on Thursday, January 6th, at 3 p.m.

FARRINGDON ELECTRICAL CO., LTD. A. B. Neil, Chartered Accountant, 22, Queen Street, London, E.C.4, appointed liquidator, December 22nd.

KNIVETOWN ELECTRIC WIRE CO., LTD., Queen's Way, Ponders End, Middlesex. S. W. Tubbs, F.C.A., of 24, Basinghall Street, E.C., appointed liquidator, December 20th. Meeting of creditors at the Institute of Chartered Accountants, Moorgate Place, E.C.2, on Monday, January 10th, at 2.30 p.m.

Bankruptcy Information.

CULLUM, Arthur James, 8, Church Street, Diss, Norfolk, electrical engineer. Receiving order, December 16th. Debtor's petition.

MILLS, Herbert Aloysius, 1, Lorne Villas, Old Windsor, Berks, electrical engineer. Receiving order, December 21st. Debtor's petition.

Notice of Dividend.

ATKINSON, Herbert Henry, 33, Princess Avenue, Old Trafford, Manchester, electrical engineer. First and final dividend, 10s. 1d. per £, payable, January 3rd, 1927, Official Receiver's offices, Byrom Street, Manchester.

Notices of Intended Dividends.

CHARNOCK, John Richard, late 6, Stonegate Road, Meanwood, Leeds, electrical engineer. Last day for receiving proofs, January 10th, 1927. Trustee, H. C. Bowling, 24, Lower Bond Street, Leeds, Official Receiver in Bankruptcy.

KELLY, Morris, 12, Jackson's Row, Manchester, radio apparatus dealer. Last day for receiving proofs, January 5th. Trustee, J. F. Warburton, 28, Queen Street, Manchester.

Partnership Dissolved.

WILEMAN AND CO. (Norman Arthur WILEMAN and William George Franklyn CHAPPELL), electrical engineers and contractors, 3, Station Hill, Maesteg, as from August 31st, 1926. Debts received and paid by N. A. Wileman.

Bankruptcy Proceedings.

PAYNE, Norman Hele, 4, The Triangle, Teignmouth, and late Queen Street, Dawlish, electrical engineer. The first meeting of creditors was held at Exeter on December 23rd. The statement of affairs showed liabilities £796 and assets were estimated to produce £558, a deficiency of £238. Debtor's deficiency account, dating from January, 1925, showed law costs of £144. Debtor stated that his position was due to having no free capital to enable him to tide over the period of long term credit which he had been obliged to give most of his customers, and to his liabilities being considerably increased by creditors suing.

WATSON, Charles William, 33, Rainhall Road, Barnoldswick, York, electrical and wireless engineer. The public examination of this debtor was held on December 20th at Bradford. According to the statement of affairs there was a deficiency of £776. It appeared that debtor commenced business at his present address in January, 1925, and his turnover, at first £30 a week, later increased to £50 weekly. This year, however, it had dropped to £15. His gross profit was 15 per cent. In the last year many writs had been issued against him and his costs in connection with executions totalled £140. He had a deficiency of £33 when he started trading. The examination was closed.

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PATENT RECORD.

The following information is prepared from published Patent specifications and from the Illustrated Official Journal (Patents) by permission of the Controller of H.M. Stationery Office. Printed copies of full Patent specifications accepted may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, at 1s. each.

Specifications Accepted.

245 855 J. A. Crabtree. Electric switches and the manufacture thereof. (18/10/24.
245 870 H. T. Brooker and L. E. Williams. Crystal detectors for wireless receiving sets. (24/10/24.)
245 872 W. G. Moore. Electrodes for obtaining therapeutic rays from an arc for medical and other purposes. (27/10/24.)
245 874 Dubilier Condenser Co., Ltd. Variable resistances. (27/10/24.)
245 876 T. W. Ross, R. Townend, and Metropolitan-Vickers Electrical Co., Ltd. Starting equipment for electric current converters. (30/10/24.)
245 878 S. J. Levi. Holders for interchangeable electrical devices, such as thermionic valves, for use in wireless telegraphy and telephony. (30/10/24.)
237 855 F. Ritter. Aerial wire. (29/7/24.)
245 892 W. Gilbert, P. A. H. Mossay, and Ransomes, Sims and Jefferies, Ltd. Control systems for electrically driven vehicles. (26/10/24.)
245 893 Electro-Mechanical Brake Co., Ltd., and M. J. Pattison. Electrical controllers for hoists. (26/11/24.)
245 895 H. Bailey. Combined thermionic valve holders and filament rheostats for the construction of wireless apparatus. (28/11/24.)
245 898 Lissen, Ltd., and R. P. Richardson. Transformers and choking-coils, especially for use in radio communication. (29/11/24.)
245 911 W. R. Hume. Electric welding apparatus. (15/12/24.)
245 916 Oldham and Son, Ltd., and W. D. Wilde. Galvanic batteries. (17/12/24.)
245 919 W. H. Powell. Control arrangements of the moving parts of wireless telegraph and telephone apparatus. (18/12/24.)
245 920 Igranic Electric Co., Ltd., and C. F. Tubbs. Starters for electric motors. (18/12/24.)
245 922 L. Barrett. Means for indicating when an accumulator is charged. (12/12/24.)
245 926 Lissen, Ltd., and R. P. Richardson. Plugs and sockets for inductance coils and the like. (30/12/24.)
245 931 Callender's Cable and Construction Co., Ltd., and E. Warbrick. Bonding or securing arrangements for electric conductors. (8/1/25.)
245 936 G. Ellison. Trip or release mechanisms for electric circuit-breakers and like apparatus. (13/1/25.)
245 947 O. Y. Imray. Electrically driven rotary printing presses and like machines. (27/1/25.)

Applications for Patents.

November 29th.

30 688 Akt.-Ges. Mix und Genest. and Telephon-und-Telegraphen-Werke. Production of insulated wires. (3/12/25, Germany.)
30 174 C. B. Backer. Electric heaters.
30 117 W. E. Boyd and T. Stewart. Means of recording presence of minute electrical static charges.
30 203 Cie pour la Fabrication des Compteurs et Material d'Usines a Gaz. Electrical measuring device. (23/12/25, France.)
30 132 J. R. English. Sealing and coupling devices for cables.
30 107 H. V. Flinn. Variable condensers.
30 113 C. Gorely. Television machines.
30 106 G. A. Leitch. Wall boxes for switches.
30 183 E. C. Little and C. R. Priestley. Electric connectors.
30 184 E. C. Little and C. R. Priestley. Wireless aerials.
30 194 Lyon and Lyon. Switches for electric torches, etc. (22/10/26, India.)
30 215 E. C. R. Marks (American Machinery and Foundry Co.). Electric conductors.
30 172 Metropolitan-Vickers Electrical Co., Ltd. Lubrication system for electric motors.
30 173 Metropolitan-Vickers Electrical Co., Ltd. Hoists, etc.
20 204 J. E. Pollak (Prepmeyer and Co.) Electric relays.
30 190 A. Reyrolle and Co., Ltd., and R. Willoughby. Electric signalling, etc., systems.
30 156 J. M. Rutherford. Ships' telegraphs.
30 221 A. Seguin. Electric speed indicators. (2/12/25, France.)

November 30th.

30 337 J. Anderson. Rheostats, etc.
30 305 A. J. Anido and W. K. Lewis. Electric lighting and power circuits.
30 357 J. L. Baird and Television, Ltd. Television apparatus.
30 298 British Thomson-Houston Co., Ltd. Radio signalling systems. (30/11/25, U.S.)
30 272 Callender's Cable and Construction Co., Ltd., and J. F. Watson. Jointing cables, etc.
30 274 English Electric Co., Ltd., and G. Schroeder. Alternating current dynamo-electric machines.
30 275, 30 292 English Electric Co., Ltd., and G. Schroeder. Starting motor converters.
30 336 E. Gumlich. Magnetisable material. (30/11/25, Germany.)
30 230 L. F. Ingram and R. V. W. Newton. Resistances.
30 353 C. L. Moyer. Stands and controls for electric irons. (30/11/25, U.S.)
30 296 J. M. Ortega. Coupling devices for conductors.
30 349 J. Robinson. Thermionic valves.
30 335 S. B. Smith and G. M. Wright. Directional wireless receiving systems.
30 360 Soc. Anon. des Ateliers de Secheron. Electric drives for vehicles. (13/1/26, Germany.)
30 313 Western Electric Co., Inc. Talking motion picture system. (26/5/26, U.S.)

December 1st.

30 440 H. G. Bartholomew and R. R. Pecorini. Photo-telegraphy, etc.
30 393 G. A. Battiscombe. Dynamo power plant.
30 426 British Thomson-Houston Co., Ltd. Current collectors. (1/12/25, U.S.)
30 427 British Thomson-Houston Co., Ltd. Electric distribution systems. (1/12/25, U.S.)
30 428 British Thomson-Houston Co., Ltd. Indicating devices. (1/12/25, U.S.)
30 429 British Thomson-Houston Co., Ltd., and C. T. Hanna. Motor controllers.
30 364 W. A. Burton. Electric fuses.
30 419 General Electric Co., Ltd., J. F. Hyslop, A. Kinnes and J. L. Rycroft. Electric heaters.
30 447 W. J. Gladitz. Electric welding machines.
30 450 W. Gurlt Ges. Telephone line selector installations. (2/12/25, Germany.)
30 416, 30 417 W. F. Hoisington and Rees Mace Manufacturing Co., Ltd. Radio receivers, etc.
30 431 Maschinenfabrik Oerlikon. Pinion gear for electric vehicles. (4/12/25, Germany.)
30 366 W. des Renzi. Electric junction boxes, etc.
30 389, 30 390 A. Round and B. J. Round and Sons. Electrodeposition of metal.
30 465 Siemens und Halske Akt. Ges. Electrically controlled intermittently advanced spindles. (17/5/26, Germany.)
30 441 Soc. Anon. du Material Simplex. Electric terminals. (3/12/26, France.)

December 2nd.

30 574 Barrett and Elers, Ltd., and C. Mullett. Electric bayonet cap adapters.
30 576 G. Bousfield. Accumulators.
30 535 British Thomson-Houston Co., Ltd. Electric condensers. (4/12/25, U.S.)
30 517 Cie Français pour l'Exploitation des Procedes Thomson-Houston. Securing conductors to carbons. (20/4/26, France.)
30 635 International General Electric Co., Inc. Arc welding, etc. (3/12/25, Germany.)
30 487 J. B. Kramer. Wireless receiving apparatus.
30 569 F. Reynolds and W. T. Slater. Mercury vapour lamps, etc.
30 541, 30 544 Siemens-Schuckert Ges. Bright annealing furnaces. (3/12/25, Germany.)
30 580 Standard Telephones and Cables, Ltd. Acoustic devices. (24/2/26, U.S.)
30 500 E. Sumner. Electric lamp holders.

December 3rd.

30 668 and 30 669 American Resistor Corporation. Electric heating apparatus. (3/12/25, U.S.)
30 710 J. L. Baird. Apparatus for producing varying illumination, etc.
30 652 W. R. Bullimore. Thermionic valves.
30 638 Callender's Cable and Construction Co., Ltd., and C. Kebblewhite. Electric protective arrangements.
30 690 S. Dunlop (Federal Telegraph Co.). Indicating dials.
30 660 Eastern Telegraph Co., Ltd., and K. L. Wood. Telegraphy.
30 623 R. Kopp and Korting and Mathiesen A.G. Electric propulsion.
30 688 M. Kubierschky. Production of insulated wires. (3/12/25, Germany.)
30 670 Kurz-Kasch Co. Housing for radio indicators, etc. (18/6/26, U.S.)
30 699 J. Lithgoe and H. Tinsley. Motor control.
30 691 R. J. Musto and Quasi Arc Co., Ltd. Dynamo-electric machines.
30 696 N. V. Philips Gloeilampenfabrieken. Incandescent lamps. (28/12/25, Holland.)
30 587 T. S. Rogers. Diaphragms of electric sound producers, etc.
30 671 and 30 680 Siemens-Schuckertwerke Ges. Bright annealing furnaces. (3/12/25, Germany.)
30 701 Siemens-Schuckertwerke Ges. Electric bright annealing furnaces. (10/12/25, Germany.)
30 705 H. Sonnenfeld. Multi-conductor cables.
30 584 A. E. Tunbridge. Magnetic microphone relays.
30 615 M. Walker. Magnetically actuated friction clutches.
30 616 M. Walker. Electromagnetic actuating mechanism.

December 4th.

30 745 Allmanna Svenska Elektriska Aktiebolaget. Motor starters. (11/10/26, Sweden.)
30 782 G. D. Barraclough, H. Green, J. E. Kemp and K. G. Battery Co. Electric batteries.
30 795 J. Billiter and Siemens und Halske Akt. Ges. Filter diaphragms for electrolytic purposes.
30 780 H. Bright. Electric lampholders and shades.
30 732 British Brass Fittings, Ltd. and G. N. Sperryn. Electric fuses, etc.
30 768 British Thomson-Houston Co., Ltd. Electrical distribution systems. (8/12/25, U.S.)
30 756 C. A. M. Buckley and F. E. Kewley. Time switches.
30 720 G. W. Cussons and A. Wood. High tension circuits for wireless telegraphy, etc.
30 755 English Electric Co., Ltd., and J. C. Wilson. Dynamo electric machines.
30 787 A. T. and J. L. Holman. Electric rock drills, etc.
30 802 N. Munthesen. Electric switch.
30 746 A. Reyrolle and Co., Ltd., and R. Willoughby. Electric circuit breakers.
30 791 Siemens Elektrowarme Ges. Bright annealing furnaces. (5/12/25, Germany.)
30 775 Standard Telephones and Cables, Ltd. (Bell Telephone Laboratories Inc.). Magnetic materials.
30 711 T. F. Wall. Thermo-electric generators.

Coming Events.

A Diary of the Chief Electrical Arrangements for the Week.

Monday, January 3rd.

Electrical Contractors' Association (Derby Branch).—Ordinary meeting.

Tuesday, January 4th.

National Association of Supervising Electricians.—Junior Institution of Engineers, 39, Victoria Street, London. Lecture by Mr. W. E. Highfield on "The Transverter." 7.15 *p.m.*

Institution of Electrical Engineers (North Western Students' Section).—Milton Hall, Deansgate, Manchester. Paper by Mr. W. J. Forster on "A Review of Domestic Load Matters." 7.30 *p.m.*

Tuesday, January 4th to 6th.

Physical and Optical Societies.—Imperial College of Science and Technology, South Kensington. 17th Annual Exhibition.

Wednesday, January 5th.

Electrical Contractors' Association (Southern Section).—Ordinary meeting.

Electrical Contractors' Association (London Branch).—Ordinary meeting.

Royal Society of Arts.—John Street, Adelphi, London. Juvenile Lecture (1) by Prof. C. R. Darling on "The Story of a Wireless Valve." 3 *p.m.*

Institution of Electrical Engineers (Wireless Section).—Institution, Savoy Place, Victoria Embankment, London. Informal discussion on "The Acoustic Problems of Microphones and Loud Speakers." 6 *p.m.*

Institution of Heating and Ventilating Engineers.—Caxton Hall, Caxton Street, Broadway, Westminster. Paper by Mr. R. E. Herring on "The Supervision During Erection and Maintenance of a Low Pressure Hot Water Heating Apparatus." 7 *p.m.*

Thursday, January 6th.

Electrical Contractors' Association (Newcastle Branch).—Ordinary meeting. 11 *a.m.*

Electrical Contractors' Association (Bristol Branch).—Ordinary meeting. 3.15 *p.m.*

Institution of Electrical Engineers.—Institution, Savoy Place, Victoria Embankment, London. Paper by Mr. A. R. Cooper on "Electrical Equipment of Track on the Underground Railways of London." 6 *p.m.*

Institution of Mechanical Engineers (Manchester Branch).—Paper by Mr. R. Potter on "Pulverised Fuel."

Friday, January 7th.

Electrical Power Engineers' Association (Southern Division).—Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London. Lecture by Mr. J. N. Waite on "Condensing Plant." 7 *p.m.*

Institution of Electrical Engineers (South Midland Centre).—Engineering and Scientific Club, Queen Street, Wolverhampton. Paper by Mr. W. Wilson on "Electrical Research." 7 *p.m.*

Institution of Mechanical Engineers.—Institution, Storey's Gate, St. James's Park, London. Informal meeting. Discussion on "Developments in the Carbonisation of Coal." (Introduced by Dr. C. H. Lander.) 7 *p.m.*

Junior Institution of Engineers.—30, Victoria Street, Westminster. Paper by Mr. P. J. Haler on "Distortion in Heat-Treated Case-Hardened Carbon Steels." 7.30 *p.m.*

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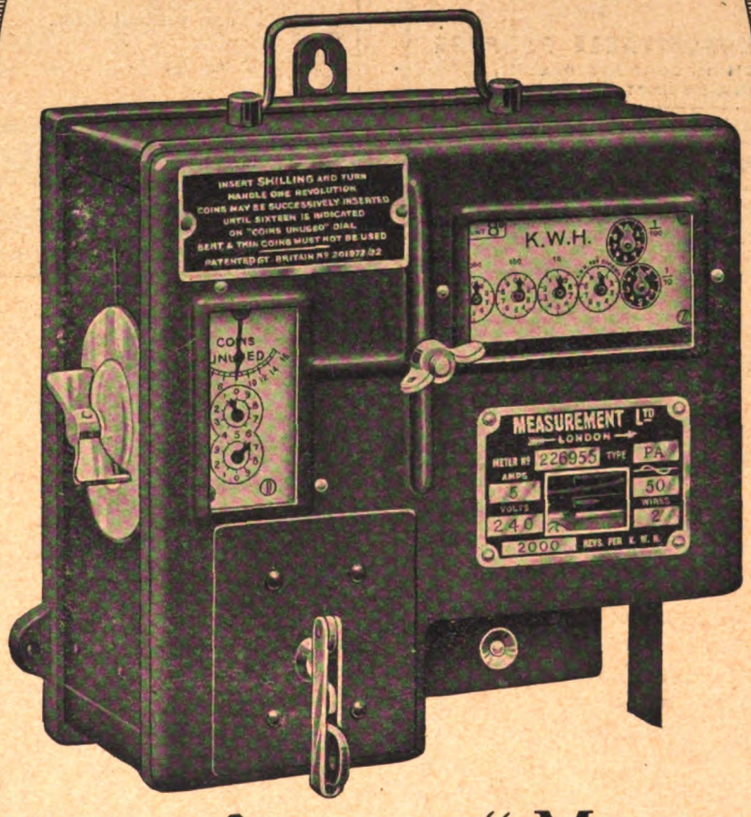

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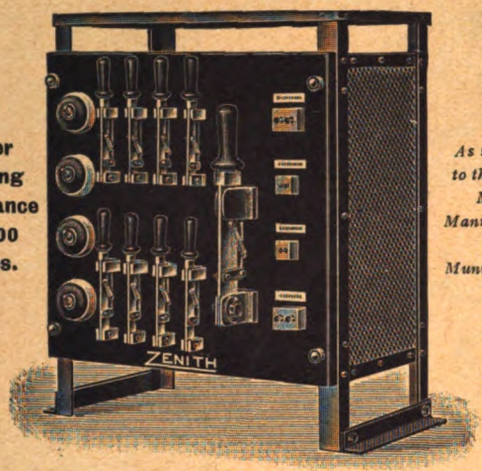

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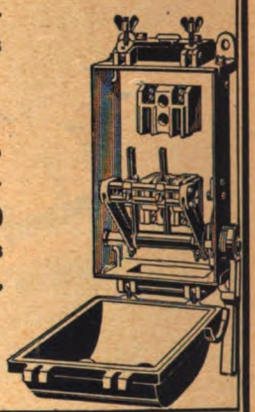

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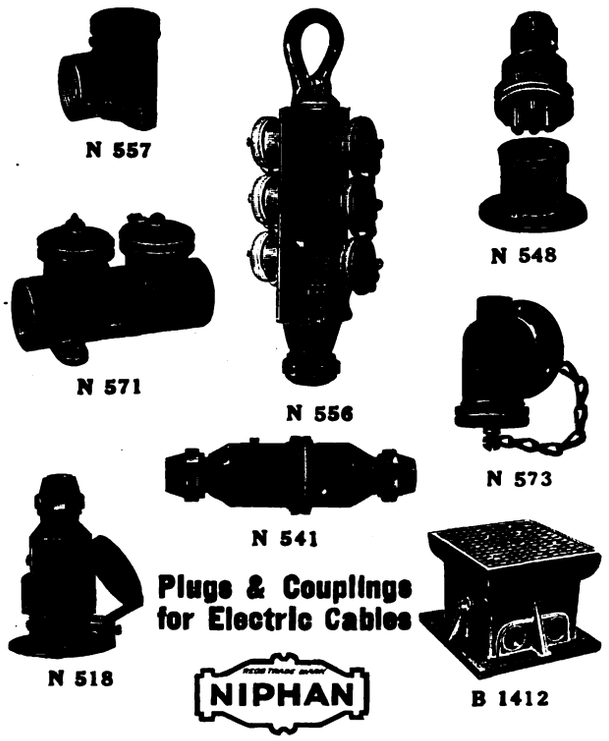

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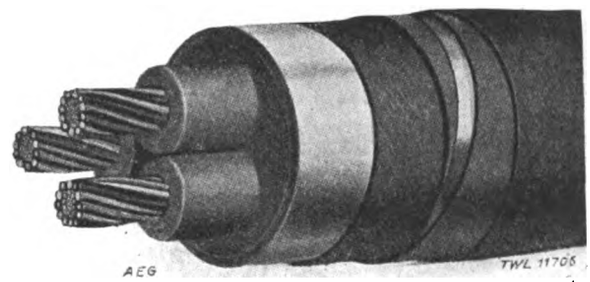

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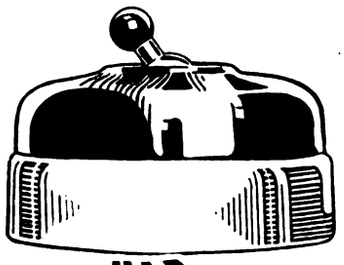

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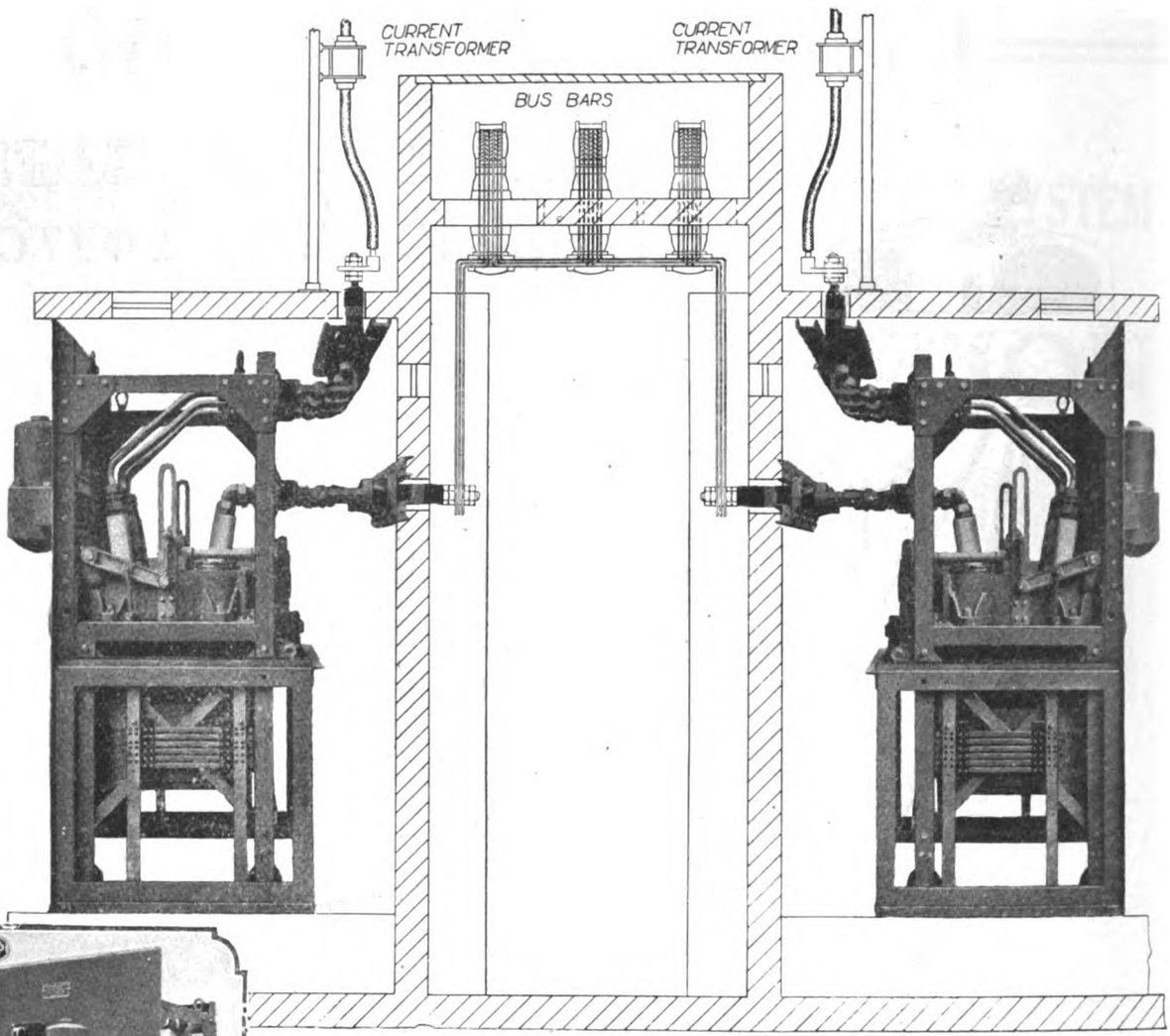

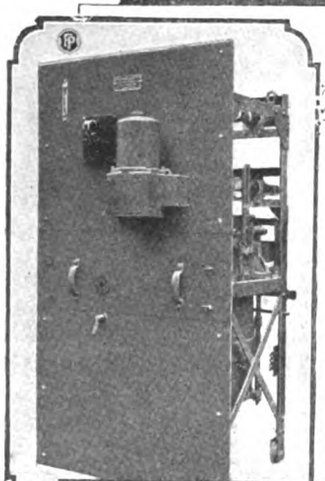

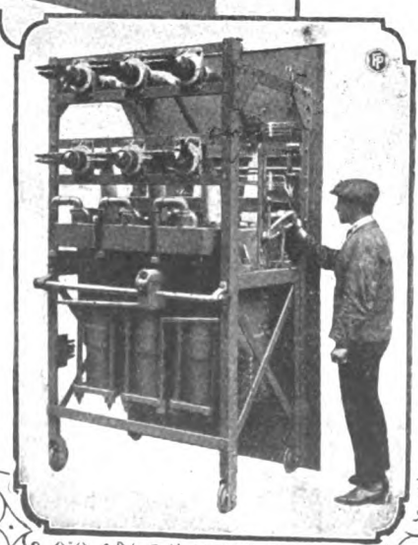

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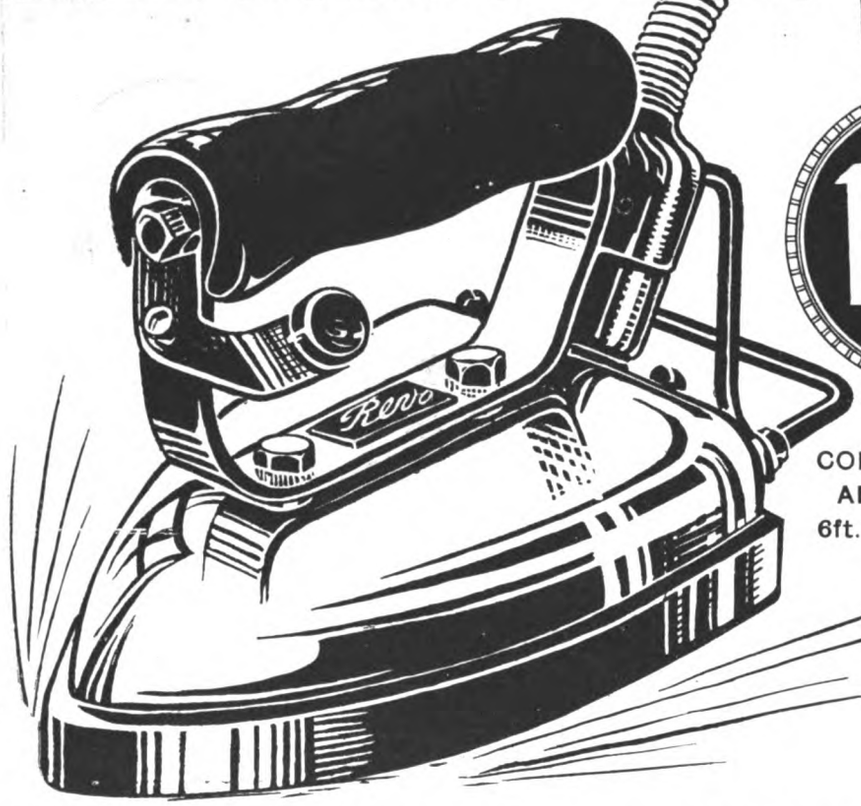

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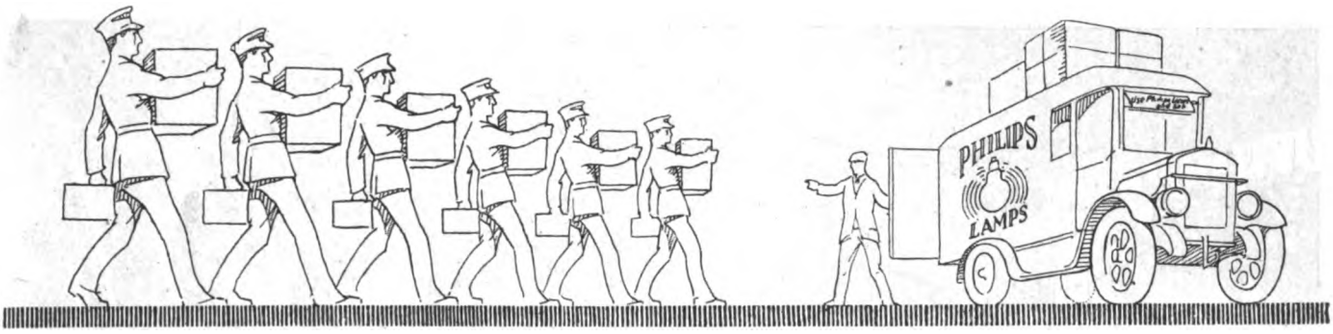

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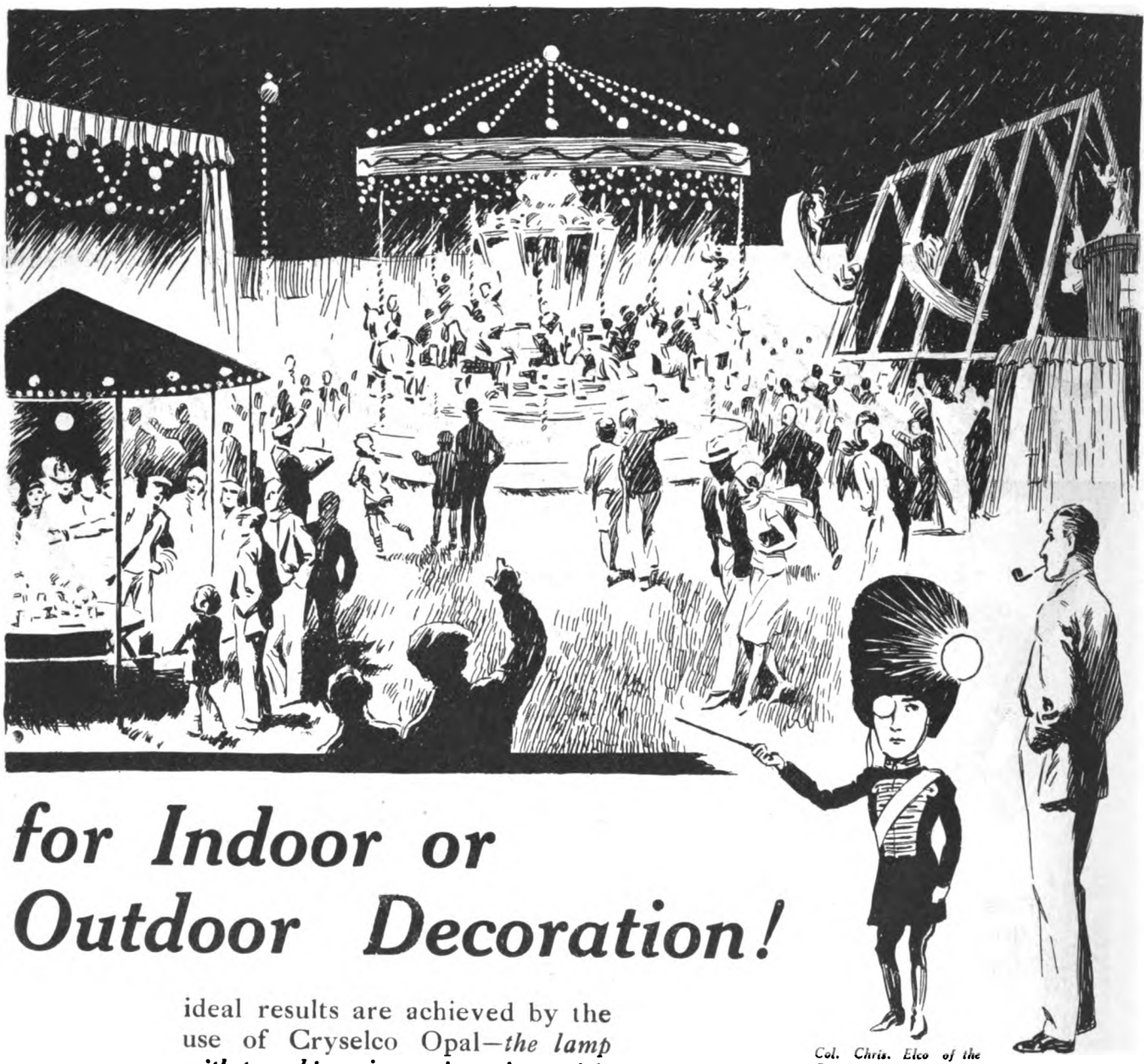

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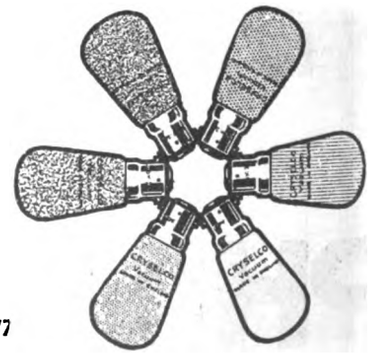

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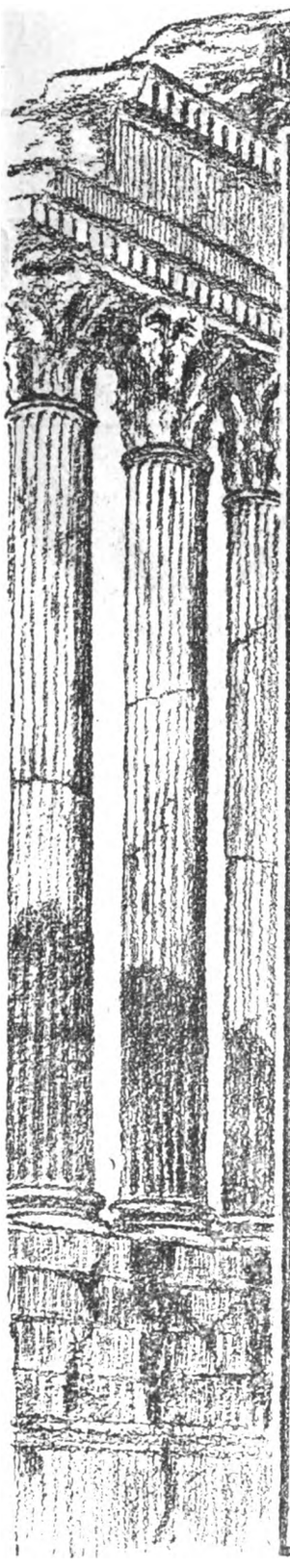

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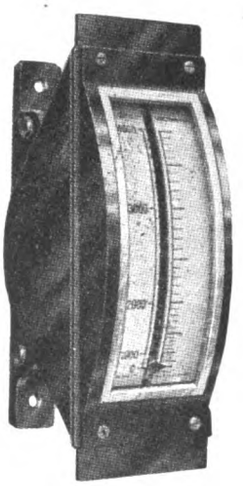

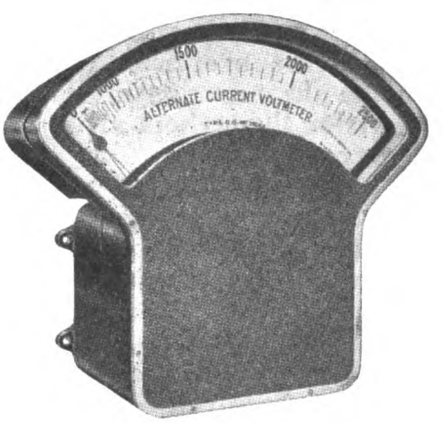

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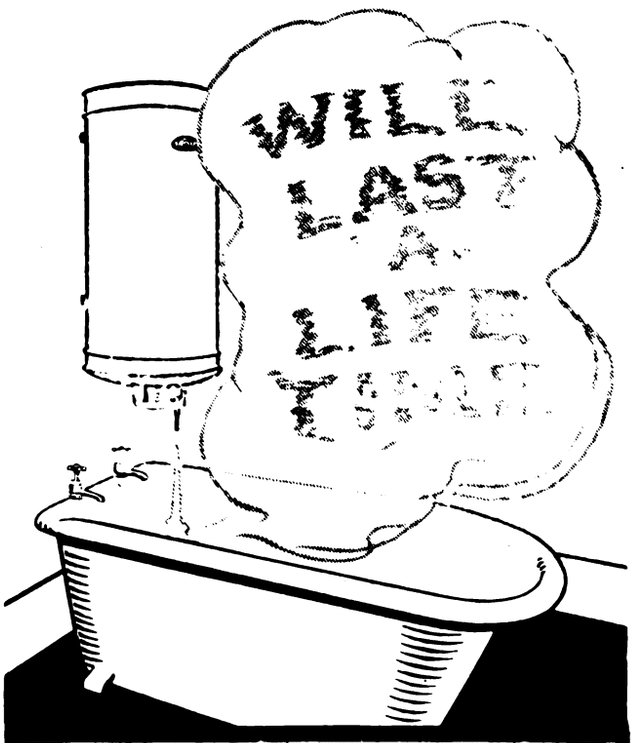

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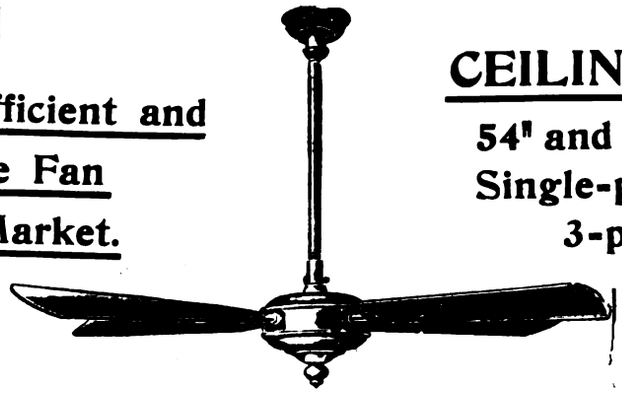

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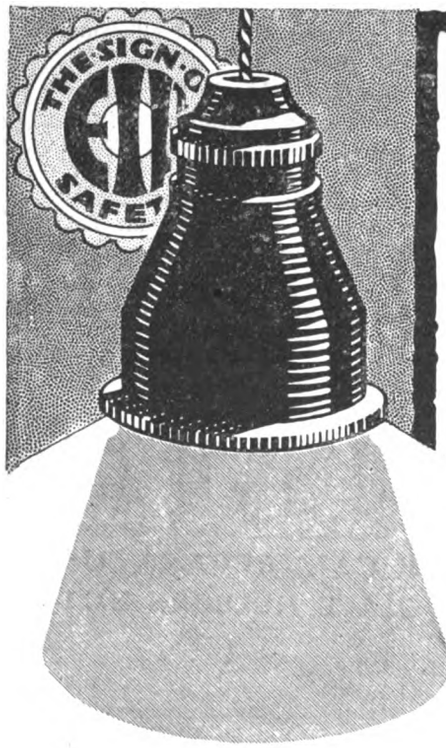

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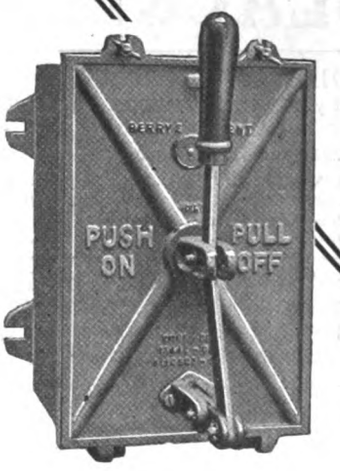

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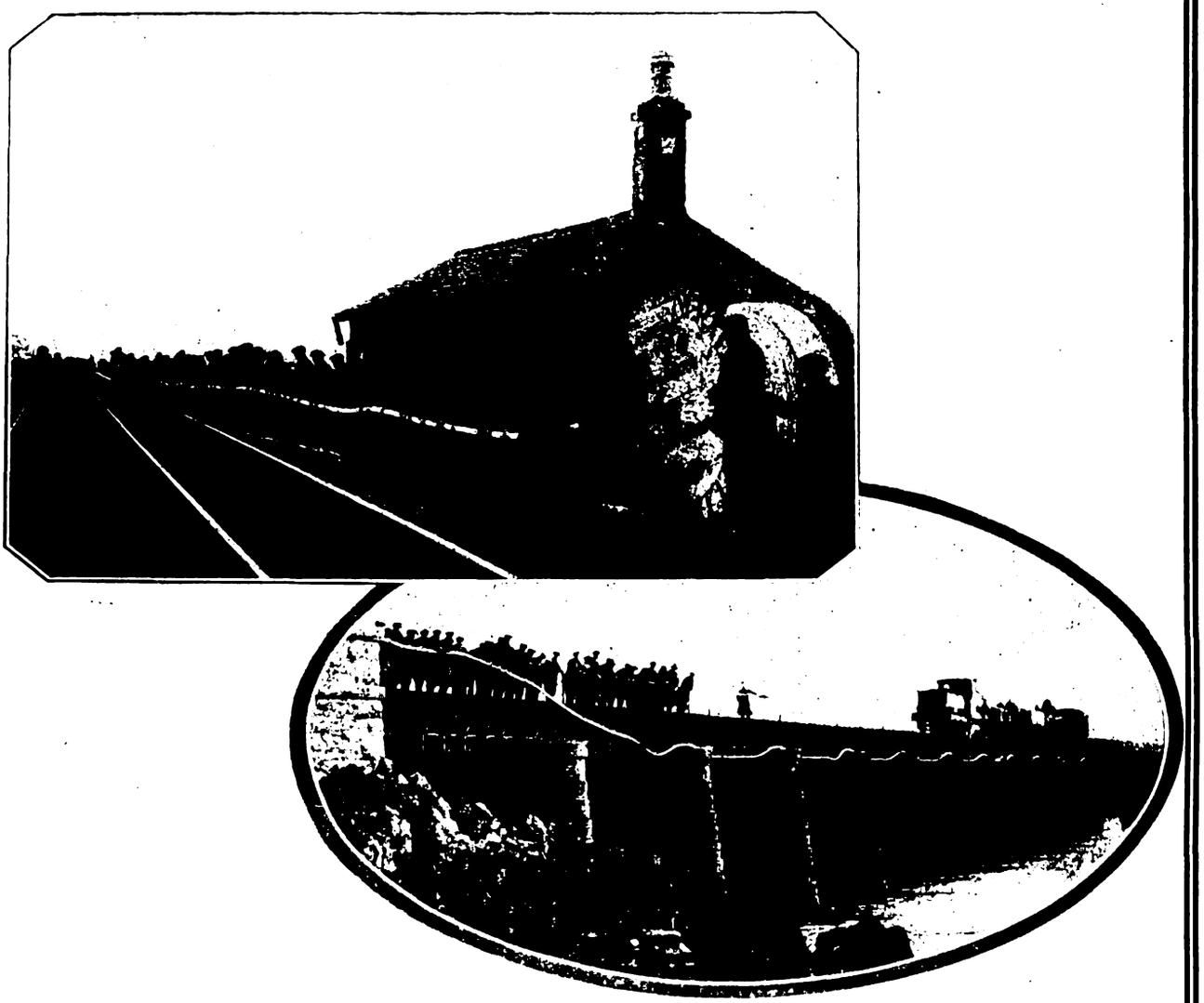

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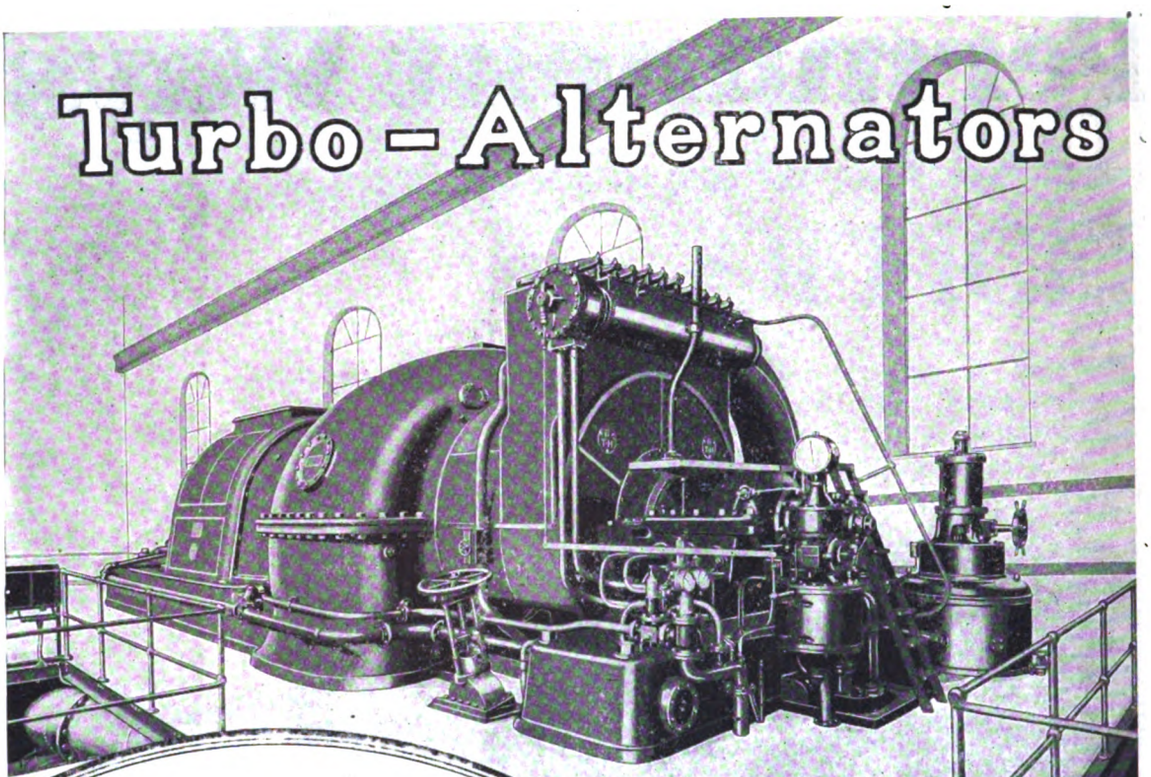

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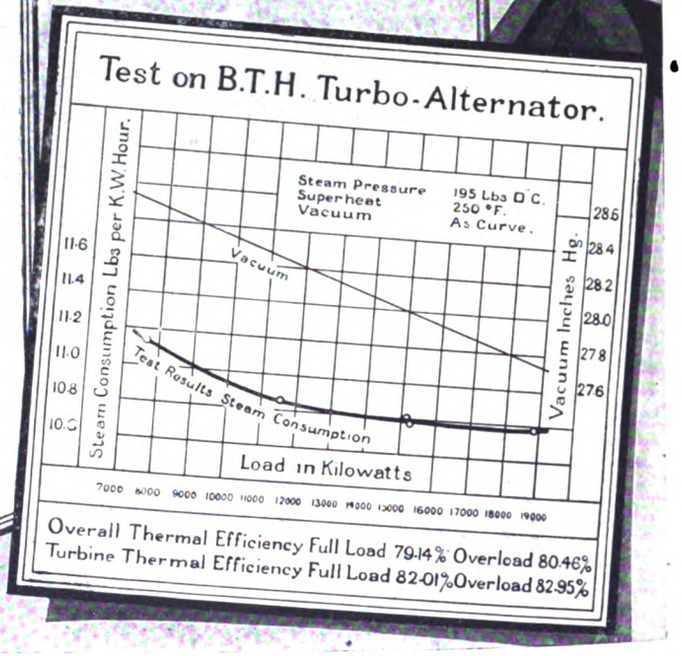

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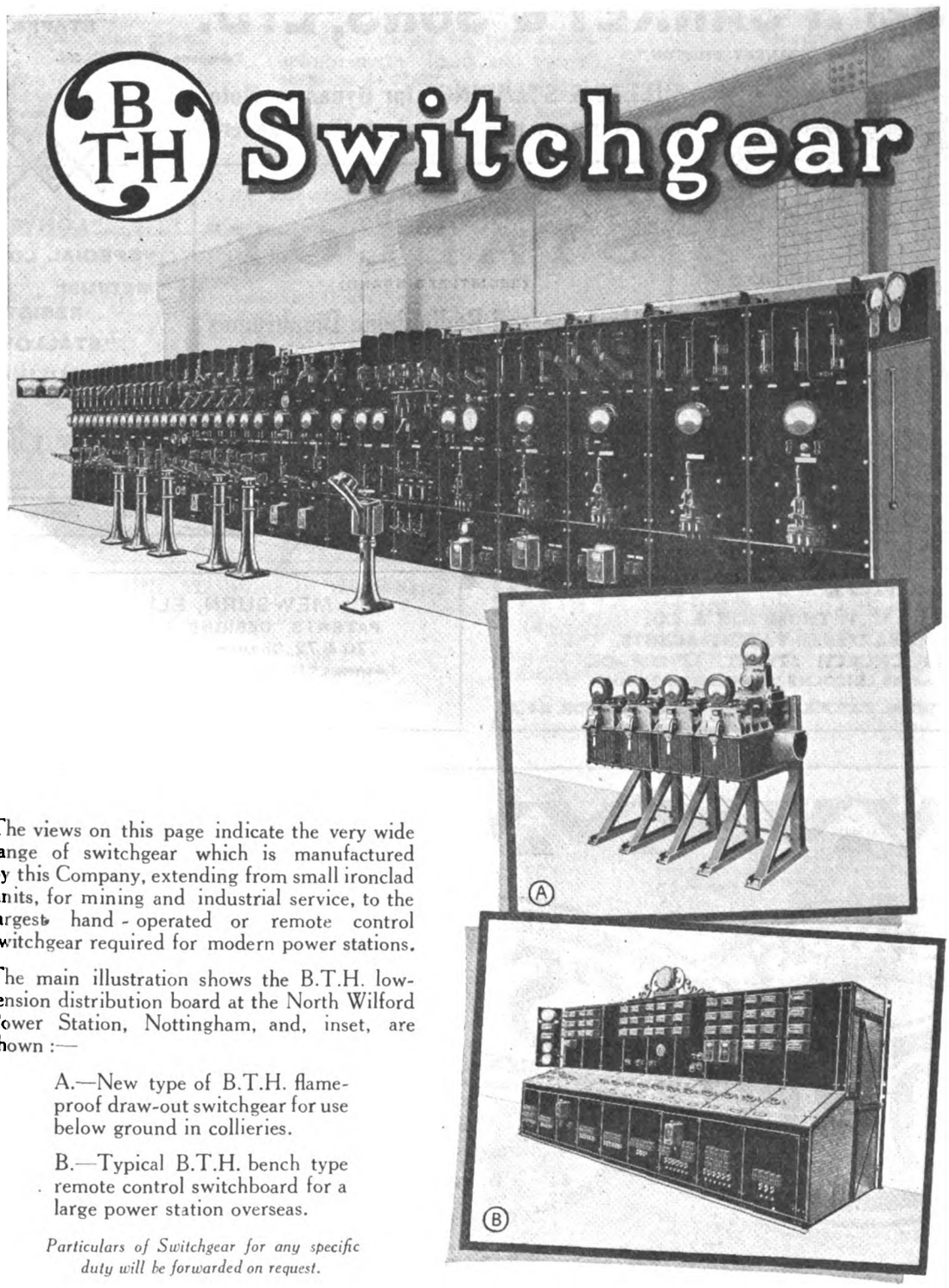

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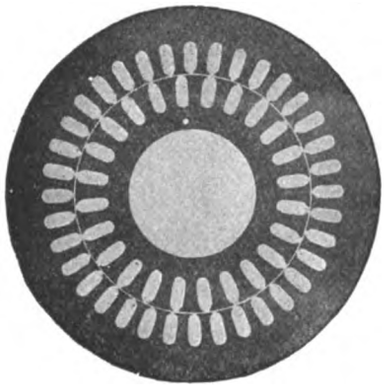

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Prospectus will be forwarded free on application to the REGISTRAR, College of Technology, Manchester.

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FORTHCOMING EXAMINATION.—Probationary Assistant Engineer in the Engineering Department of the General Post Office (20 to 23, with extension in certain cases). Regulations and particulars are obtainable from THE SECRETARY, Civil Service Commission, Burlington Gardens, London, W.1, together with the form on which application must be made. The latest date for the receipt of application forms is August 19th.

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THE Corporation are prepared to receive Tenders for :—
SPECIFICATION NO. 217—L.T. CABLES.
The Specification comprises the supply of the P.I.L.C.L.T. Cables required by the Department during one year, estimated at 15,000 yards.
The Specification may be obtained gratis from the undersigned.
Tenders are to be received not later than first post Saturday, July 10th.

W. A. VIGNOLES,
Borough Electrical Engineer.

Electricity Works,
Grimsby.
June, 1926.

COUNTY BOROUGH OF BELFAST.

ELECTRICITY DEPARTMENT.

THE Belfast Corporation invite tenders for the manufacture, delivery and erection of
One 15,625 kW (M.C.R.) Turbo-Alternator with Condensing Plant and Auxiliaries, and alternatively
One 18,750 kW (M.C.R.) Turbo-Alternator with Condensing Plant and Auxiliaries.
Specifications (Nos. W.48 and W.48A) with Form of Contract, may be obtained from Mr. Johnstone Wright, M.I.E.E., M.I.Mech.E., City Electrical Engineer and Manager, East Bridge Street, Belfast, on deposit of three guineas for each set of two specifications. This deposit will be refunded provided a bona-fide tender has been sent in and not withdrawn. Extra copies may be obtained at one guinea for each specification, which sum will not be returnable.
Sealed tenders, endorsed "Tender for Turbo-Alternator, Electricity Department," to be lodged in my office not later than 10 a.m. on Saturday, July 31st, 1926.
Persons tendering must comply with the Council's Standing Orders relating to wages, hours of labour, extras, etc.
The lowest or any tender not necessarily accepted.
An official receipt must be obtained for every tender delivered by hand. Tenders sent by post must be registered.

R. MEYER,
Town Clerk.

June 28th, 1926.

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APPOINTMENTS VACANT.

SHANGHAI MUNICIPAL ELECTRICITY DEPARTMENT.

STAFF APPOINTMENTS.

THE Electricity Department of the Council requires the services of:
Three Sub-station Engineering Assistants.
Two Overhead Mains Engineering Assistants.
Two Meter and Testing Assistants.

SUB-STATION ENGINEERING ASSISTANTS.—The duties attaching to these appointments are those connected with the construction, maintenance and operation of static and rotary sub-stations and it is essential that candidates should have good workshop training and some subsequent sub-station experience.

OVERHEAD MAINS ENGINEERING ASSISTANTS.—The duties attaching to these appointments are those connected with the installation and maintenance of an overhead distribution system and although experience in such work is desirable, it is not essential and applications will be considered from those having prior experience which may be deemed suitable.

METER AND TESTING ASSISTANTS.—The duties attaching to these appointments are those connected with the testing and installation of house service and three-phase maximum demand watt hour meters and also the testing and maintenance of generating station meters and instruments.

GENERAL INFORMATION.—The system at Shanghai is three phase, 50 cycles. Generation pressure is 6 600 volts stepped up to 22 000 volts for transmission to super-sub-stations from which it is redistributed at 6 300 volts to smaller sub-stations. Consumer's pressure-lighting 200 volts, single phase; power 350 6 300 and 22 000 volt, three phase. Split conductor and straight three core underground cables are used with Merz-Price and other balanced protection systems. Low pressure distribution is mostly overhead.

SALARY.—Taels 350 per month for each appointment. The usual rate of exchange is about 3s. per tael.

GENERAL TERMS.—The first engagement will be for a period of three years. Free second class passage out and home and medical attention are provided. In the event of the selected candidate being married, the wife's passage to Shanghai will be paid under certain conditions which will be explained to candidates.

Applications, in writing only, giving full particulars as to age, education, training and subsequent experience, together with copies of testimonials to be sent to C. S. TAYLOR, M.I.E.E., M.A.I.E.E., Deputy Engineer-in-Chief and Manager, c/o Messrs. Preece, Cardew and Rider, 8, Queen Anne's Gate, S.W.1, not later than noon on Friday, July 16th, 1926. Envelopes to be marked "Sub-station Engineering Assistant," or "Overhead Mains Engineering Assistant," or "Meter and Testing Assistant" as the case may be.

T. H. U. ALDRIDGE, M.I.E.E., M.I.Mech.E., Fel.A.I.E.E.,
Engineer-in-Chief and Manager.

Dated June 24th, 1926.

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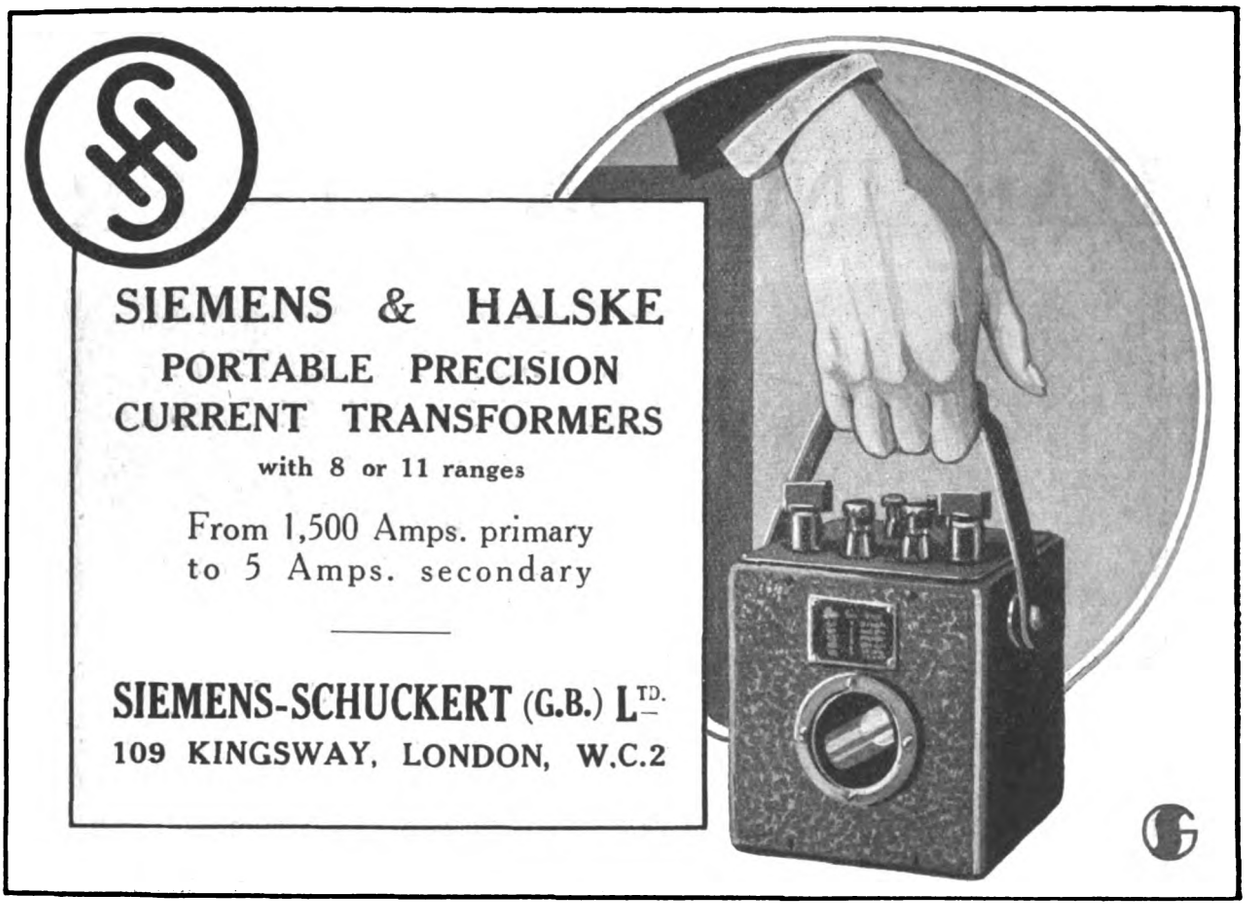

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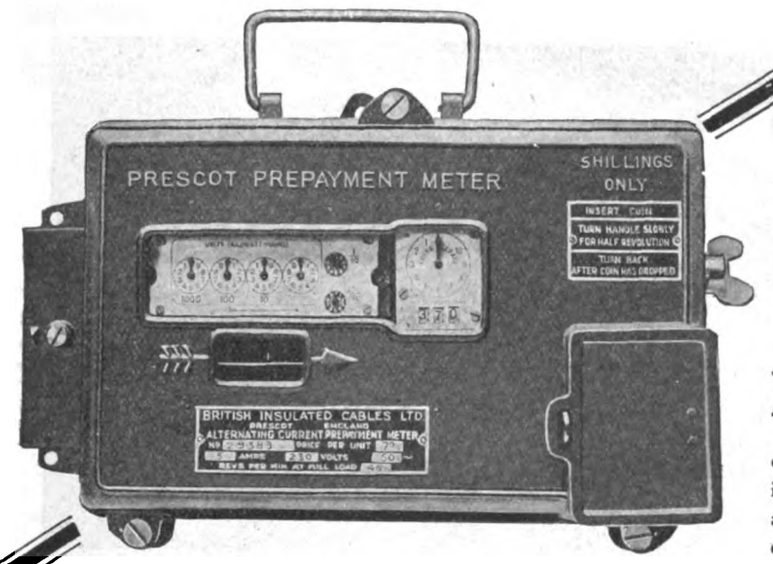

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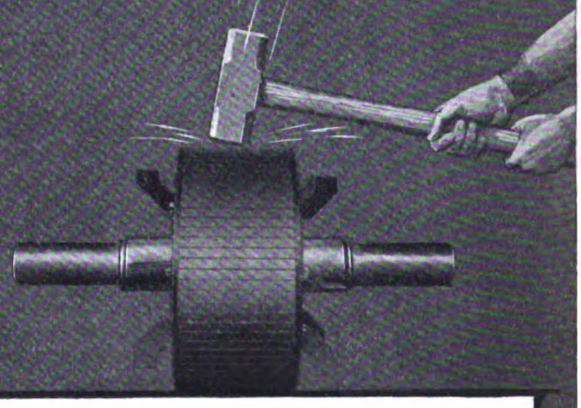

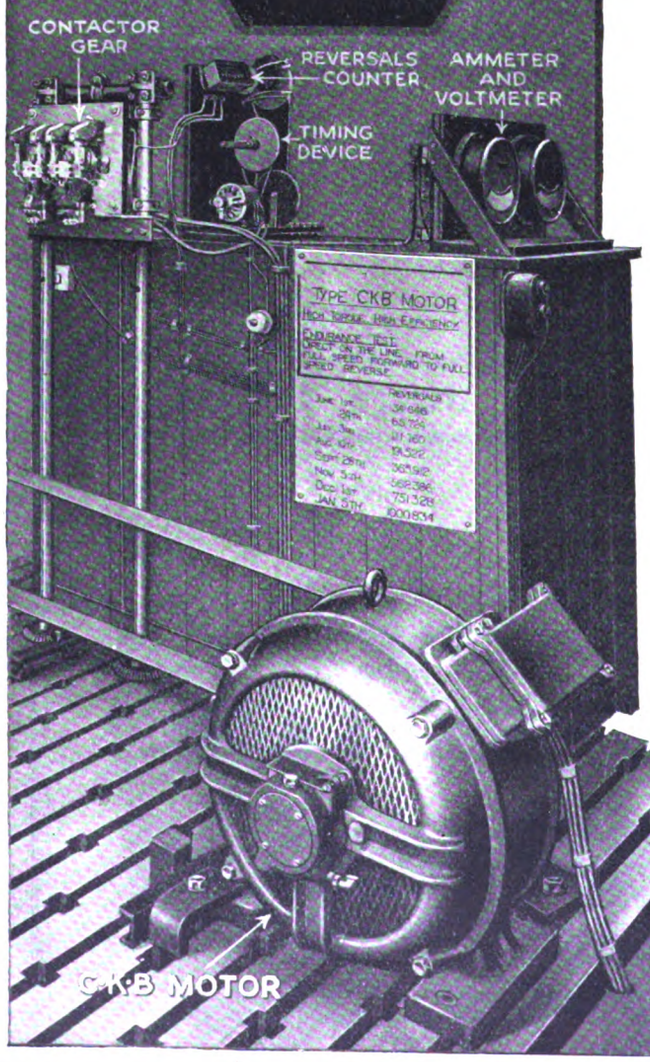

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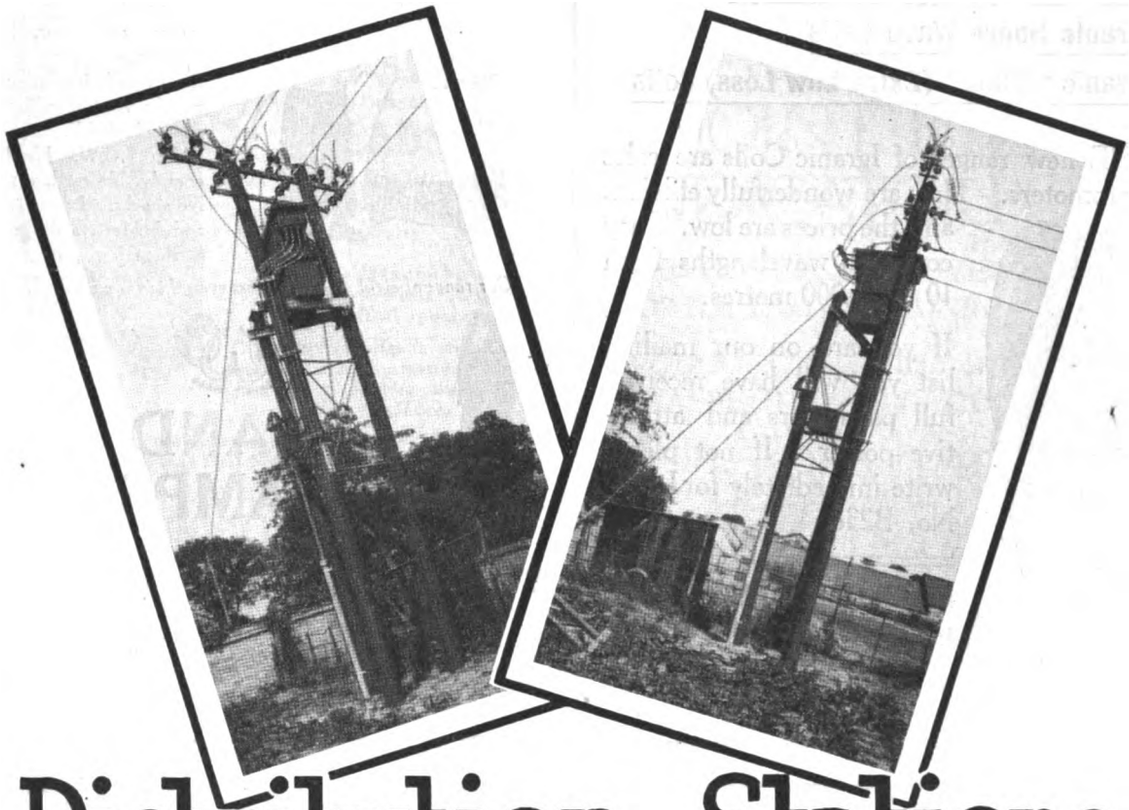

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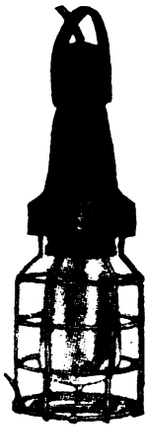

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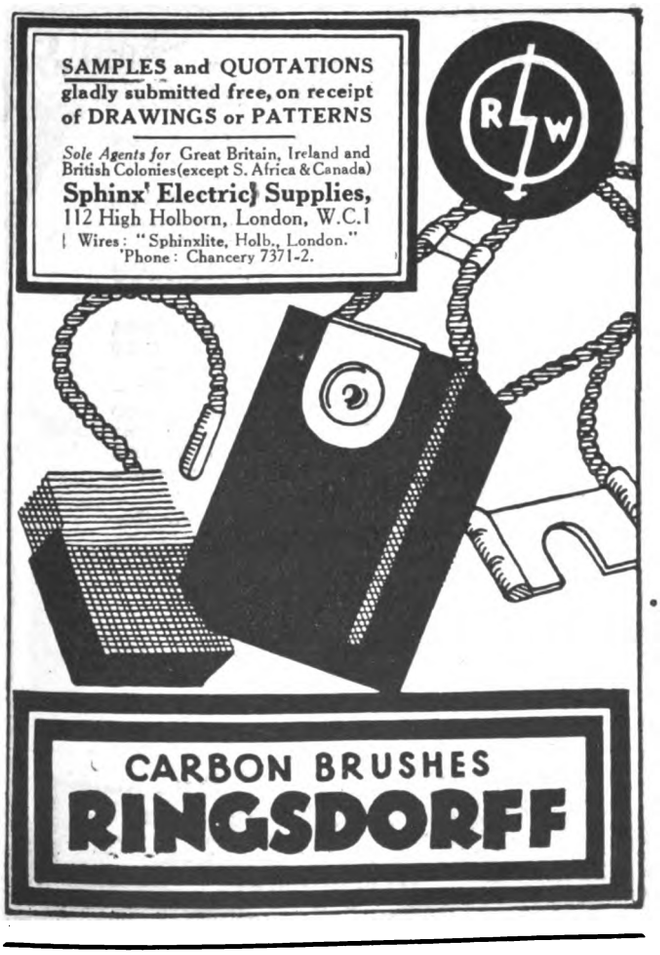

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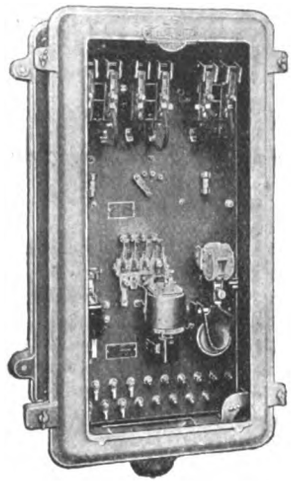

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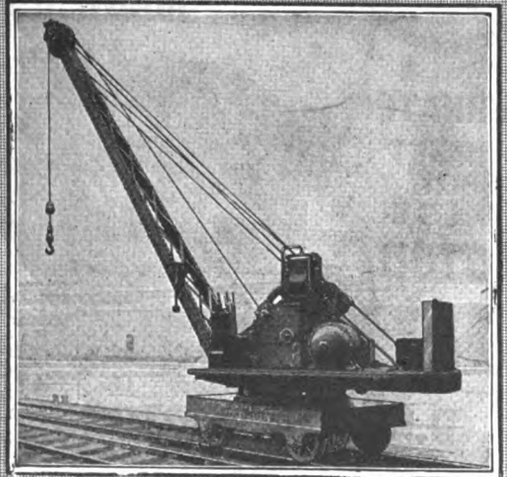

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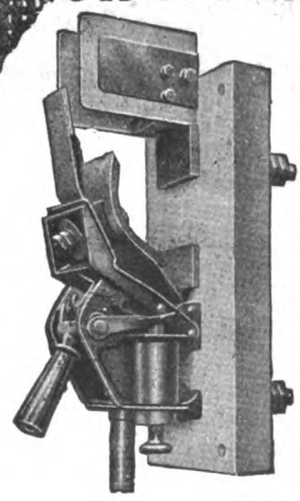

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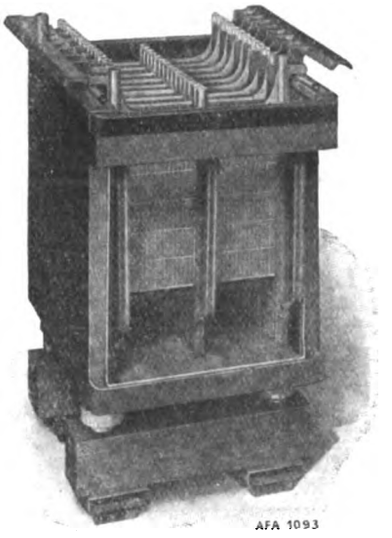

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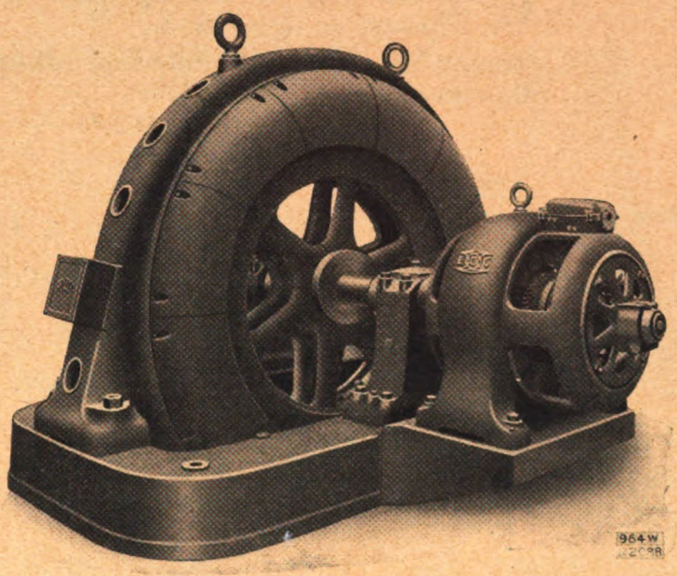

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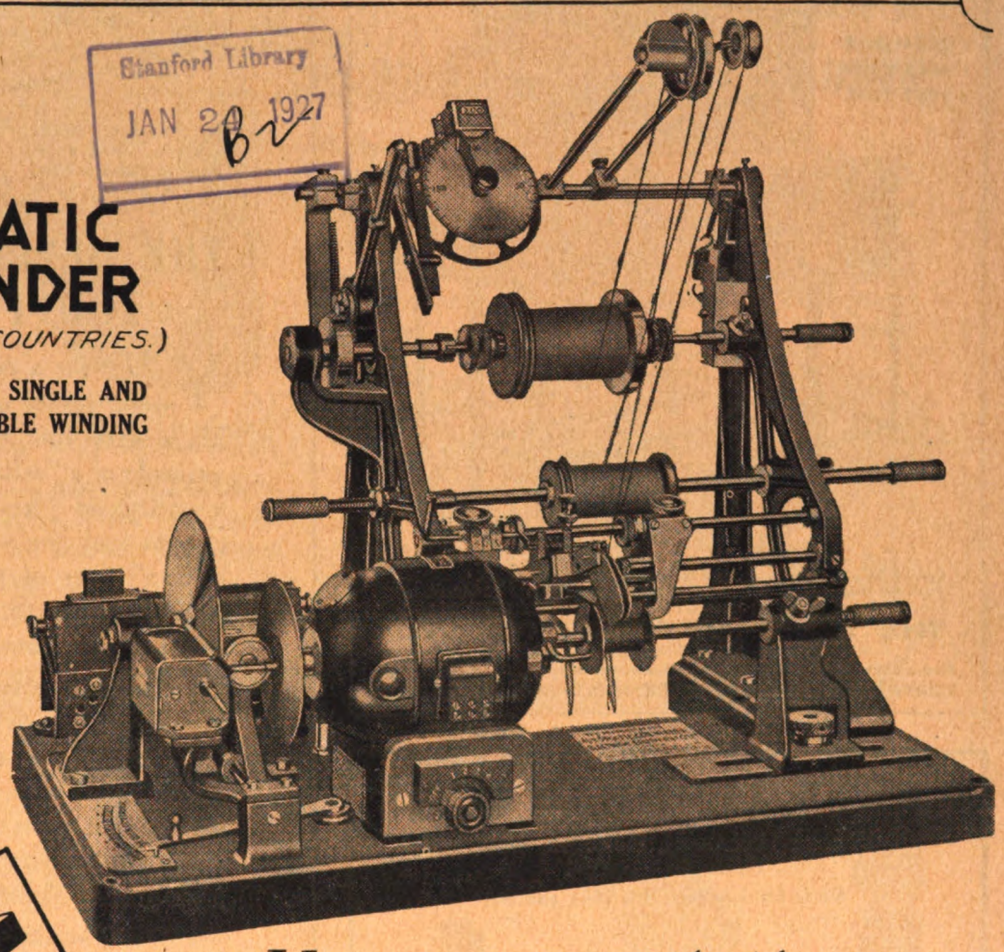

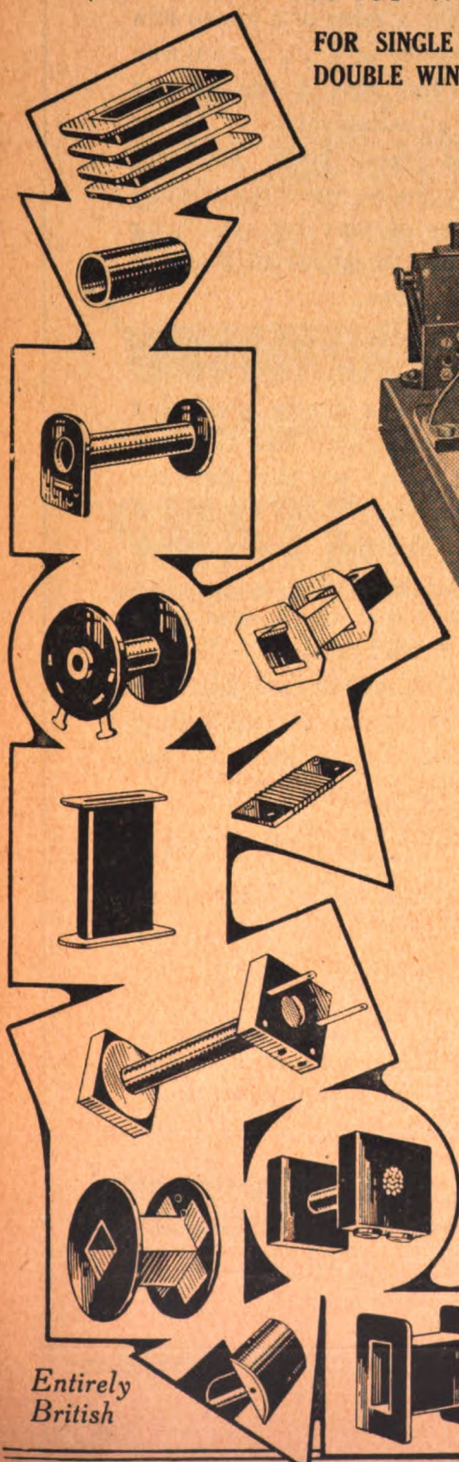

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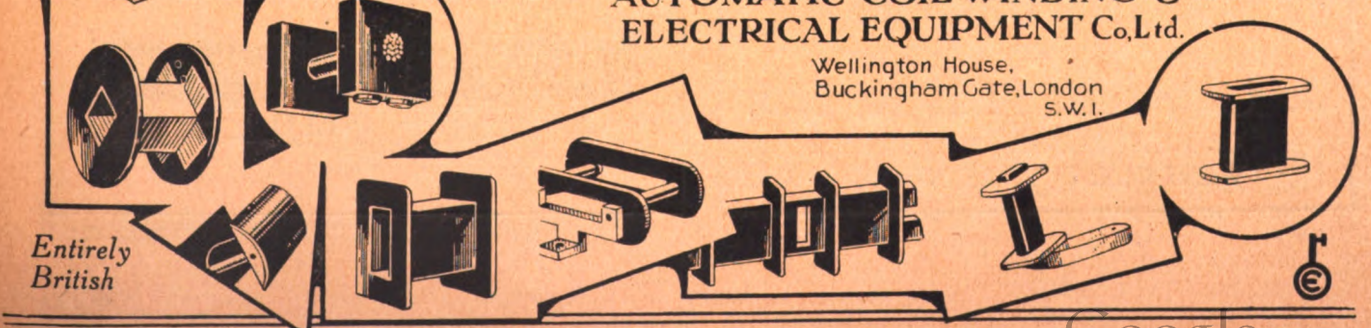

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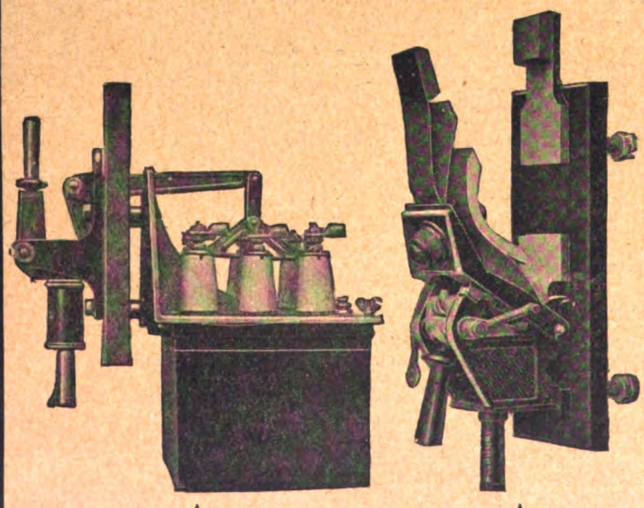

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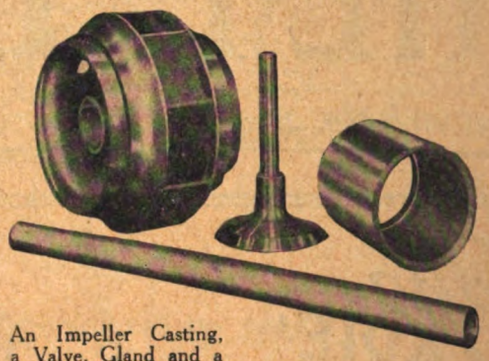

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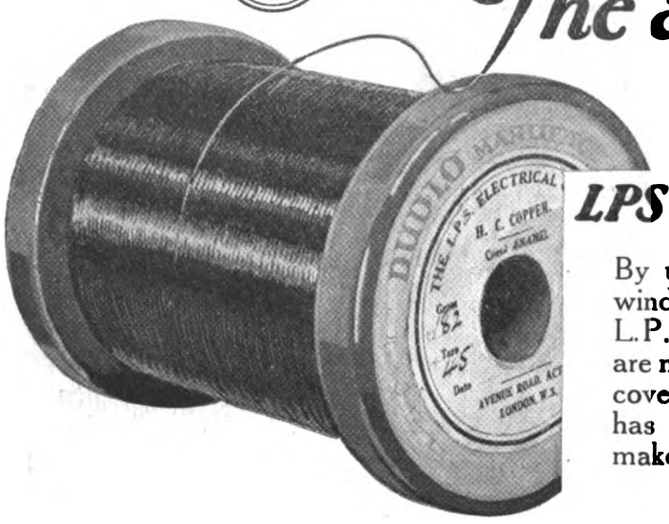

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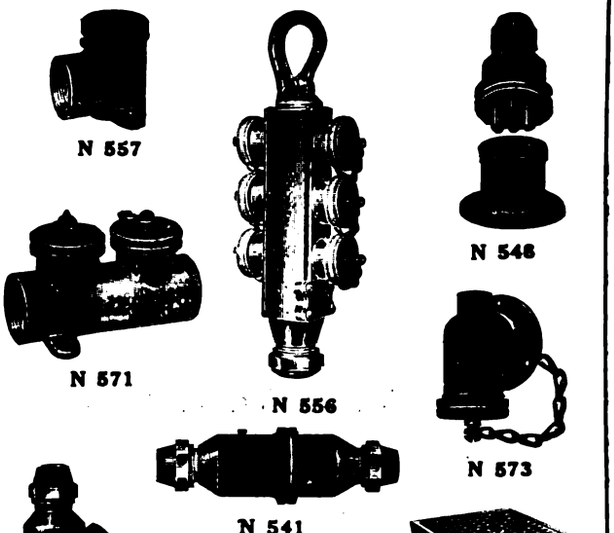

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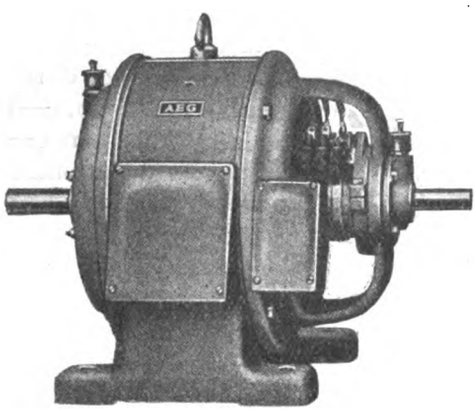

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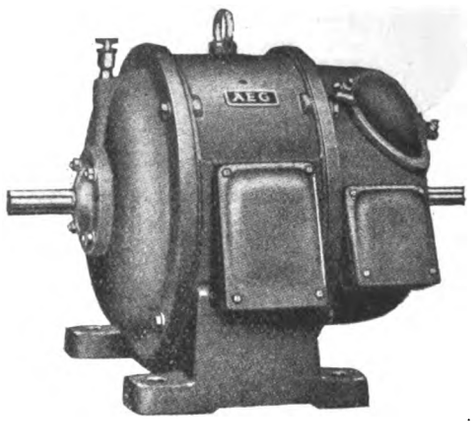

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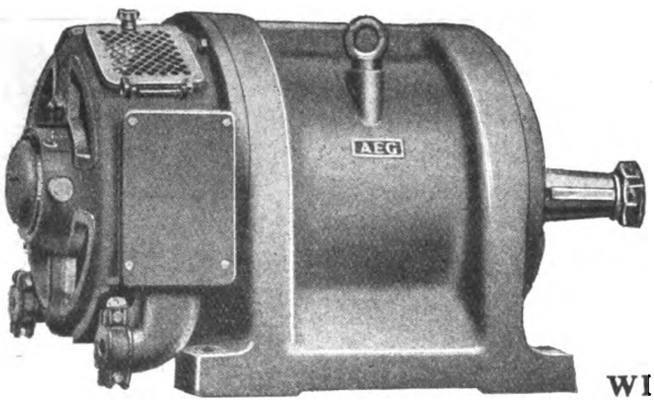

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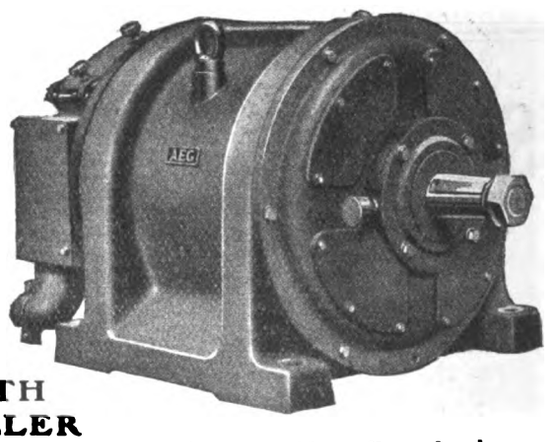

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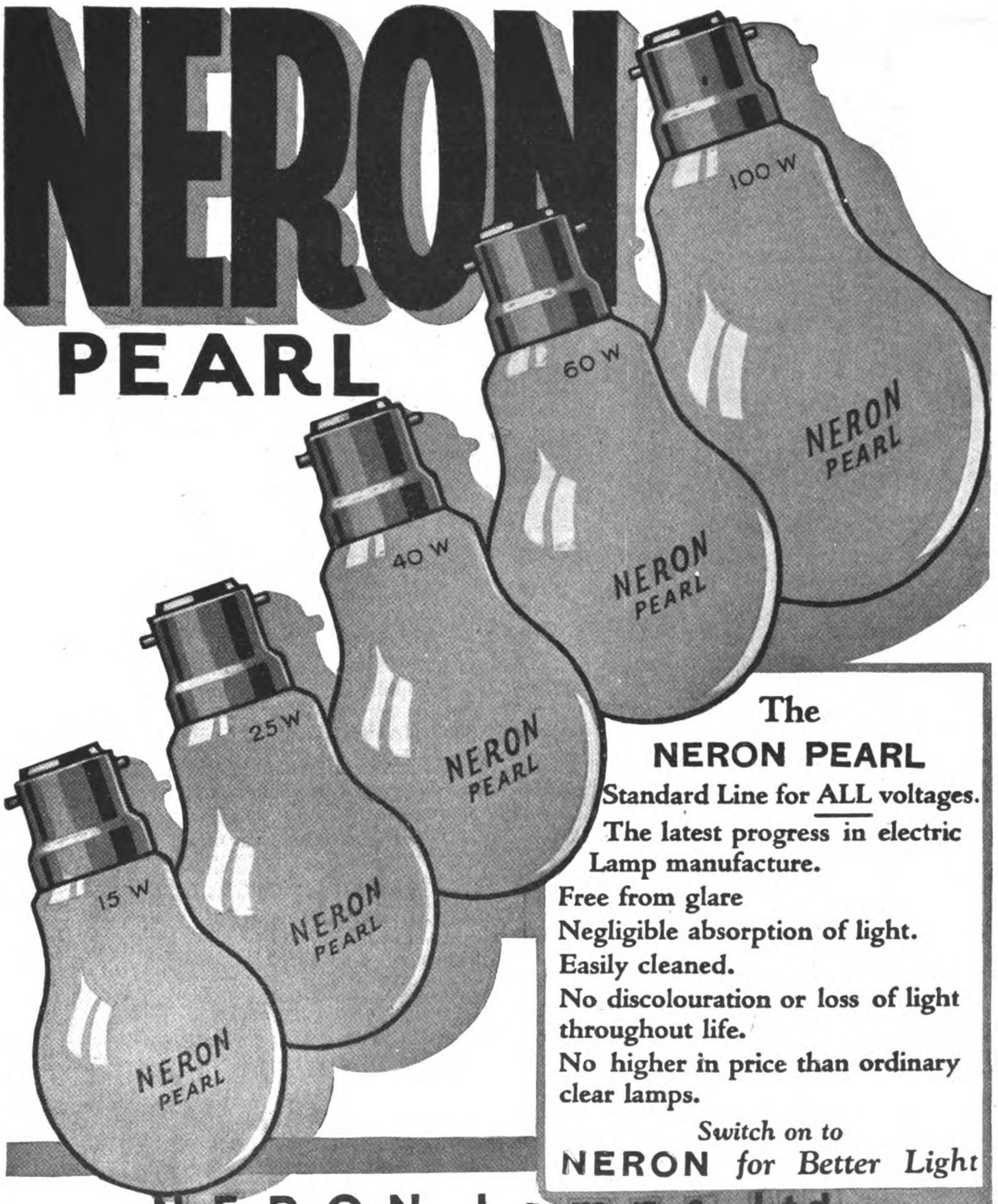

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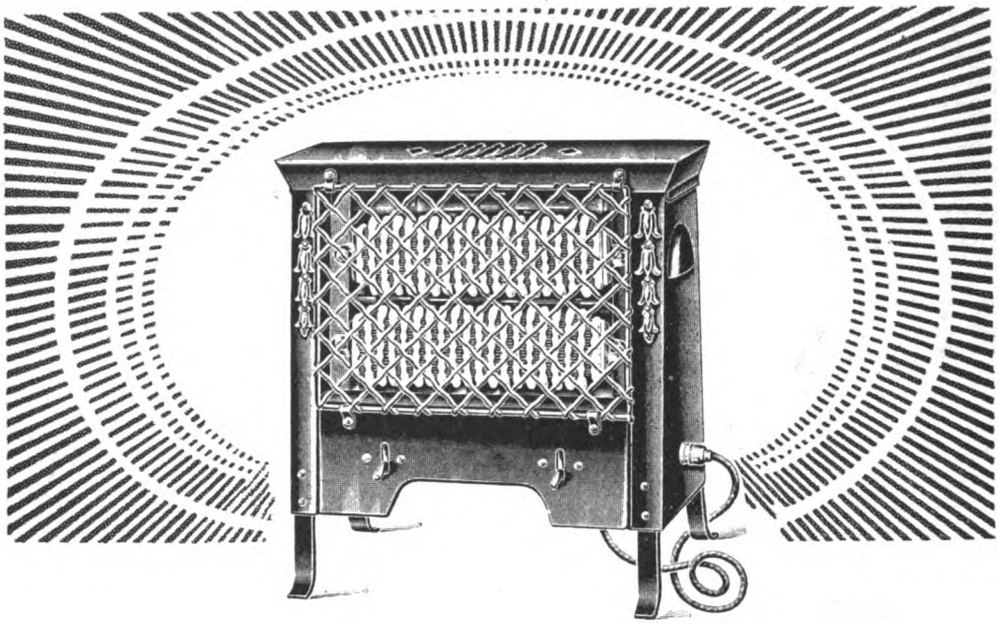

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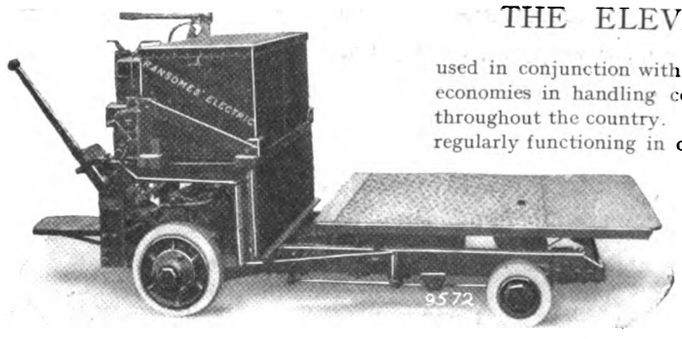
Ransomes' "Orwell" Electric Industrial Trucks are made in 24 standard models and can be readily adapted to meet any special requirements. The following are the leading types:—

Fixed Platform Trucks. Elevating Trucks. Tiering Trucks.
Crane Trucks. Tipping Hopper Trucks.

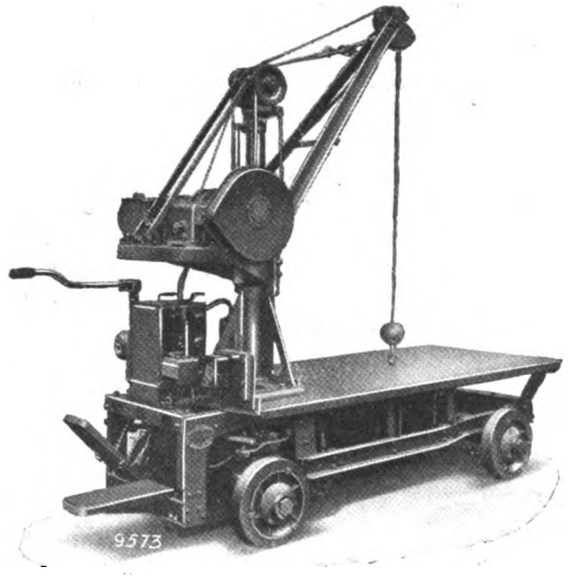


THE ELEVATING TRUCK,

used in conjunction with stillages, has effected enormous economies in handling costs in large and small works throughout the country. We have several of these trucks regularly functioning in our own Plough and Implement Factory, where we find their use effects an economy of many hundreds of pounds a year, each truck saving approximately an amount annually equal to its initial cost.

THE CRANE TRUCK.

A user of our latest pattern of crane truck, recently delivered to him, reports that he has this in constant daily use in his factory, handling barrels, and that he calculates the saving effected at £15 per week.



EXPERT ADVICE.

We are prepared at all times to place at the disposal of prospective users the services of one of our technical outside staff, who will be in a position to advise as to the best system of Electric Truck service to meet any special conditions.

RANSOMES' ELECTRIC TRUCKS

Write for catalogue giving detailed information and illustrations of the 24 standard models which we manufacture.

Ransomes, Sims & Jefferies, Ltd.,
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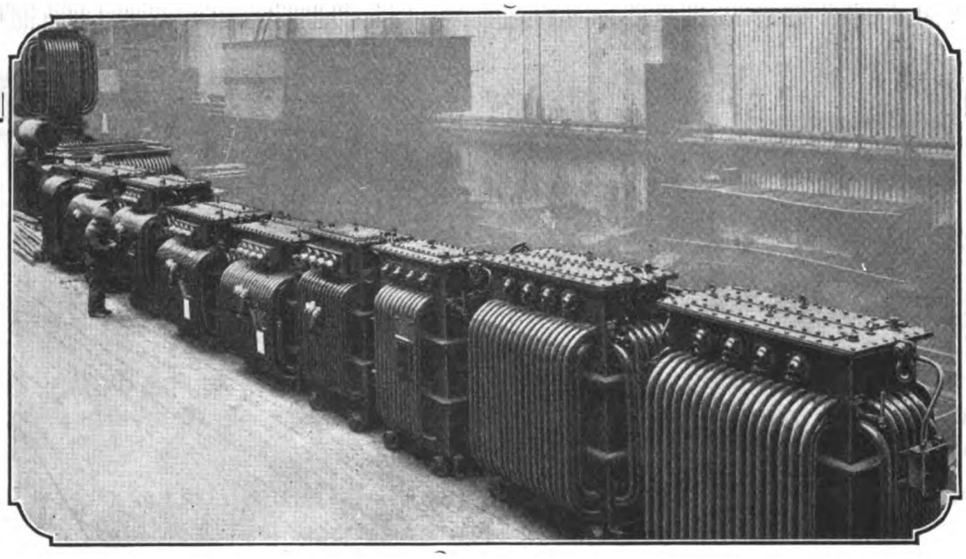

A group of Parsons Transformers at Heaton Works. From 100 kVA to 1,200 kVA.

PARSONS TRANSFORMERS

EMBODY THE EXPERIENCE GAINED FROM YEARS OF PIONEERING WORK IN THE FIELD OF ELECTRICAL ENGINEERING.

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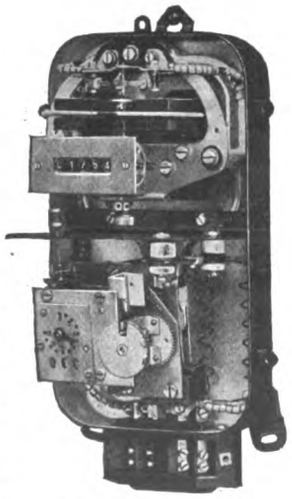

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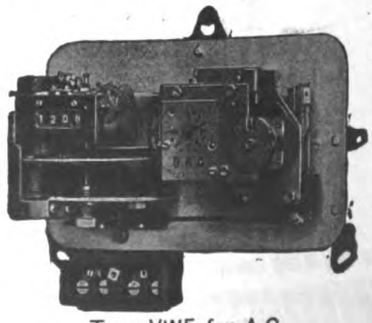

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Loss in Shunt, 0·5 watt.
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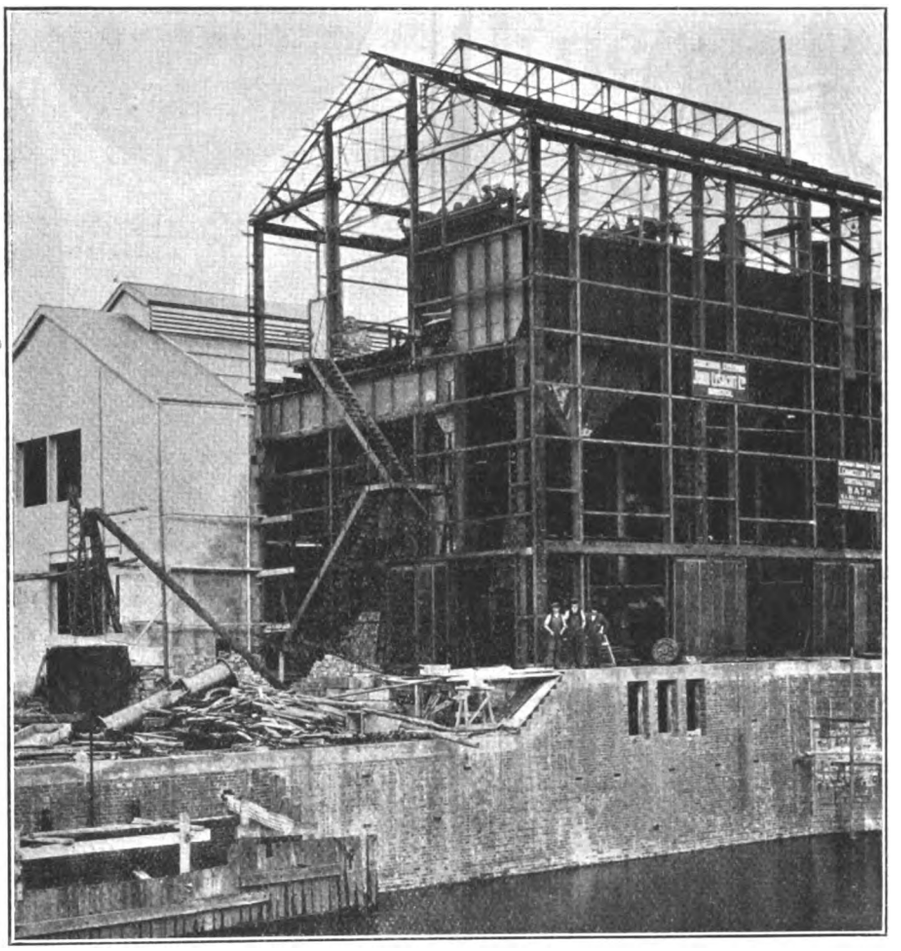

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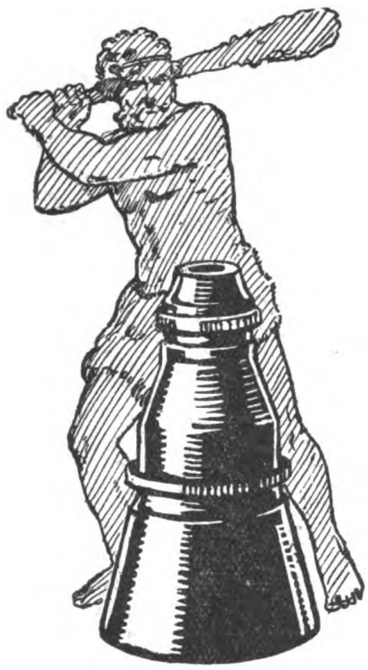

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"Weaklings not wanted." That is the motto we kept in mind when designing the E.I.L. Lampholder. So we selected one of the strongest grades of Ebonestos for the material, moulded it to the simplest shapes, and incorporated very simple and robust components. Result: Lampholders that will stand the roughest handling without getting chipped, broken, or going out of action.

THE MODEL ILLUSTRATED.

This Lampholder has a detachable skirt, thus allowing a shade to be fitted without disturbing the wiring. The skirt is not part of the body of the lampholder, but can easily be removed by unscrewing, leaving the interior, the cord grip and the body of the lampholder intact. Designed according to Home Office regulations. Resists the temperature generated by any kind of lamp.

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We have two very interesting little booklets we should like to send you. One—describing the E.I.L. Lampholder—is called "Safe?" The other—dealing with the material Ebonestos—is called "The Sign of Safety." Both of them contain facts and figures.

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It's *Tone* that matters now in listening in!

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Customers now discriminate as you know . . . . . volume alone doesn't satisfy. They want *tone*—and they get it in Ericsson Super Tone Loudspeakers Senior and Junior. Are you stocking? Our terms and discounts are generous.

The Ericsson Senior retails at 63/—moderate enough as Loudspeaker prices go, you'll admit. Stands 18 in. high on wood base.

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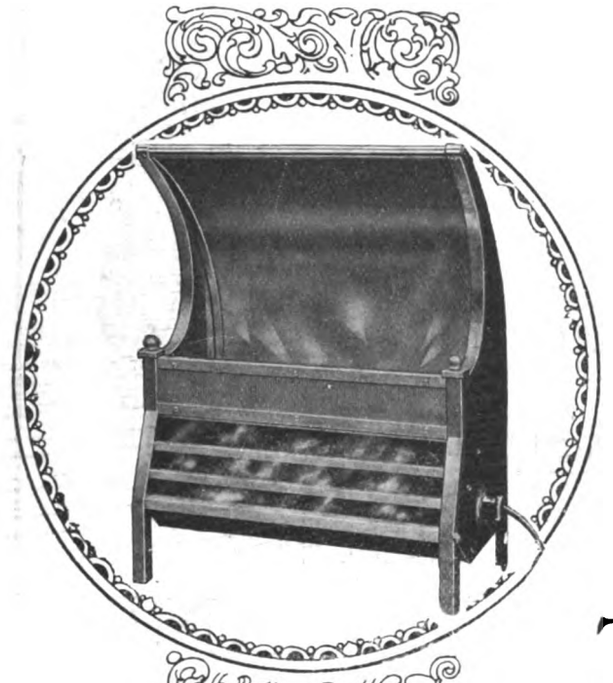

Magicoal Fly Model.
Brass and Polished Steel Finish (Rustless Alloy). Complete with 3 Units, Heating Capacity, 3-way Control.

Magicoal
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Bright, Rustless Finish. 3 kW Heating Capacity.

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THE MAGICOAL FIRE is just like a coal fire at its best—has its living, flickering flames, its cheerful, glowing embers.

The coals are not just pieces of coloured glass, but are manufactured from specially prepared materials to represent coal in its various stages of combustion; and when out they have the appearance of an unkindled fire.

THE MAGICOAL FIRE, whilst gratifying the natural love of a cheerful, genial fireside, is unparalleled in heating efficiency. Scientific construction has been made compatible with artistic design.

Prices and details of a large range of models (all periods and styles) will gladly be sent upon request.

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Telephone: Museum 6800 (4 lines).
Works: London and Birmingham.
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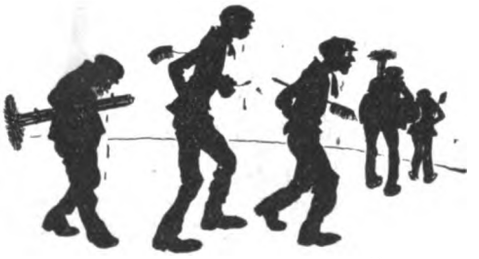

—but the Electrical Industry provides more and more employment each week.

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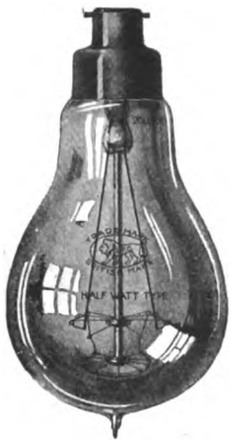
LET LION LAMPS LIGHT LIFE'S LONG LANE



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ARC RESISTING BOARD.
NATURAL SINDANYO
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THE SURFACE OF THE BOARD IS SMOOTH, AND THE THICKNESS IS UNIFORM AND ACCURATE TO WITHIN ± 0.01".
THE MATERIAL IS SUPPLIED IN STANDARD-SIZED SHEETS OF 4' × 3', AND IN THICKNESSES FROM 1/8" TO 2", OR CUT TO CUSTOMERS' REQUIREMENTS.
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ONE OF THE J. & P. PAGES

1927 an Electrical Year

In the Industrial World—in Municipal spheres—among all progressive manufacturers—on the Railways—in the Mines—and last, but by no means least—in the Englishman's Home, be it cottage or castle, there exists on the eve of 1927 a widespread determination to make a fuller and more comprehensive use of Electricity.

That is our opportunity and—yours!

For ourselves, we are making every possible preparation to satisfy this universal desire for the greater economy, convenience and efficiency which the more general use of Electricity will bring, and—

The whole of the specialised knowledge which we have acquired during our 50 years' experience in the manufacture of

CABLES, TRANSFORMERS, SWITCHGEAR,
OVERHEAD LINE MATERIAL and
THE J. & P. WIRING SYSTEM

will be brought to bear on the maintenance of that standard in production which has earned for our manufactures a world-wide reputation for that "little more" in quality which means so much in service, and that "little more" in service which adds so much to quality.

In every sphere of Electrical application British plant is best, and our constant aim will be to preserve at all cost, even in that goodly company, the J. & P. supremacy.

Let us have your New Year enquiries.

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Specialists in the Transmission, Transformation and Control of Electricity.

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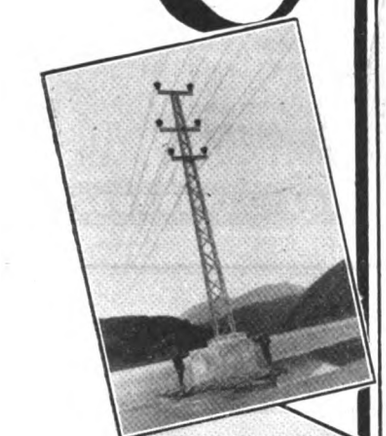

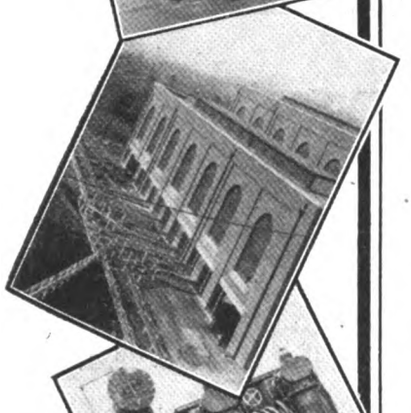

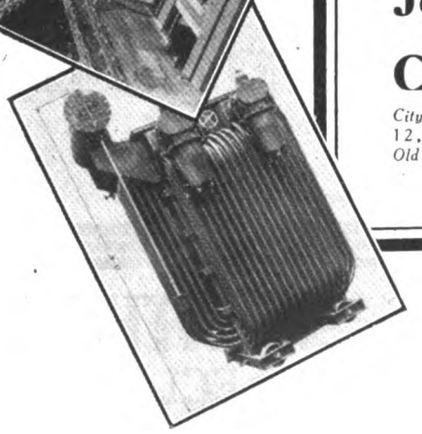

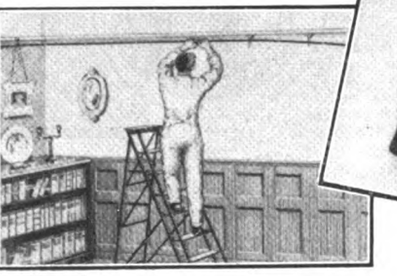

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By so doing, you describe motors designed to give the last ounce of efficiency, with complete reliability and freedom from breakdown.

Use the word—"Metrovick" to describe your next motor.

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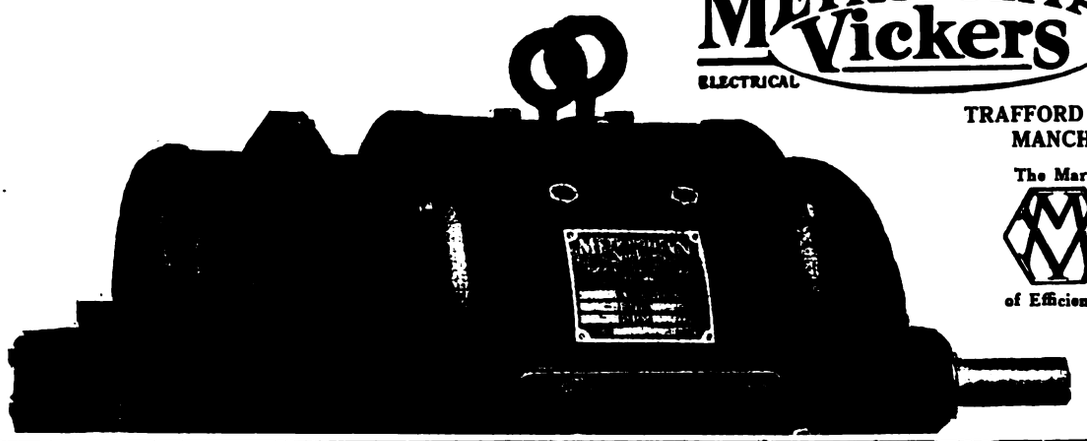
The Mar[k] of Efficiency.



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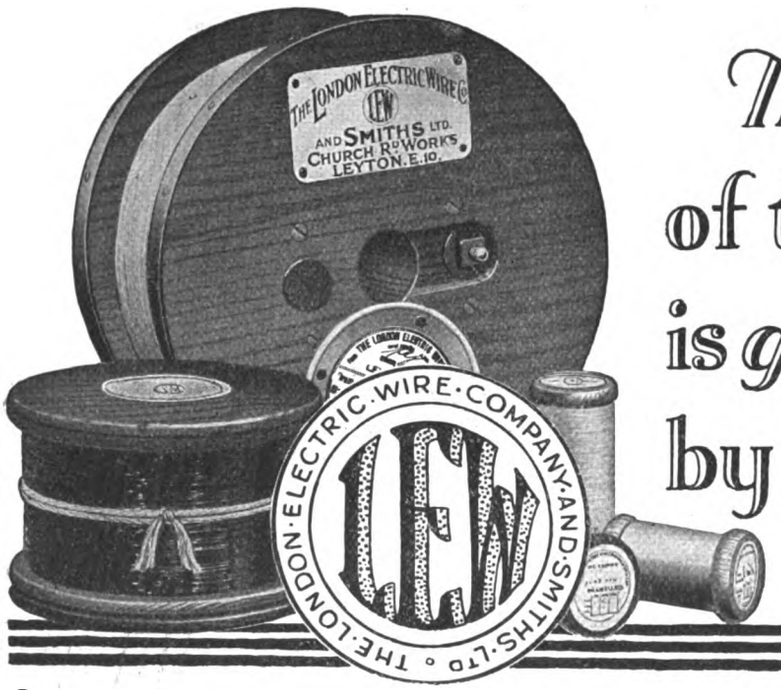

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'Phone: Clerkenwell 1388. 'Grams: "Electric, London."

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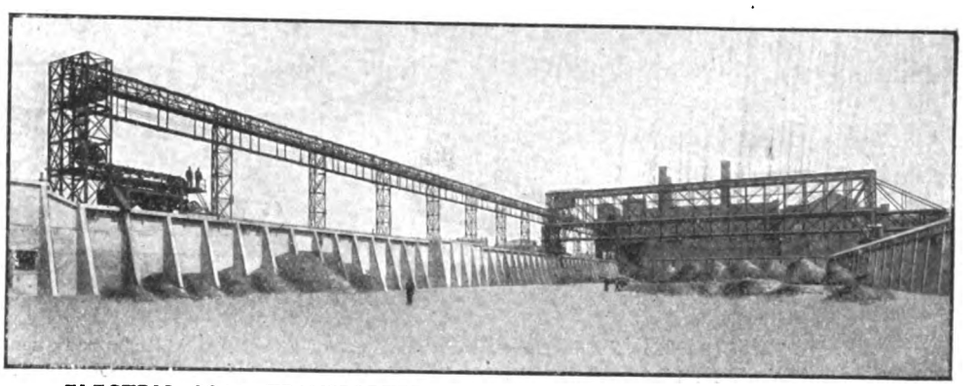

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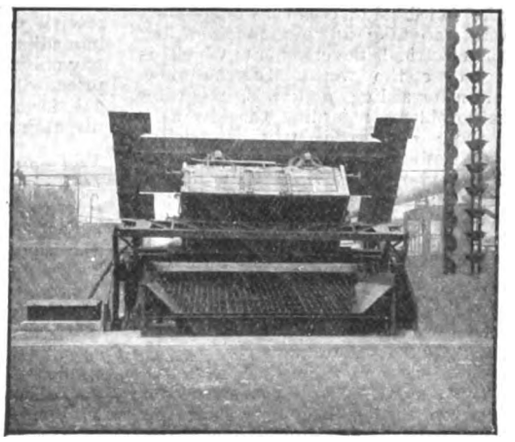
25-TON ELECTRIC COALING CRANE installed on the Clyde.



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With Overlapping Gravity Bucket Conveyor installed in Scotland.

TWO ELECTRIC TRAVELLING 4-TON JIB COALING CRANES installed in London.

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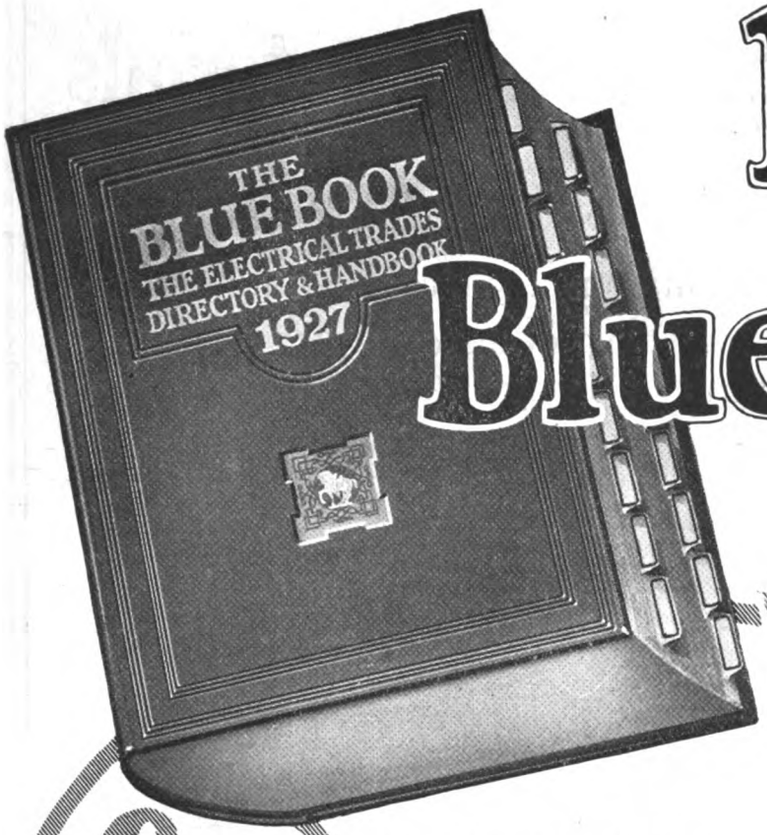

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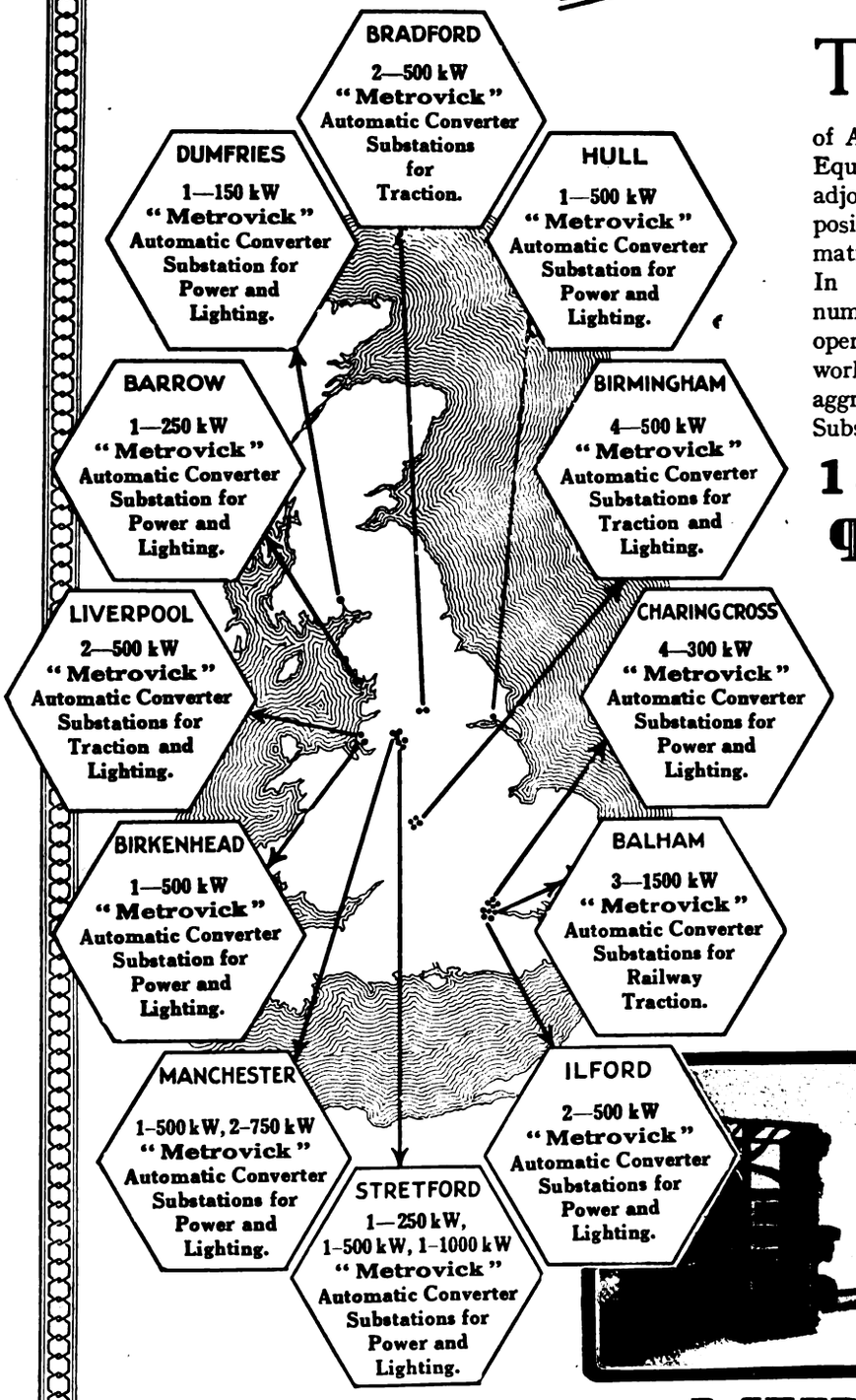

THE extensive experience of the Metropolitan-Vickers Electrical Co., Ltd., in the manufacture of Automatic Converter Substation Equipment is exemplified in the adjoining map which indicates the position of 27 "Metrovick" Automatic Substations in Great Britain. In addition to these, there are numerous other similar equipments operating in various parts of the world. The present approximate aggregate of "Metrovick" Automatic Substation plant is

150,000 kW

¶ "Metrovick" Substation equipments cover LIGHTING, POWER AND TRACTION and are of the following types:—

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(*b*) Time Switch Operation.
(*c*) Remote Control.
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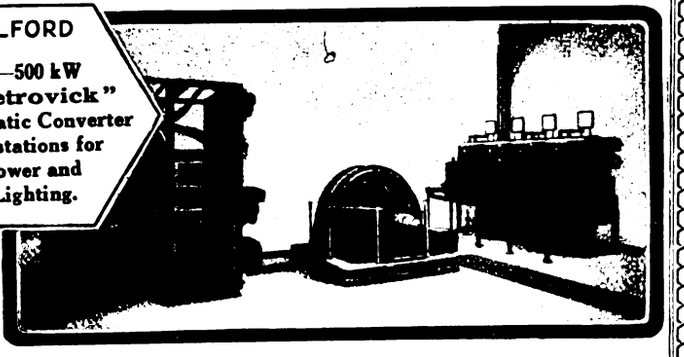
The whole of the apparatus necessary is manufactured at the "Metrovick" Works, so that the responsibility for successful operation is quite UNDIVIDED.

Attention is drawn to the fact that "Metrovick" equipments can be supplied embodying the metalclad, drawout type switchgear, as shown in the Ilford Station reproduced below.

Send your enquiries.



The "Metrovick" Equipments Overseas include:

8—2 500 kW Automatic Converter Substations for Bombay, Baroda, and Central Indian Railways, for operation of Suburban Lines.

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METROPOLITAN Vickers ELECTRICAL CO. LTD

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Always Ready For Service

TIREX "rubber-armored" Portable Cord is a tough, flexible, long wearing cord that is always ready for service.

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We manufacture wires and cables insulated with rubber, paper and varnished cambric.

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Easy to carry about on testing and erection jobs.

Accurate for laboratory work.

The most inexpensive and adaptable instruments on the market, supplied with series and shunt resistances for D.C. and with current and potential transformers for A.C. tests.

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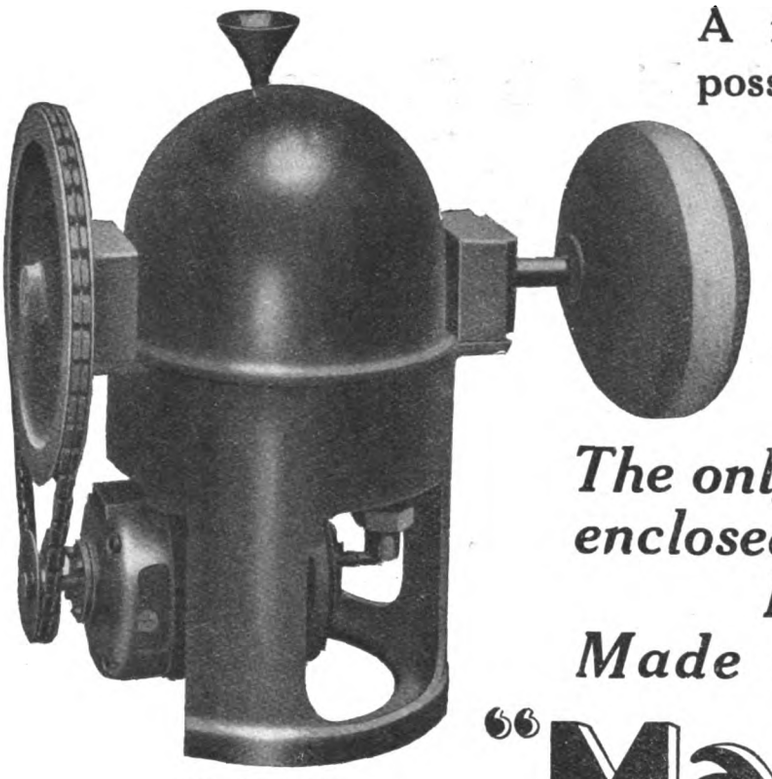

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"Magnet"
Refrigerating Machine
Complete with standard D.C. or 50 cycles A.C. Electric Motor

The only hermetically-enclosed Refrigerating Machine Made in England—

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There is unlimited scope for electric refrigeration amongst Hotels, Restaurants, Purveyors of Perishable Goods and Domestic Users.

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The G.E.C.-your guarantee

MANUFACTURERS—
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Branches throughout Great Britain and in all the principal markets of the world.

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IN looking back over the past year it seems remarkable, in face of the many set-backs, that the Electrical Industry has done so well.

It is a convincing testimony to the optimism and courage of our Engineers.

We feel that throughout the new year conditions will steadily improve, and we take this opportunity of wishing all our customers a generous share in the coming prosperity.

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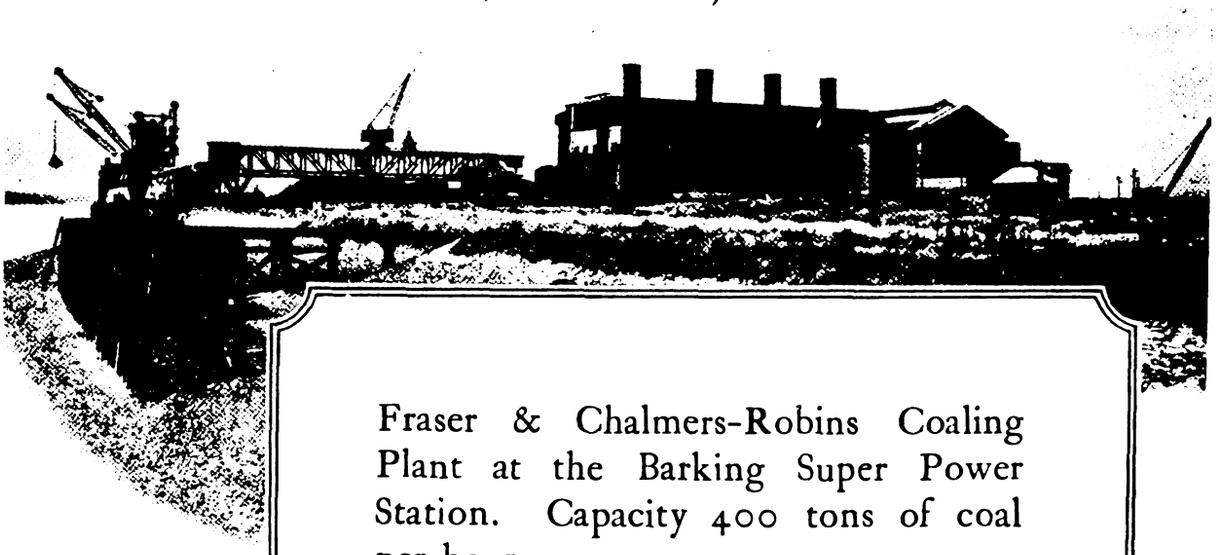
Power Station Coaling Plant

(ROBINS SYSTEM)



Fraser & Chalmers-Robins Coaling Plant at the Barking Super Power Station. Capacity 400 tons of coal per hour.

Two unloading cranes, each with a capacity of 200 tons per hour, unload coal from colliers and deliver by means of belt conveyors either to boiler house or storage.

A typical installation of Power Station Coaling Plant by Fraser & Chalmers Engineering Works, who have equipped some of the largest Power Stations in the Kingdom with Materials Handling Plant embodying the most up-to-date practice and design.

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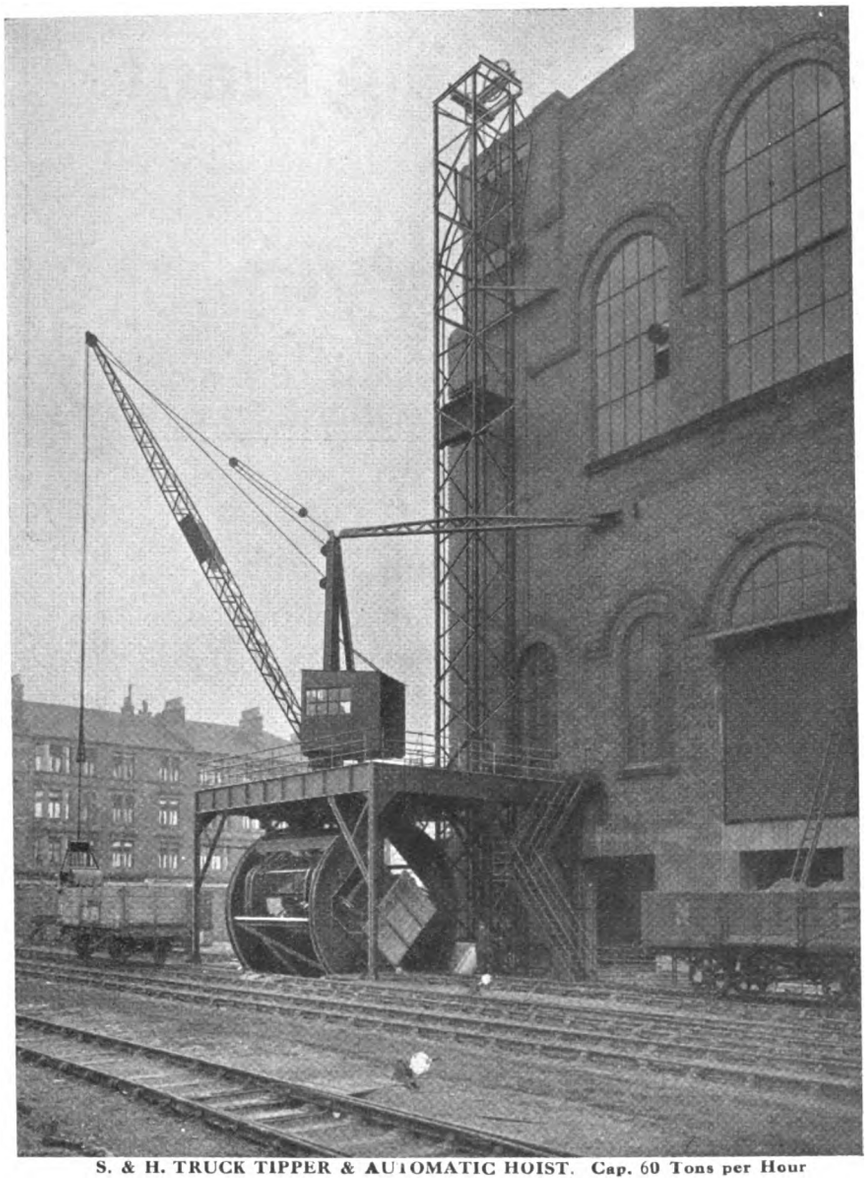

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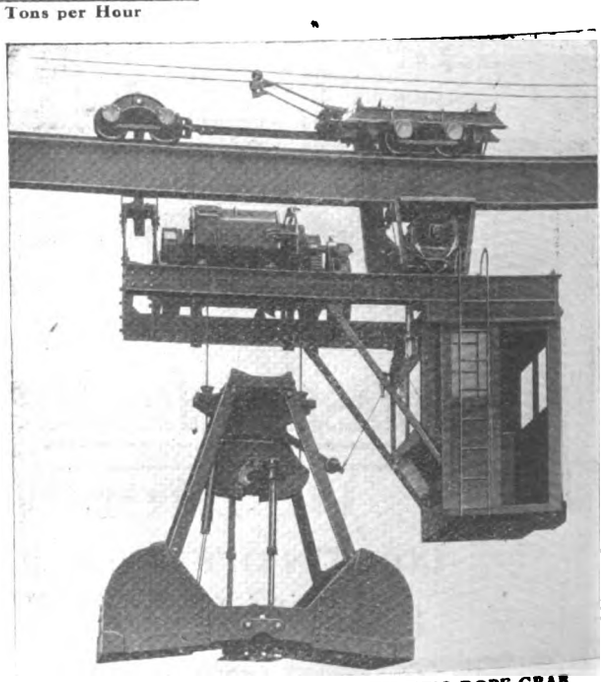

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CHIEF ENGINEER required by the Government of CEYLON in connection with the completion of the Hydro-Electric Scheme and Transmission Lines to Colombo and their development. The person engaged will also assume responsibility for the working of the existing power station and distribution in Colombo and its extensions, as well as of all Government electrical work, except postal and railway telegraphs and telephones. The Hydro-Electric scheme now under construction consists of a small dam, 8 000 ft. of tunnel and two 48 in. pipe lines with a power house containing 15 000 kilowatts of turbine plant. The transmission line in Colombo is about 50 miles. The pressure is 88 000 volts. Distribution at Colombo will be three-phase. Candidates, age 35 to 45, should preferably be Corporate Members of the Institution of Civil Engineers and also Members of the Institution of Electrical Engineers. They must possess practical experience of the construction and operation of hydro-electric power installations, and especially the distribution of electricity upon a large scale. Good administrative ability essential. Salary £2 000 a year with free quarters. Free first class passages, and, if married, for wife and children also, not exceeding four persons beside the candidate selected. Period of engagement five years. Intending applicants should write to the Crown Agents for the Colonies, 4, Millbank, London, S.W.1., for forms of application, quoting M 15000, and enclosing a stamped addressed foolscap envelope.

BOROUGH OF HARROGATE
ELECTRICITY DEPARTMENT.

BOROUGH ELECTRICAL ENGINEER.

APPLICATIONS are invited for the post of Borough Electrical Engineer to the Harrogate Corporation.

Applicants must have had a sound technical and mechanical training. Corporate membership of the Institution of Electrical Engineers is an essential qualification.

Thorough knowledge and experience of the following duties are essential:—

The construction and operation of electrical generating and converting plant with transmitting and distributing systems.

Good administrative ability will constitute an advantage.

The salary attaching to the position will be in accordance with the recognised scale of the Association of Municipal Electrical Engineers (the units sold by the Harrogate Electricity Undertaking, 1926, is, approximately, 5 200 000).

The successful candidate will be required to devote his whole time to the duties of the office, and to reside within the Borough. Canvassing members of the Council (either directly or indirectly) will be a disqualification.

List of duties and forms on which applications are to be made may be obtained from the undersigned.

Applications, endorsed "Borough Electrical Engineer," accompanied by copies of not more than three testimonials (which will not be returned) to be sent to reach me not later than the first post on Saturday, January 15th, 1927.

J. TURNER TAYLOR,
Town Clerk.

Municipal Offices,
Harrogate.
December 21st, 1926.

BRISTOL CORPORATION ELECTRICITY DEPARTMENT.

APPOINTMENT OF RESIDENT ENGINEER.

THE ELECTRICITY COMMITTEE of the Corporation of Bristol invite applications for the appointment of a RESIDENT ENGINEER to act as Clerk of Works for the construction and complete equipment of the PORTISHEAD GENERATING STATION, at a salary at the rate of £800 per annum.

Applications in writing, on the prescribed form, which may be obtained from the undersigned, to be delivered not later than Saturday, January 15th, 1927, to

H. FARADAY PROCTOR, M.I.E.E., M.Inst.C.E.,
Chief Engineer and General Manager.

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REPRESENTATIVES WANTED.

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"IMPROVEMENTS IN OR RELATING TO FRAMES or CASINGS for COMBINED ELECTRIC MOTORS and GEARINGS." The Owners of British Patent No. 255 332 desire to dispose of the same, or would enter into working arrangements with a firm likely to be interested. Particulars may be obtained from TECHNICAL RECORDS, LIMITED, of 59–60, Lincoln's Inn Fields, London, W.C.2.

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ELECTRICAL POWER ENGINEERS' ASSOCIATION.

NOTICE.

THE Special attention of Members of the Association and other Engineers is called to the following decision of the National Joint Board of Employers and Members of Staff (Electricity Supply Industry) given in June, 1924, viz.:

"RESOLVED that as the operation of the N.J.B. Schedule should at this period have ensured a certain measure of standardisation in the technical staff arrangements of Electricity Supply Undertakings, this National Joint Board is of the opinion and recommends that all undertakings over 1 000 kWs capacity should, when advertising vacancies on their technical staffs, state definitely the grade and minimum salary attaching to such positions."

All Members of the Association and other Engineers are urged to give active support to the above agreed recommendation of the National Joint Board by refraining from applying for any position unless the appropriate grade and minimum salary for the post is mutually agreed with the prospective employers.

(Signed) W. ARTHUR JONES,
General Secretary.

102, St. George's Square,
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DRAUGHTSMAN, Grade III, required at the Royal Aircraft Establishment for work in connection with the design of wireless and photographic apparatus. Candidates should have good technical education and suitable shops and drawing office experience. Salary from 40s. to 52s. per week, plus Civil Service bonus depending on experience. The corresponding total remunerations are 66s. 2d. and 82s. per week. Ex-Service men preferred. Apply, quoting A. 140, to the CHIEF SUPERINTENDENT, R.A.E., South Farnborough, Hants.

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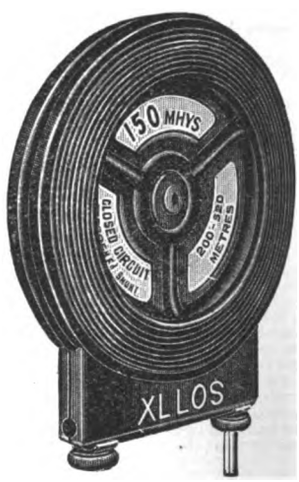

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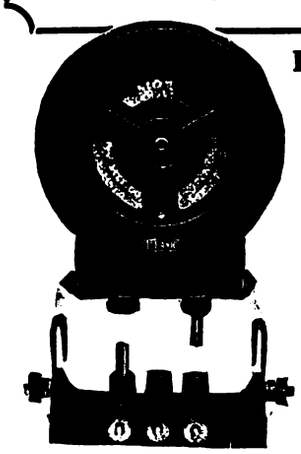

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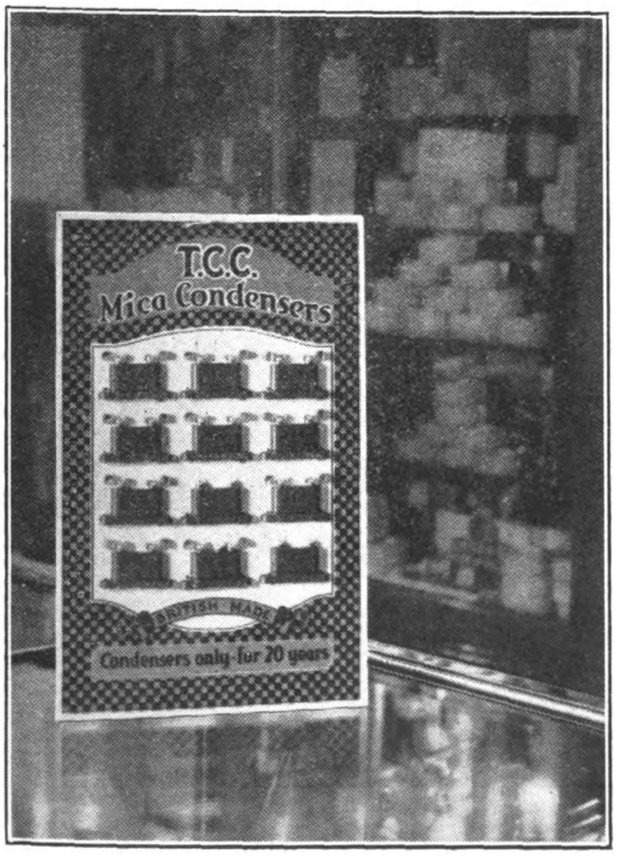

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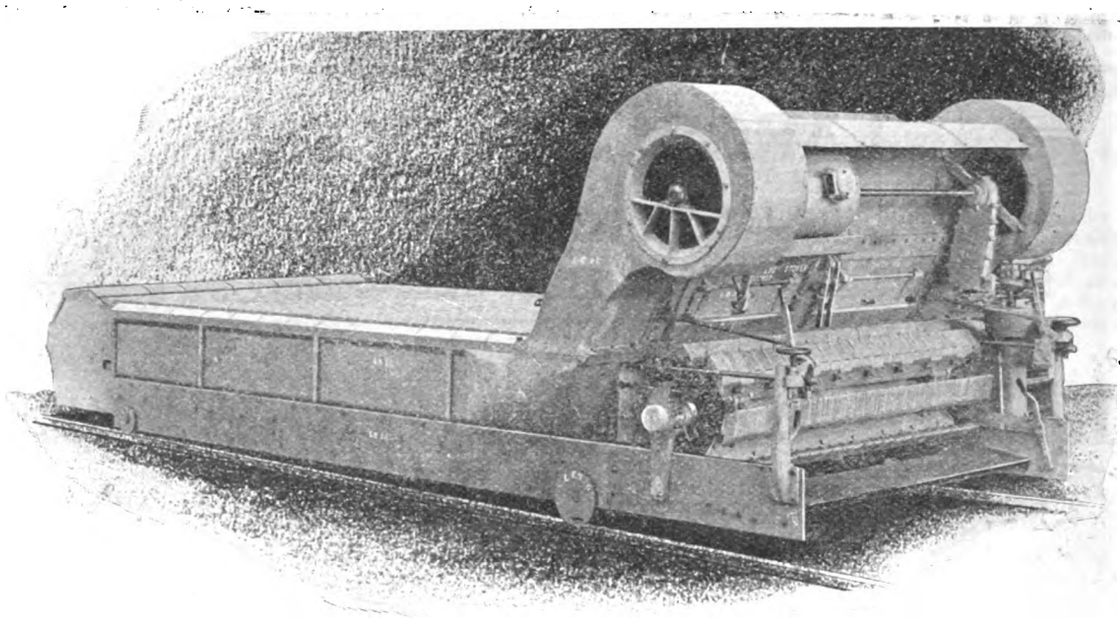

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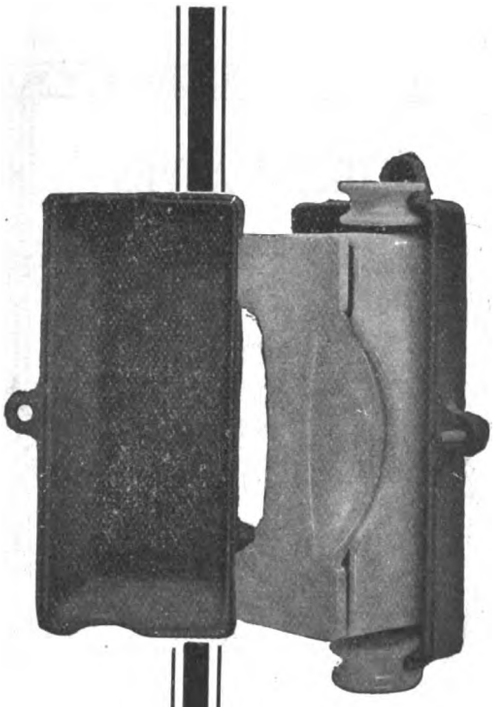

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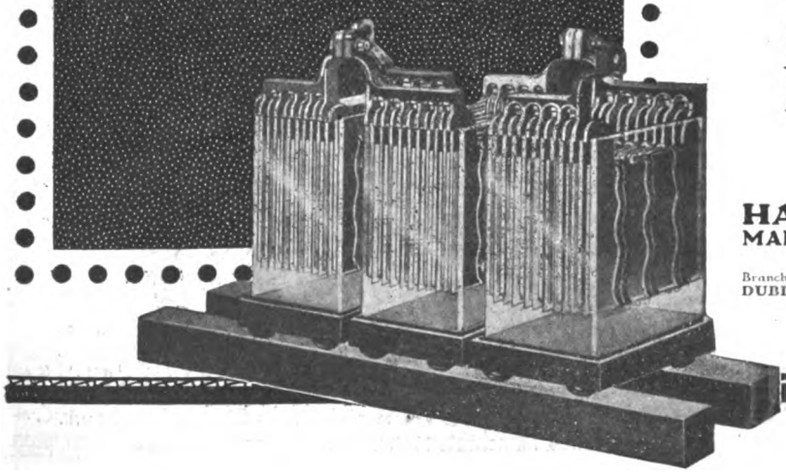

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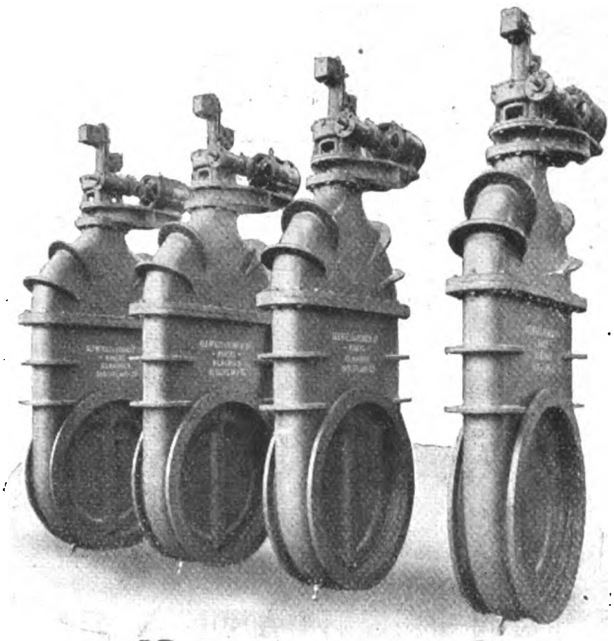

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Self replacement limit switches control valve travel.

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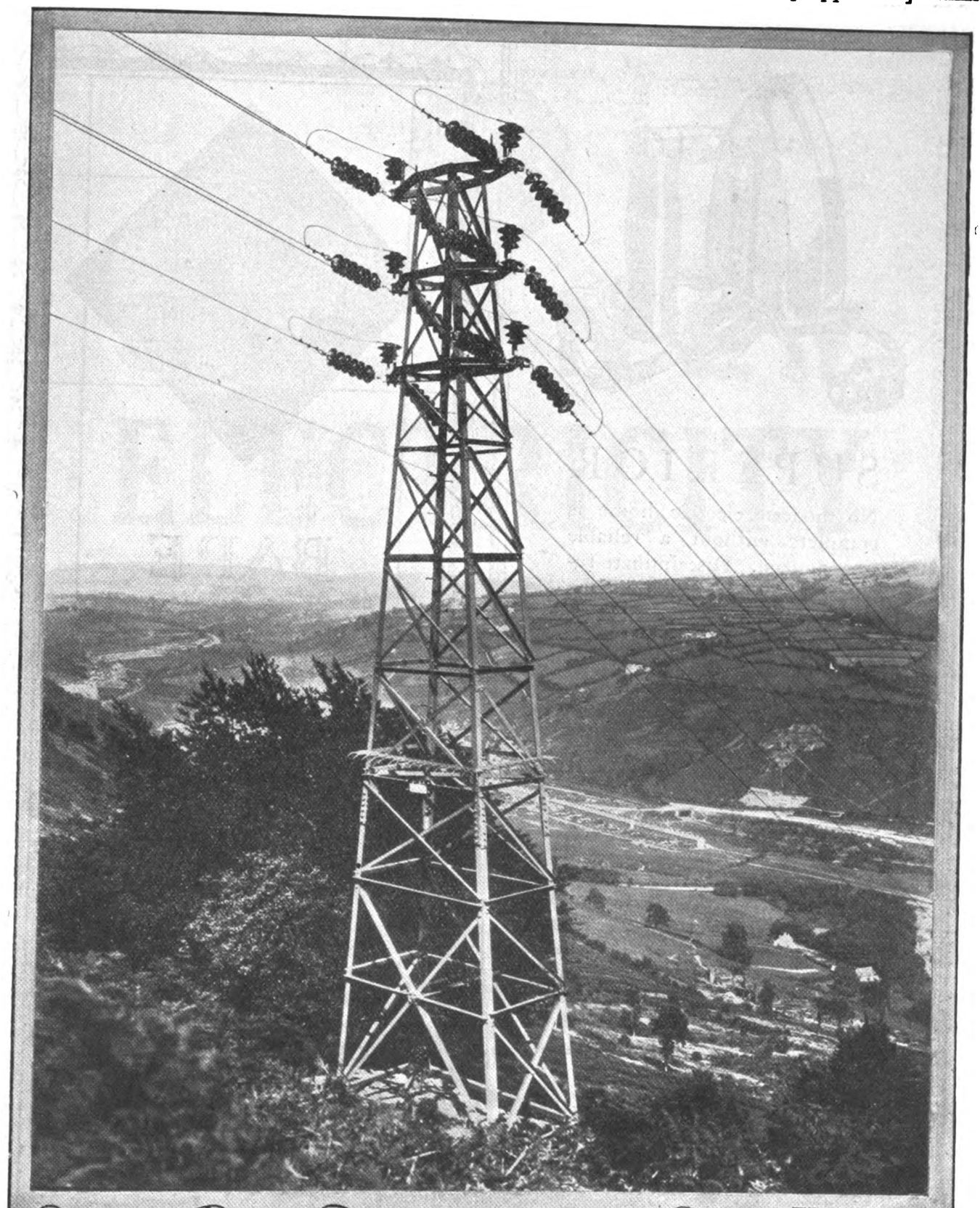

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BY

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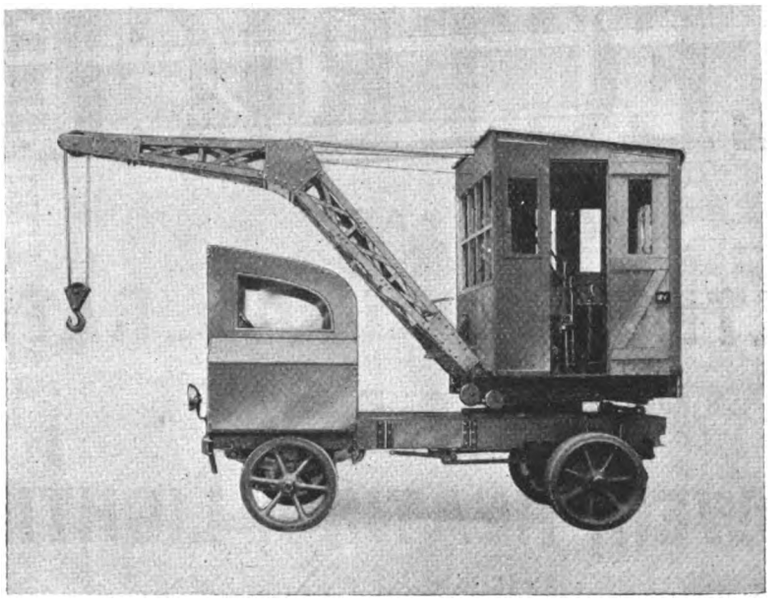
"WITTON-KRAMER"

Electric Battery

TRUCK CRANES

5 cwts—3 tons



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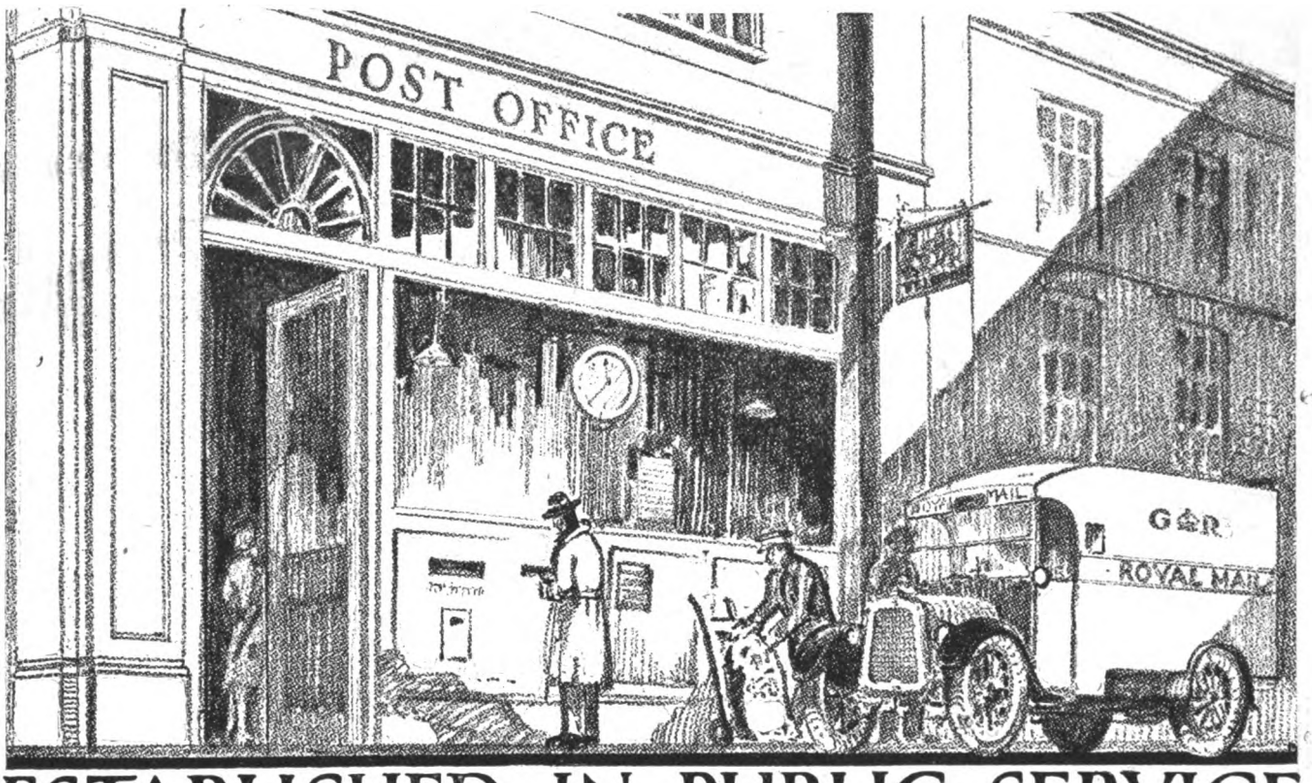

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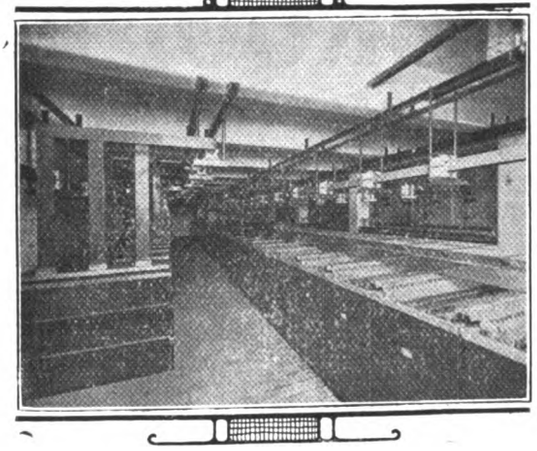

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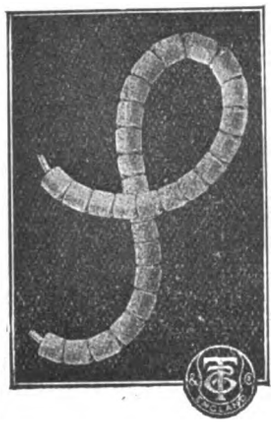

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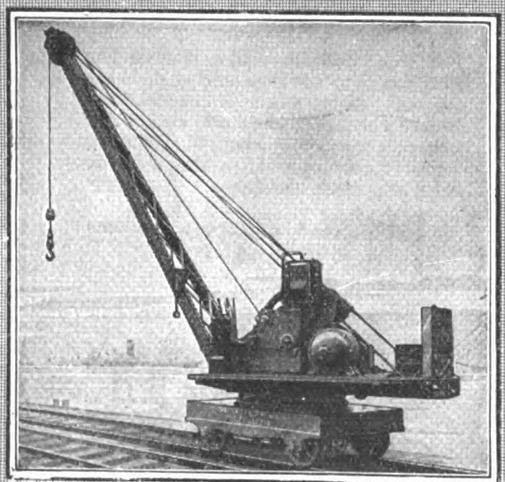

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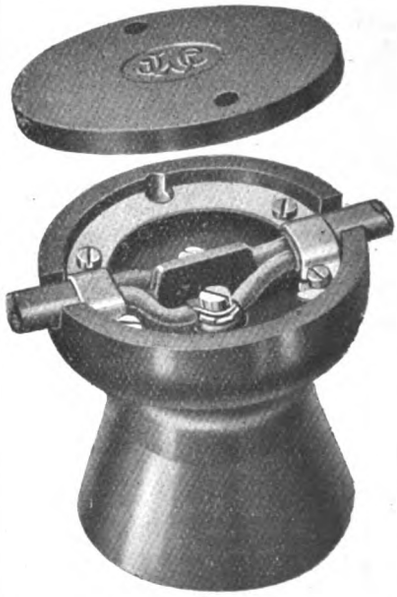

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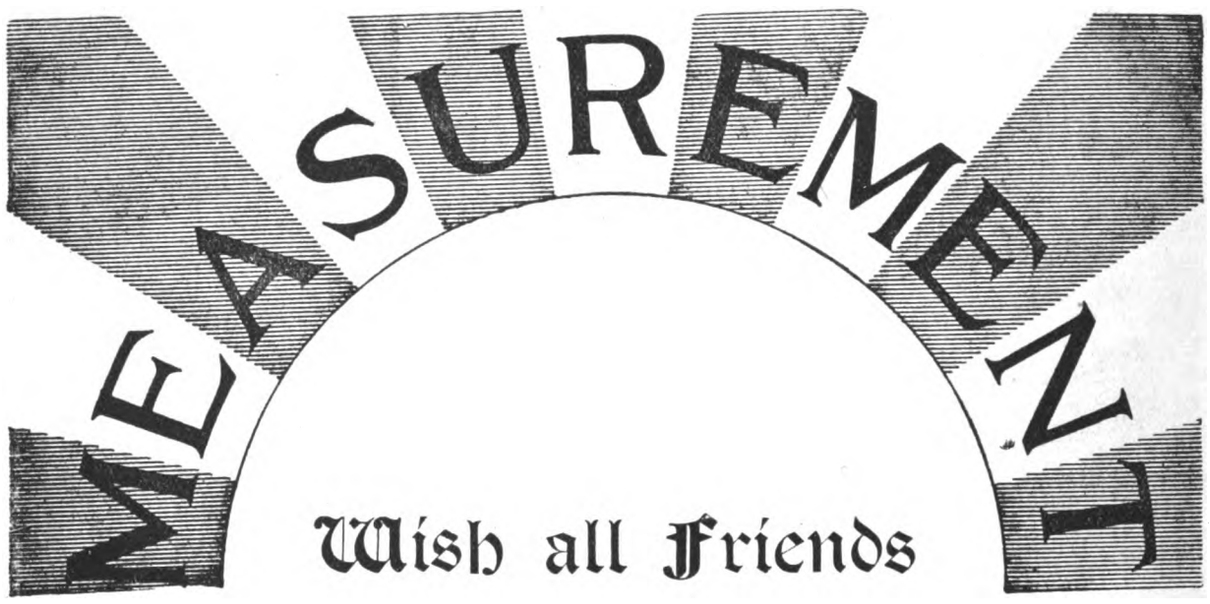

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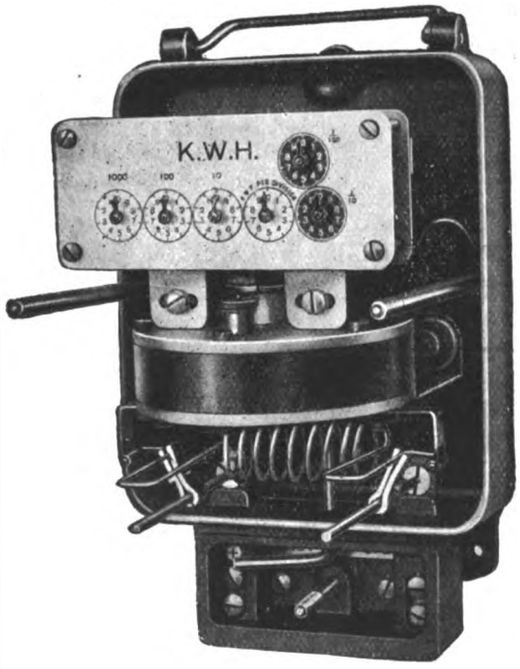

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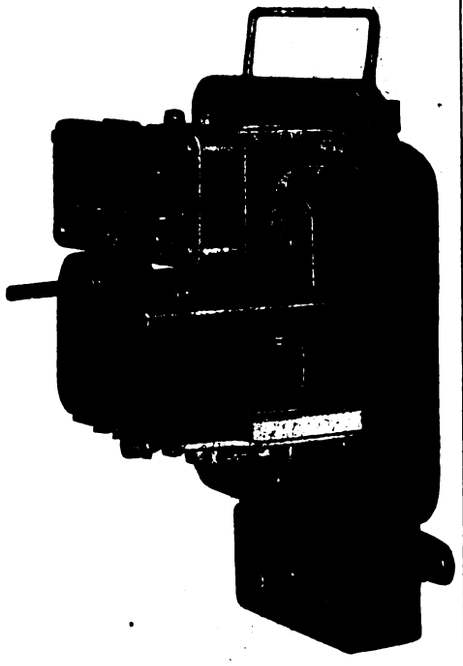

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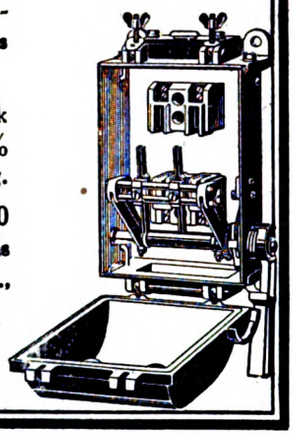

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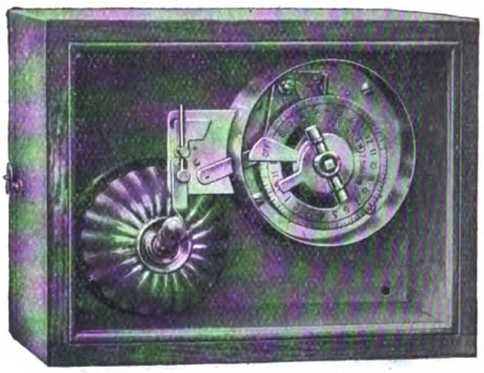

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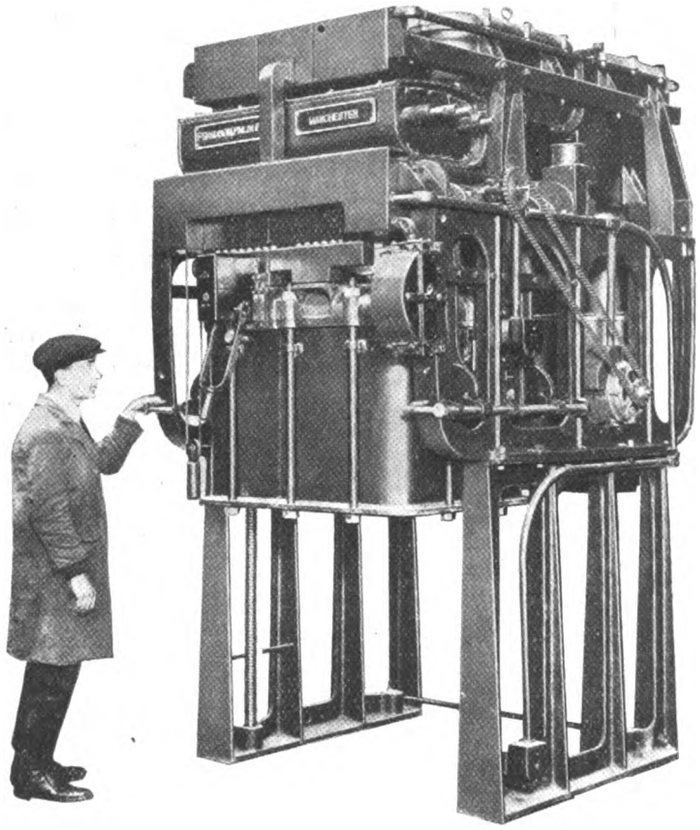
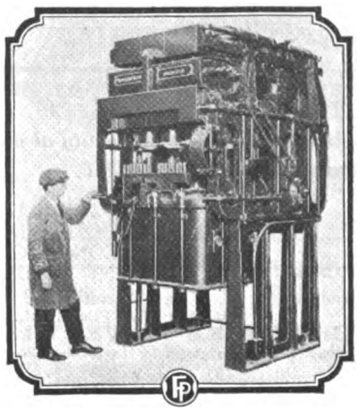
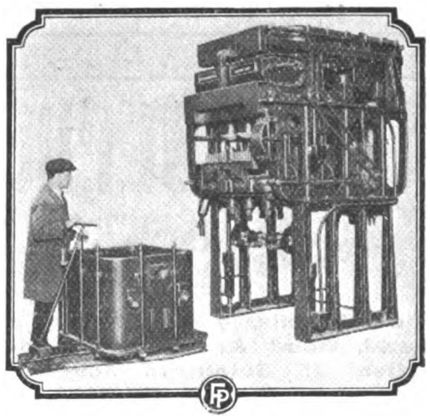


Unit for operating position with circuit breakers plugged in.



Unit in isolated position.



Unit in isolated position with circuit breaker tank removed.

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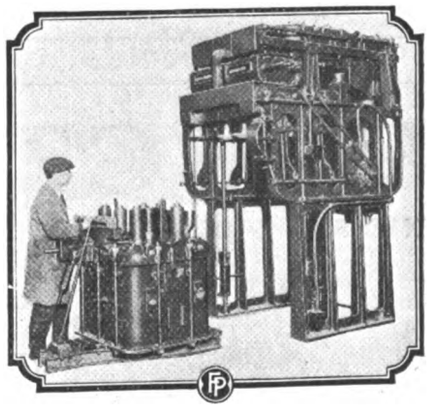

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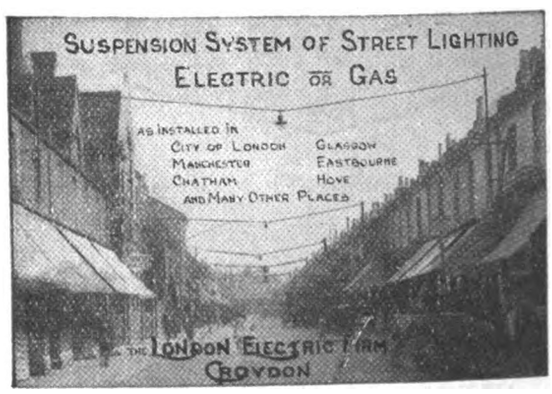

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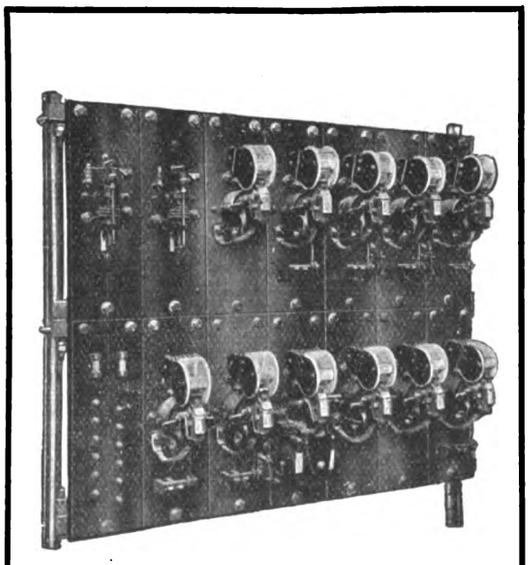

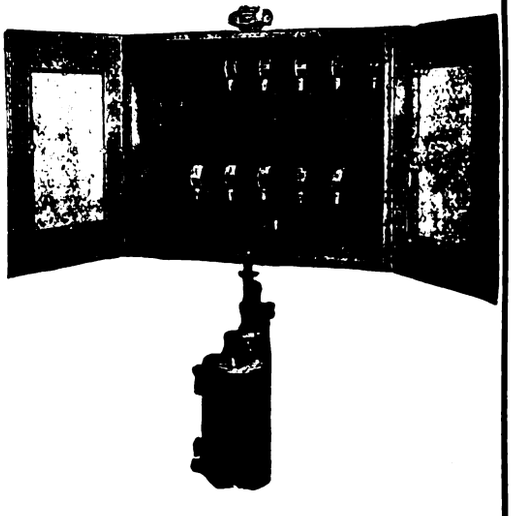

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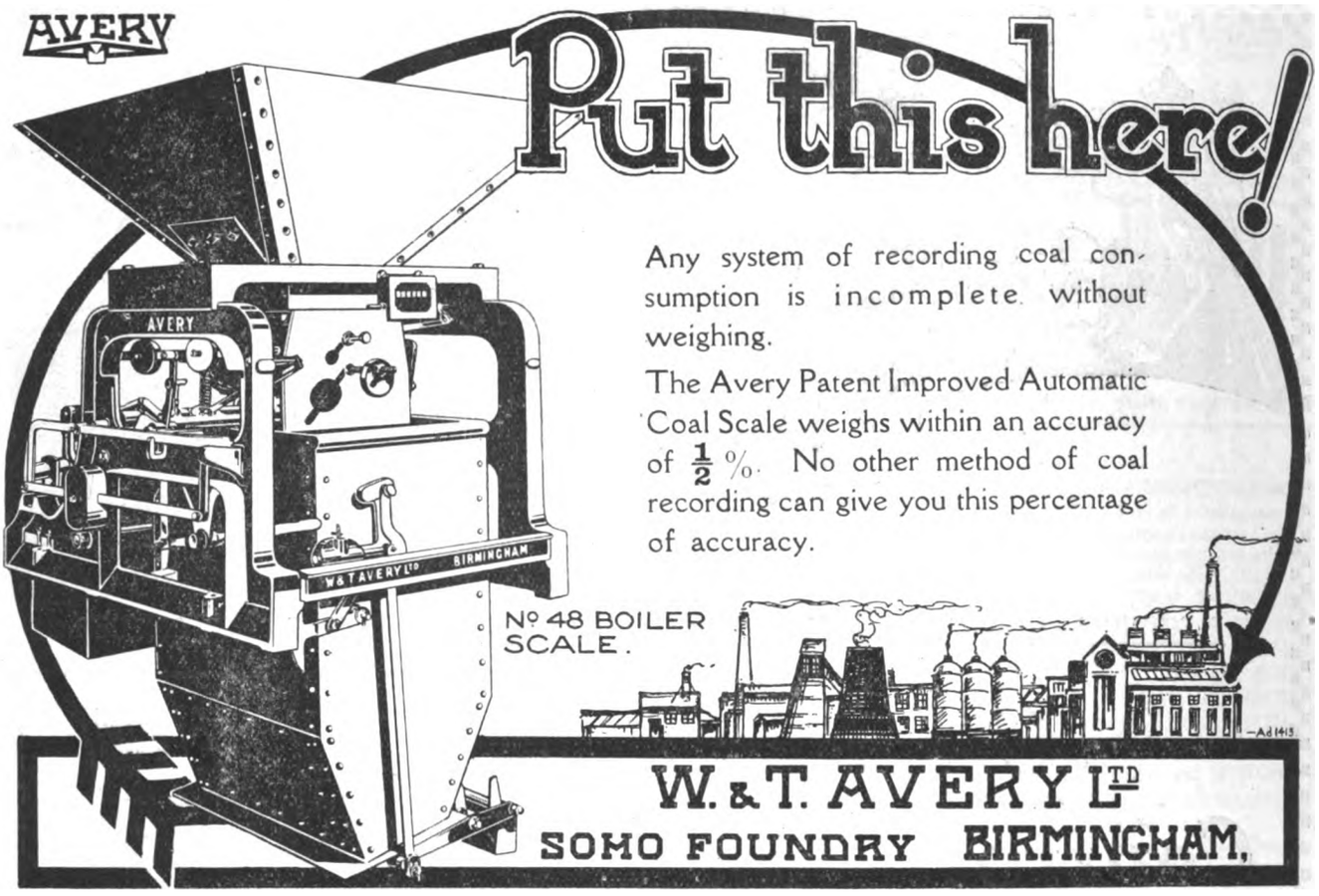
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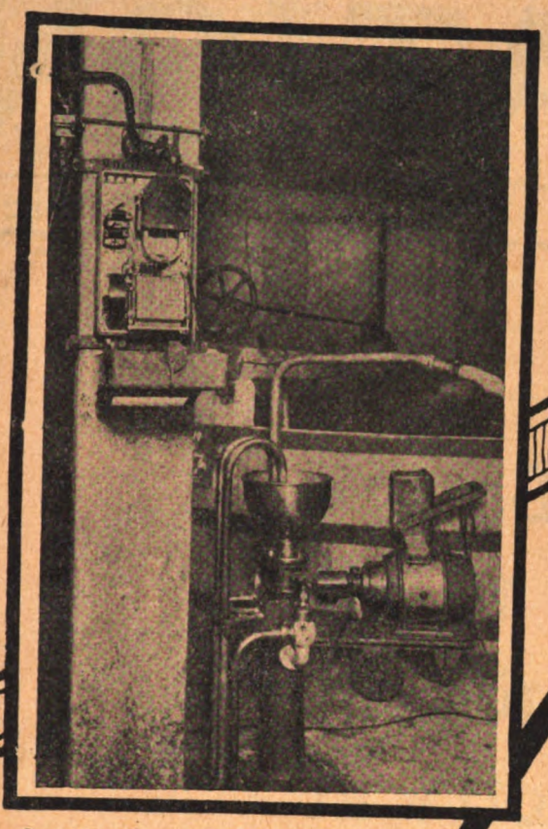

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